THE EFFECT OF CLASS SIZE ON THE STUDENTS' MATHEMATICS PERFORMANCE IN SECONDARY SCHOOL A CASE STUDY OF SOME SELECTED SECONDARY SCHOOLS IN KADUNA METROPOLIS, KADUNA STATE

BY

SANI NASIRU

OCTOBER, 2015

THE EFFECT OF CLASS SIZE ON THE STUDENTS' MATHEMATICS PERFORMANCE IN SECONDARY SCHOOL

"A CASE STUDY OF SOME SELECTED SECONDARY SCHOOLS IN KADUNA METROPOLIS, KADUNA STATE"

BY

SANI NASIRU
U12EZ2016

N.C.E (K.S.C.O.E, 2008)

A PROJECT SUBMITTED TO THE DEPARTMENT OF MATHEMATICS EDUCATION, AHMADU BELLO UNIVERSITY, ZARIA, IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR DEGREE IN B.SC (ED) MATHEMATICS

OCTOBER, 2015

DEDICATION

This research work is dedicated to my late mother Malama Jummai Ahmad and my late primary school mathematics teacher Mal. Ibrahim Gambo Kubau.

May almighty Allah forgive all your errors and grant you with Al-Jannatul Fiddausi.

DECLARATION

I declare that this research work is my original work under the supervision of Mr. I.I Omeza. I attest that no part of this project was previously presented for another degree or diploma at any university, the information derived from the literatures have been duly acknowledged in the text and a list of references provided.

Sani Nasiru

Date

ACKNOWLEDGMENT

My greatest and deepest appreciation first and foremost, goes to the Almighty Allah for his guidance and unmerited favor in my life.

Words will not quantify my sincere gratitude to all those who contributed to the success of this project especially Muhammad Sulaiman (Babangida Bankwam) and Vivian Ahmed a friend from statistics, mathematics department A.B.U, Zaria

I am most grateful to my able supervisor, Mr. I.I Omeza who guidance, wealth of knowledge and exchange of ideas enhanced the quality of this study.

My profound gratitude to my caring parents and brothers, Mal. Yunusa Abdul-Hamid, Habiba yunus, Abdul-Hamd Yunus, Nasiru Yunus, Shuaibu Yunus (Manufa), Hadiza Yunus, Amina Yunus, Aisha Yunus (Magajiya) and Hajiya Mairo Yunus. Alh. Sani. Haj. Hassana Sani, Haj. Habiba Sani. I say a very big thank you for your kindness and support in all areas of my academic. May Almighty Allah bless you and replenish you abundantly.

A million thanks to Mal. Zayyana Registrar Kaduna Polytechnic, Alh. Mamoon former Registrar Kaduna polytechnic, Mal. Lawal Kamba Deputy Registrar information and protocol, Kadpoly, Haj. Rakiya Muhammad Assistant Head Teacher, Kaduna Polytechnic Staff School and all Kaduna Polytechnic members of management and staff who contributed in one way or the other to the success of my study. May Allah increase you all in your careers

Also, my appreciation goes to all my lovely friends, Ibrahim Zubairu (Magaji Soja), Musa Muhammad (Musa rewire), Lawasi Usman, Yusuf Nadabo Kasuwar Barchi Kaduna, Nura Muhammad Ahmad and all my classmates

Finally, I wish to acknowledge all the literature materials used in my study. I say I appreciate your contribution to the body of knowledge and may Almighty Allah increase your wisdom and skills in the fields of academy.

CERTIFICATION

This project entitled "THE EFFECT OF CLASS SIZE ON STUDENTS' MATHEMATICSS PERFORMANCE IN SOME SELECTED SECONDARY SCHOOLS IN KADUNA METROPOLIS, KADUNA STATE" by Sani Nasiru meets the regulations governing the award of the degree of B.Sc (ed) mathematics of Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

Mr. I.I Omeza
Project Supervisor

17 – 11 – 2015
Date

Mal. Dr. M.O. Ibrahim
Head of Section

17/11/2015
Date

ABSTRACT

The main purpose this study was to determine the effect of class size on the students' academic performance in mathematics in secondary school. A total of eighty (80) second year students of senior secondary school participated in the study. The students were from two different schools. School A represents small class size of 30 students while school B represents large class size of 50 students. A mathematics achievement test of 20 multiple choice questions was used for data collection from the students. Based on the findings, the study revealed that, class size is critical factor in determining the quality of output on students' mathematics performance. Students having small class size had better quality of output in their mathematical performance than students having large class size. Based on the recommendation Educational planners have to take class size into consideration when conducting school mapping exercises, while educational administrators have to take class size into consideration in the course of administering schools. To reduce the large number of enrolment at schools, an admission test should be given prior to admission. Those who fail could be encouraged to try other schools. State government should build more classes in all schools. In doing so, much emphaphasis should be given to the provision of more of more classrooms in the state annual capital budget

TABLE OF CONTENTS

CHAPTER ONE

1.0 Introduction

1.1 Background of the Study

The relationship between the class size and mathematics performance of students has been one of the critical challenges for educators. Studies have found that the physical environment, class overcrowding, and teaching methods are all variables that affect students' achievement (Molnar, et al, 2000). Other factors that affect students' achievement are school population and class size (Gentry,& Swift, 2001).

The issue of poor mathematics performance of students in Nigerian secondary schools has been of much concern to all and sundry. The problem is so much that it has led to the decline in standard of teaching and learning of mathematics. Since the academic success of students depends largely on the school environment, it is imperative to examine the impact variables of class size on the mathematics performance of students in secondary school.

Large class size and over populated schools have direct impact of the quality of teaching mathematics. Overcrowded classrooms have increased the possibilities for mass failure of mathematics and make students lose interest in the subject. This is because large class size do not allow individual student to get attention from the mathematics teacher which invariably lead to low reading scores, frustration and poor academic performance.

In order to better understand the skill levels of students, it might be necessary to evaluate factors affecting their performance. These factors can include school structure and organization, teacher quality, curriculum and teaching philosophies (Driscoll, Halcoussis & Svorny 2003).

Study shows that large class affected teacher's behavior and students' performance in mathematics. Thus, this study was embarked upon to determine the effect of class of class size on students' mathematics performance in some selected secondary schools within Kaduna metropolis

1.2 Statement of the Problem

The poor performance of students in mathematics in WAEC and NECO is at an alarming rate. This is because the classes in most secondary school are overcrowded. This has amount to in ability of the teachers to have adequate control of the class during the mathematics teaching/learning process. In spite of the recommended normal class size of thirty students to a teacher by the national policy on education (NPE). A case of over population in the classroom is still very rampant.

Most teachers find it very difficult to evaluate their students properly simply because of the great number of students they are faced with. It is therefore became the concern of the researcher to undergo study into how class size affect students mathematics performance in some selected secondary school in Kaduna metropolis. Since poor evaluation of the students by the mathematics teachers is caused by overcrowded classroom. it is hoped that the result if this research may help improve students' mathematics performance in Nigerian secondary schools at large.

1.3 Objectives of the Study

The general purpose of the study is to find out the different between the students performance in mathematics in small class size and large class size using some selected secondary schools in Kaduna metropolis, Kaduna state as case of study.

The specific objectives are:

i. To determine the relationship between the class sizes and students' mathematics performance.

ii. To determine the different between the male students' mathematics performance in small class size and those in large class size.

iii. To determine the different between the female students' mathematics performance in small class size and those in large class size

iv. To determine the different between the mathematics performance of female students in small class size and male students in large class size

v. To determine the different between the mathematics performance of male students in small class size and female students in large class size

1.4 Research Question

Answers to the following formulated questions would hopefully achieved the objectives of the study.

1. To what extent has class size affects students mathematics performance?
2. To what extent has class size affects male students' mathematics performance?
3. To what extent has class size affects female students' mathematics performance?
4. To what extent has class size affect gender in students' mathematics performance?

1.5 Research Hypothesis

Ho_1: There is no significant different between the male students' mathematics performance in large class size and those in small class size.

Ho_2: There is no significant different between the male students' mathematics

performance in large class size and those in small class size.

Ho_3: There is no significant different between the female students' mathematics performance in large class size and those small size.

Ho_4: There is no significant different between the male students' mathematics performance in large class size and female students' mathematics performance in small class size.

Ho_5: There is no significant different between the female students' mathematics performance in large class size and male students' mathematics performance in small class size.

1.6 Significance of the Study

This study which aimed at finding the effects of class size on students' performance in mathematics, its finding at the end would be of great significant in the following ways:

I. The findings would help teachers to identify the reasons for the mathematics performance of student in large classes and how they can address the problems.

II. It would enlighten and encourage the school proprietors, principles and stakeholders on the need to appreciate the approved norms of class size.

III. Parents and entire community as well as private organizations will experience positive changes in performances of students in mathematics both at WAEC and NECO examination and their terminal examination at school.

IV. This study would also give incentive to mathematics teachers to use the approved norms of class size to encourage students' participation in classroom and group work during teaching. This will therefore lead to creativity thereby enhancing scientific and technological development and the nations stand a better chance to benefit from its outcomes

1.7 Scope of the Study

Although the problems involved with class size on teaching and learning of mathematics is nationwide, but this research is concerned with some selected secondary schools in Kaduna metropolis, Kaduna State. This is due to the financial involvement and time limit for the study.

There are many public and private secondary schools in Kaduna metropolis. Two secondary schools were selected due to their proximity and accessibility to the researcher. The selected schools are as follows:

1. Kaduna polytechnic demonstration secondary school, (KPTSS), Kaduna
2. Government secondary school (G.S.S) Rigasa Kaduna.

The content of coverage for the students includes their level of assimilation and assessment and evaluation. The result of this study can be generalized and applied to other secondary schools within the educational zone and beyond

1.8 Basic Assumptions

The followings were assumed under this study

1. The students used for this study have been taught by competent mathematics teachers.
2. The students used for this study have interest in learning mathematics
3. The schools used have all the necessary mathematics teaching aids

CHAPTER TWO

Literature Review

2.1 Introduction

This study is being carried out to investigate the effect of class size on students' mathematics performance a case study of some selected secondary schools in Kaduna metropolis, Kaduna State. In this regards, the review of literature shall be focusing on the following:

i. The concept of class size

ii. Effect of class size on mathematics performance

iii. Class size and teachers' methods of instruction

iv. Class size and students' attitude

v. Mathematics performance in a large class size

vi. Effect of class size on resources and facilities utilization in teaching and learning of mathematics

2.2 The Concept of Class Size

Class size refers to the number of students regularly in a single teacher's classroom for whom that teacher is responsible (Lauren, 2003). It can mean the number of students enrolled in the course, the number of students completing the course, or the number of students completing major course assignments, (Arias & Walkers, 2004). Class size is therefore the number of students in a classroom that the teacher is accountable for on daily basis for the teaching and learning process (Brooke, 2009).

The class unit is the basic unit of organization for instruction, therefore class size information should be foundational knowledge for educators. Yet between the first edition of the encyclopedia of education in 1971 and its second edition in 2002, understanding of class size and its actual use have arguably seen both the greatest and the least change among the fundamentals of education. Class size and pupil teacher ratio (PTR) are define, computed, conceptualized and used differently. There are many factors which effect the teaching process. Among

these, class size is considered as one of the most important factors (Kyriacou & Adam 2006).

The related literature clearly indicated that class size and the effect associated with class size should be seriously taken into consideration by educators. In his overviewed of studies about class size, Hassan (2007) stated that research on class size generally examined the relationships with class size and childrens' performance, childrens motivation, teacher satisfaction, teacher stress and the organization.

NPE recommends a normal class size of 30 students per teacher which is hardly attainable in Nigeria because of the growing population which leads to increase in school enrollment without corresponding increase in provision of facilities and manpower. Other factors that determine class size include financial hardship, inadequate supply of teachers, structures, among others. This has been a great concern to government, administrators and other stakeholders in education.

Meanwhile development in grouping or curriculum organization has direct and immediate implication on the class size (Dukawa, 2011).

2.3 Effect of class size on Mathematics Performance

Reduced class size proved to have a positive effect on students' mathematics performance at the elementary, secondary and college levels. Result of Wuttebols, (2000) and Haenn, (2002) suggest that smaller class size produce the largest and most consistent test gains among disadvantaged students.

Monks and Haller (2000) found out that curricular adequacy was reached at a small higher school level, that is graduating class of 100. Becker and powers (2001) studied the effects of class size and other class specific variables on learning of secondary school mathematics, they found that beginning class size was significant and negatively correlated to learning mathematics, since students in large class were significantly more lively to withdraw before taking the post – test. At college level, Dillon, Konnelenberg and Christy (2002) found that class

size negatively affects mathematics grades. Generally students' average grade decline as class size increases.

2.4 Class Size and Teachers' Method of Instruction

Students questionnaires and mathematics teacher interviews, revealed that both students and mathematics teachers, believed that large class size inhabit small group activities, an individualize instruction because of noise level and lack of space in the classroom. The mathematics teacher does not have enough sufficient time to check each student's work. The mathematics teachers indicate that they do not have enough time to pay attention to each student and give every students a chance to speak or participate during teaching and learning of mathematics. As a result, individual student do not receive sufficient attention from the instructor (Kalajaiye, 2004)

Researchers maintained that reasons to why the effects of class size on students learning outcome is very small is that teachers tend to use the same teaching methods regardless of class size, and that there may be greater attention to peer

effect in smaller classroom. Regardless of the fact that teacher does not change his fundamental teaching strategies when given small class. So many methods of instruction have been identified and recommended for teaching and learning mathematics in secondary schools. Among them are: discussion method, individualized method, demonstration method, laboratory method, discovery method, problem solving method, assignment method among other (Ellis, 2011).

Ughamadu (2006) identified that class size is a determining factor in the selection of method of teaching. He further stated that discussion method may be appropriate for a small class but not appropriate for a larger class.

It was found that, the relationship between class size and instructional effectiveness depend on many related variables, such as age, level of students, subject matter taught and instructional method used (Collins, et al, 2001). Recent statistical syntheses of this research reveal that the instructional benefits of smaller classes are most significant for classes numbering under 20 students, in

effect in smaller classroom. Regardless of the fact that teacher does not change his fundamental teaching strategies when given small class. So many methods of instruction have been identified and recommended for teaching and learning mathematics in secondary schools. Among them are: discussion method, individualized method, demonstration method, laboratory method, discovery method, problem solving method, assignment method among other (Ellis, 2011).

Ughamadu (2006) identified that class size is a determining factor in the selection of method of teaching. He further stated that discussion method may be appropriate for a small class but not appropriate for a larger class.

It was found that, the relationship between class size and instructional effectiveness depend on many related variables, such as age, level of students, subject matter taught and instructional method used (Collins, et al, 2001). Recent statistical syntheses of this research reveal that the instructional benefits of smaller classes are most significant for classes numbering under 20 students, in

those with 30 to 40 students class size has little overall effect on educational quality (George, 2003)

Class size is a policy issue that has perennially divided teachers and policy makers, especially during contract negotiation (Edgell, 2003). Common sense tell us, as teachers argue that smaller classes facilitate increase student-teacher-interaction, allow for thorough student evaluation, and provide (potentially) far greater flexibility in teaching strategies. A number of studies, such as one by Shapson and Collseagues (2007) have demonstrated that, teachers do not necessarily modify their teaching strategies when placed in smaller classes. Shapson found that class size makes a large difference to teacher in terms of their attitudes and expectation but little or no difference to students or to instructional method used. And concluded that teachers need to be trained in his instructional strategies for various class sizes.

Meanwhile, teacher can improve themselves through improving the quality of the material presented and providing help needed for weaker students. Excellent

teachers support acquaintances with students, encourage vigorous learning, make students relate it to their every day lives. Offer beneficial feedback on performance and respect the way students learn and understand. Tell me, and I'll listen. Show me I'll understand. Comparisons of large classes with small classes suggested that students perceived the instructors effectiveness in teaching the subject matter, organization and clarity and use of examples and illustrations to be of significantly higher quality in the best large classes. Instructors interest in students learning and instructor/student interaction, however were related of significantly higher quality in the best small classes (Saba & Umar, 2010)

A number of education researchers have written books and articles detailing how to teach effectively in large classes by employing teaching methods to make the classes seem smaller. Example include brainstorming, asking student questions, dividing the class into smaller groups, and starting the class with a puzzle or paradox to get student to exercise the higher-level cognitive skills (Frank, 2005)

In addition to these techniques, research suggest that the use of media technology, such as using a wireless microphone to wander through the classroom while teaching, also mitigate the negative effects of large class size for student. While these types of suggestion would seem to eliminate the problem instructors face in teaching large classes and hence improve student learning.

2.5 Class Size and Students Attitude

The various researchers study over the years have reached some consensus. Smaller classes do lead to a more positive attitude towards the subject matter of the course. In the most extensive study of class size and student attitude, the specific conclusions were larger classes appeal less to students with good grade. Better students seem to desire the positive impacts of smaller classes on the development of higher order cognitive skills. The reason is that students in general viewed large classes less favorably than smaller classes as they perceived lack of teacher student interaction in the larger classes and the deleterious impact on student motivation inherent in large classes. Also smaller classes tend to minimize student discipline problems because teachers can move easily, keep

all students under their watchful eyes, allowing more time for instruction and reducing the emotional strain of teaching (Saba & Umar, 2010).

Moreover, as you can imagine having a smaller class directly reflects the classrooms behavior. Having a teacher manage fewer student will be easier and therefore eliminate time wasted on disciplinary actions.

Recent analysis has shown that those students who were in smaller classes in the early grades also exhibit lower crime and teen pregnancy rates. Children's behaviour may be affected this is way because smaller classes make it harder for them to escape the teachers notice. The reduction of the amount of students in a classroom will also result in fewer distractions for the teacher and students (Barnett, 2004). Additionally, smaller class size will lower the overall noise present in a classroom.

Some researchers have shown that, class size has little effect on student performance. In his research Zahorik (2001) shows that it can have a profound effect on students attitude toward a given subject in large class, students tend to

be less motivated to participate orally and thus feel less free to contribute , and there is also less incentive to pay attention given the anonymity and available to students in the large classroom. The combination of these factors brought in by large classes can thus deter student from developing hatred in mathematics as subject and as discipline. Moreover students create fewer discipline problems as engage in more pro-social behaviour, allowing teachers to devote more time to instruction and less to controlling the class. Smaller classrooms are more pleasant and have fewer distraction (Robinson, 2003)

It was also found that, greater opportunities for interpersonal interaction and individual participation which facilitate a more favourable social climate will exist in smaller groups than in larger groups. This is a good instrument for altitudinal development in the student about a particular subject (Miguel, 2006).

It is obvious, from the aforementioned, class size has a greater influence in determining the students attitude as well as teachers attitude in a particular subject, as such the teacher in the classroom should try all his possible best to

make the student develop positive attitude in any situation he find himself. Also, the administrators, government should always put in place the necessary things in place for teachers encouragement.

2.6 Mathematics Performance in Large Class Size

In a large class size as the school continues to experience enrolment explosion, interms of the students' intake, less care was taken to provide adequate human and materials resources to take care of the students in quality and quantity. Some researcher have assessed the effect of class size on the mathematics performance of the student.

Performance has been seen by John (2000) as a response which may be identified as one of the action or reaction that constitute the operations of an interaction system. The author views performance as am aspect of behaviour that will represent a complex aspect of behaviour of an individual difference in performance which provides the basis for the differentiation of structure on

groups. Scheck (2001) Noted that large class size affect mathematics teachers behaviour and students' performance in mathematics.

It has been argued that students in smaller classes benefit from greater attention which results in higher students achievement especially in learning of mathematics (Macrea, 2005). It was suggested that only very small classes (in which instruction is nearly one – to one) produce significant difference in average students achievement (Okonkwo, 2009).

Abert Bengtsson, L. (2007) also identified the causes of student under achievement in mathematics to include large classes population and quick in recommending a reduction of class size toward better mathematics achievement. Reducing class size to increase student mathematical achievement as an approach that has been tried, debated and analysed from several I decades. The premises seen logical fewer student to teach, mathematics teacher can coax better performance from each of them. But what does the research show, some researchers have not found a connection between smaller classes and higher

students performance in mathematics but most of the researcher shows that when a class size reduction program are well design and implemented, students performance in mathematics rises as class size drops, that is by the central of public education (CPE), (2005).

Finn, (2000) reported that students in smaller classes did better than those in large classes. Nye, (2004) analysed project star data to determine of certain subgroup of students had greater gain in mathematics achievement when placed in smaller classes. The researcher found the minority students participating in small classes had larger gain in mathematics achievement than students in large classes.

In another study, Nyne Hedges and Konstautopoulos (2004) explored the long term effect of studying mathematics by student who had learnt mathematics in small classes. Student who were taught mathematics in small class size had statically significant higher scores in mathematics than student who were taught in large class size for four years under the same learning condition.

Space (2003) found mixed result in a evaluation of class size reduction program's impact on mathematical achievement in the third year. At class III on significant differences were found in the achievement of mathematics between students in reduced class size and those in regular class size. Johnson (2000) concluded that it is likely, infact that class size has a variation pales in comparison with the effect of many factors not included in the data such as teachers quality and teaching method.

2.7 Effect of Class Size on Resources and Facilities Utilization in Teaching and Learning of Mathematics.

Many classrooms of our senior secondary school are small and cannot seat more than 50 students (the average classroom space is less than one meter per student) Simon (2001). He further argued that, there are approved norms of class size, 40 students per class for junior secondary school (JSS1-3) and senior secondary school (SS1-3) while the standard allocation of class space per student is 1:25 square meters.

However, it was also argued that, few students per class are uneconomic as they do not make full use of space, teacher and teaching materials. As a result, student are squeezed in and some cannot find a chair to sit and cannot squeezed extra seats. Students are crowded by the door. Those who sit in the back find it difficult to see what is written on the chalk board. During interms, classroom are not spacious enough as more space between the seats is needed. Rows are two close that the mathematics teacher cannot walk in between the seats to check the students' work. Seat cannot be arranged in a U-shape or a semi-circle for small group activities. Many mathematics teacher seek for help during test invigilation. During test, some student can easily cheat as seat are two close to each other (Okoro, 2005)

CHAPTER THREE

Methodology

3.0 Introductions

The goal of this study is to find out the effect of class size on students' mathematics performance in some selected secondary schools in Kaduna metropolis. This chapter describes the research design, area of the study, population of the study, sample and simplifying techniques, instrument for data collection and method of data analysis to be employed in the research.

3.1 Research Design

The research design use in the study was survey research design where by two schools one with large class size of 50 and the other with small class size of 30 were pre-tested and post-tested with mathematics achievement test (MAT).

3.2 Area of the study

The extent to which this research work could be applicable covers some selected secondary schools in Kaduna metropolis.

3.3 Population

The target population includes all senior secondary school two (S.S II) within Kaduna metropolis of which Kaduna polytechnic demonstration secondary school (KPTDSS) and government secondary school (G.S.S) Rigasa were used due to their proximity and access ability to the researchers. Where KPTDSS two (SS II) of the school was taken as the small class size of 30 and GSS Rigasa senior secondary school two (SSII) was taken as the large class size of 50.

Table 3.3.1 The List of Schools for the Study.

S/N	NAME OF SCHOOL	SCHOOL TYPE	S.SI	S.SII	S.S.III	POPULATION
1.	Kaduna polytechnic demonstration secondary school	Public	98	67	45	210
2.	Government secondary school Rigasa Kaduna	Public	302	283	254	839
TOTAL			400	350	299	1049

Table 3.3.2 Students Sampled sex

S/N	SEX	FREQUENCY	PERCENTAGE
1.	Male	47	58.75%
2.	Female	33	41.25%
	Total	80	100%

3.4 Sampling and Sample Techniques

S.SII arm out of the three arms of the two schools that made up the entire population of the study were taken as sample. The procedure for selecting the S.SII arm of the two schools was simple random sampling technique whereby three arms were written on piece of papers and one was chosen at random.

3.5 Instrument for Data Collection

The instrument use for data collection was the mathematics achievement test for the students. This was developed by the researchers by selecting questions from past WAEC questions on all the topics covered by the students from S.SI to S.SII twenty (20) multiple choice questions with four options.(a, b, c, d) were then selected from the past WAEC questions based on the above topic of which one option is the correct answer.

3.6 Validity of the Instrument.

Copies of the achievement test were validated by expert in the field of educational research, one of which include the supervisor of this research work who is a lecturer with the mathematics education section of Ahmadu Bello University, Zaria. They maintained that the instrument were very reliable.

3.7 Reliability of the Instrument.

Test re-test method of reliability was adopted for the testing of the reliability of the instrument used for the study in this regards, the test was administered to the students and re-administered to the same students and product moments co-efficient of correlation was computed between the two scores to obtained the reliability coefficient for the two school is 0.62 since the result is between 0 and 1 hence this instrument is said to be reliable.

3.8 Methods of Data Collection

The researcher collect the data necessary for this study using mathematics achievement test carefully selected from past standardized WAEC questions. Also

data was equally collected from related documents such as project, textbooks, journals e.t.c.

3.9 Method of Data Analysis

The method of data analysis that was used for the study were mean standard deviation, product moment coefficient of correlation and independent t-test of the post-test scores of the result of the mathematics achievements test of both the large class size and small class size.

CHAPTER FOUR

Presentation of Data and Data Analysis

4.0 Introduction

This chapter presents the data collected and its analyses in other to give the result on the findings of the study titled "The effect of class size on students' mathematics performance in some selected secondary school in Kaduna metropolis". This is based on the research hypotheses and the research questions as raised in the study. The data presentation and analysis is based on the pre-test and post-test set of scores of the mathematics achievement test administered to eighty (80) S.SII students in two schools selected as sample for the study. School A (small class size of thirty (30) students), and school B (large class of fifty (50) students) and analyzed using inferential and descriptive statistics to test the research hypotheses in order to attain the research objectives.

4.1 Testing of Hypotheses

Hypothesis1 (H_{01}): There is no significant difference between the students' mathematics performance in large class size and those in small class size.

Table 4.1.1 T-test Analysis of the set of Test Scores of Large Class Size and Small Class Size

CLASSES	N	MEAN	S.D	df	t_{cal}	t_{tab}
Small class size	30	65	12.4	78	8.4	2.000
Large class size	50	43	11.6			

The independent t-test on table 4.1.1 above revealed that the calculator value of t is 8.4 at the degree of freedom 78 with 0.05 level of significance is greater than the table value of t 2.000. It indicates that there is significant difference between the two set of scores of the students' mathematics achievement test in small class size and large class size. The much gap of the mean scores of students between students from small class size of 65 and large class size of 43 further confirmed that there is significant difference. Therefore the null hypothesis H_{01} Is Rejected. Class size has effect on the mathematics performance of students, in favor of small class size.

Hypothesis2 (H_{02}): There is no significant different between the male students' mathematics performance in large class size and those in small class size.

Table 4.1.2 T-test Analysis of the Post Test Scores of Male Students in Small Class Size and Male in Large Class Size.

Classes	N	Mean	S.D	df	t_{cal}	t_{tab}
Small class size	17	64.4	13.4	45	6.0	2.021
Large class size	30	41.0	12.6			

The independence t-test on table 4.1.2 above revealed that the calculated value of t is 6.0 at the degree of freedom 45 with 0.05 level of significance is greater than the table value of t 2.021, it indicates that there is significance difference between the two set of scores of the students' mathematics achievement test in small class size and large class size. The much wide margin on the mean scores of students in small class size of 64.4 and students in large class size of 41.0 further confirmed that there is significant difference. The null hypothesis is here by rejected, in favor of small class size.

Hypothesis3 (H_{03}): There is no significant difference between the female students' mathematics performance in large class size and those in small class size.

Table 4.1.3 T-test Analysis of the Post Test Scores of Female Students in Small Class Size and those in Large Class Size.

Classes	N	Mean	S.D	df	t_{cal}	t_{tab}
Small class size	13	65.0	11.1	31	5.6	2.042
Large class size	20	44.3	9.8			

An understanding of the independent t-test on table 4.1.3 above showed that the calculated value of t is 5.6 at the degree of freedom 31with 0.05 level of significance is greater than the table value of t 2.042. This indicates that there is significance difference between two set of scores of female students in small class size and those in large class size. The much gap of the mean scores of students between female students from small class size of 65.0 and female students from large class size of 44.3 further confirmed that there is significance difference.

As a result of this, the null hypothesis which states that "There is no significant difference between female students mathematics performance in large class size and those in small class size" is rejected, in favor of small class size.

Hypothesis4 (H_{04}): There is no significant difference between the male students' mathematics performance in large class size and female students' mathematics performance in small class size.

Table 4.1.4 T-test Analysis of the Post Test Scores of Female Students in Small Class Size and Male Students in Large Class Size.

Classes	N	Mean	S.D	df	t_{cal}	t_{tab}
Small class size	13	65	11.1	41	3.1	2.021
Large class size	30	41	12.6			

The independent T-test on the table of 4.1.4 above revealed that the calculated value of t is 3.1 at degree of freedom 41 with 0.05 level of significance is larger than the table value of t 2.021. This clearly shows a significant difference between the post test set of scores of female students in small class size and male students in large class size. The much wide margin of the mean scores of the female students in small class size of 65 and male students in large class size of 41 further confirmed that there is significant difference. Therefore the null hypothesis is hereby rejected, in favor of small class size.

Hypothesis5 (H_{05}) : There is no significant different between the female students' mathematics performance in large class size and male students' mathematics performance in small class size.

Table 4.1.5 T-test Analysis of the Post Test Scores of the Male Students in Small Class Size and Female Students in Large Class Size.

Classes	N	Mean	S.D	df	t_{cal}	t_{tab}
Small class size	17	64.4	13.4	35	17.7	2.042
Large class size	20	44.3	9.8			

The independence T-test on the table 4.1.5 above shows that the calculated value of t is 17.7 at the degree of freedom 35 with 0.05 level of significance is large than the table value of t 2.021. This clearly shows a significant difference between the post test set of scores of male students in small class size and female students in large class size. The much wide margin of the mean scores of male students in small class size of 64.4 and female students in large class size of 44.3

further confirmed that there is significant difference. Therefore, the null hypothesis is hereby rejected, in favor of small class size.

CHAPTER FIVE

Summary, Conclusion and Recommendation

5.0 introductions

This chapter presents the summary, conclusion and recommendation of the study based on the finding established in the preceding chapter, suggestion for further was also given in this chapter.

5.1 Summary

From the analysis of the result and the testing of the hypothesis, it has been revealed that there is a significant difference between the students' mathematics performance in small class size and large class size. This is empirically true as the result conform to the previous research finding as reviewed in the literatures. Though, there are other researchers that deviate in result from the present finding. This variation may arise from the number of the students used as small as size and large class size and the age of the students used in the study.

Other notable result of the finding is the significant differences that exist between the male students' mathematics performance in large class size and female students' mathematics performance in small class size.

5.2 Conclusion

Based on the findings, it is concluded that class size is a critical factor in determining the quality of output on students' mathematics performance. This was established from some selected secondary schools within Kaduna metropolis. Student in these schools having small class size had better quality of output in their mathematical performance than in student having large class size.

5.3 Recommendations

Based on the research finding, the following recommendations were made.

i. Educational planners have to take class size into consideration when conduction school mapping exercises, while educational administrators have to take class size into consideration in the course of administering schools.

ii. State government should build more classes in all schools. In doing so, much emphasis should be given to the provision of more classroom in the state annual capital budget.

iii. Both federal and state government should be conscious of class size while allocating resources to education. This means that resources should be in proportion to the students' population.

iv. To reduce the large number of enrolment at schools, an admission test should be given prior to admission. Those who fail could be encouraged to try other schools.

5.4 Suggestion for Further Studies

- Class size and the different methods of teaching mathematics in secondary schools.
- Class size and the mathematics teacher's attitude in secondary schools.
- Class size and mathematics classroom management
- Effect of class size on students' mathematical achievement and mathematics teachers' behaviour in senior secondary schools.
- Analysis of the relationship of average class size and secondary school students' academic performance in mathematics.

REFERENCES

Blatchford, P. et al. (2003). *Class Size Pupil Attentiveness, and Peer Relationship British Journal of Educational Psychology*, 2(1): 28 – 35

Finn, J.D, et al. (2003). The Why's Of Class Size: Student Behaviour in Small Classes. Review of Educational Research

Hattie, J. (2005). *The Paradox of Reducing Class Size and Improving Learning Outcomes. International Journal of Education.*

Hess, N. (2001). Teaching Large Multilevel Classes. New York: Cambridge University Press.

Wobmann, L. & West, M.R. (2002). Class Size Effects In School Systems Around The World. New York: Macmillan

Aliyu Usman (no date) Statistical Methods for Biometric & Medical Research. Department of Mathematics, Statistics and Computer Science, Kaduna Polytechnic, Kaduna Nigeria.

WAEC Mathematics (1988-2014) Past Questions & Answers

Stretcher, B. M. & Bohrnstedt. G.W. (Eds). (2000). Class Size Reduction In California: The 1998-99 Evaluation Findings. Sacramento. CA: California Department of Education

Ladan (M/M) (2006),: *Qualitative Teacher Educational System in Nigeria Journal Of Education. 2 (3): 45-52*

Dogo. J. (2006): *Teaching Mathematical Concepts in Secondary Schools. Waya Journal Of General Studies 1(3): 112-115*

National Education Association (NEA). (2006). "Class Size"

http://www.nea.org/classsize/index.html

Cakmak, M. (2009). The Perception of Students Teachers about the Effect of Class Size With Regard To Effective Teaching Process. The Qualitative Report, http://www.nova.edu/sss/qr/qr14-3/cakmak.pdf.

Saba & Umar. (2010): Effect Of Class Size on Students Academic Performance In Mathematics in Senior Secondary School in Samaru, Sabon Gari Local Government Area of Kaduna State.

Isa & Emmanuel. (2009): Effect of Class Size In Teaching and Learning Mathematics Secondary School in Samaru Metropolis.

Kiger, D.M. (2002) Class Size Reduction: A Facilitator of Instruction Program Coherence. The Qualitative Report, 7(4). http://www.nova.edu/sss/qr/qr7-4/kiger.ht

APPENDIX A

Scores of Small class size

S/N	PRE-TEST SCORES	POST-TEST-SCORES
1.	10	50
2.	25	60
3.	20	45
4.	30	70
5.	15	55
6.	40	70
7.	45	70
8.	35	60
9.	20	55
10.	45	75
11.	40	65
12.	50	80
13.	45	85
14.	40	70
15.	25	55
16.	10	40
17.	50	90
18.	50	80
19.	40	65
20.	30	50
21.	35	60
22.	45	75
23.	40	55
24.	25	50
25.	30	70
26.	35	65

27.	40	70
28.	45	70
29.	50	85
30.	25	50

LARGE CLASS SIZE

(Scores of large class size)

S/N	PRE-TEST SCORES	POST-TEST-SCORES
1.	20	30
2.	15	40
3.	10	35
4.	25	40
5.	30	35
6.	05	20
7.	05	15
8.	30	45
9.	35	55
10.	20	45
11.	25	40
12.	15	35
13.	20	50
14.	15	45
15.	10	30
16.	10	25
17.	15	40
18.	20	45
19.	20	40
20.	15	30
21.	10	35
22.	05	20
23.	35	60
24.	40	65
25.	30	55

26.	35	50
27.	30	55
28.	25	80
29.	20	45
30.	40	65
31.	25	40
32.	30	35
33.	25	40
34.	40	60
35.	15	50
36.	10	30
37.	10	35
38.	15	30
39.	10	40
40.	15	40
41.	25	35
42.	30	55
43.	20	50
44.	15	40
45.	10	35
46.	25	50
47.	35	65
48.	30	50
49.	40	55
50.	25	50

SMALL CLASS SIZE

(Scores of male students only)

S/N	PRE-TEST SCORES	POST-TEST-SCORES
1.	10	50
2.	25	60
3.	20	45
4.	30	70
5.	15	55
6.	40	70
7.	45	70
8.	35	60
9.	20	55
10.	45	75
11.	40	65
12.	50	80
13.	45	85
14.	40	70
15.	25	55
16.	10	40
17.	50	90

LARGE CLASS SIZE

(Scores of female students only)

S/N	PRE-TEST SCORES	POST-TEST-SCORES
1.	50	80
2.	40	65
3.	30	50
4.	35	60
5.	45	75
6.	40	55
7.	25	50
8.	30	70
9.	35	65
10.	40	70
11.	45	70
12.	50	85
13.	25	50

LARGE CLASS SIZE

(Scores Male students only)

S/N	PRE-TEST SCORES	POST-TEST-SCORES
1.	20	30
2.	15	40
3.	10	35
4.	25	40
5.	30	35
6.	05	20
7.	05	15
8.	30	45
9.	35	55
10.	20	45
11.	25	40
12.	15	35
13.	20	50
14.	15	45
15.	10	30
16.	10	25
17.	15	40
18.	20	45
19.	20	40
20.	15	30
21.	10	35
22.	05	20
23.	35	60
24.	40	65
25.	30	55

26.	35	50
27.	30	55
28.	25	80
29.	20	45
30.	40	65

LARGE CLASS SIZE

(Sources female students only)

S/N	PRE-TEST SCORES	POST-TEST-SCORES
1.	25	40
2.	30	35
3.	25	40
4.	40	60
5.	15	50
6.	10	30
7.	10	35
8.	15	30
9.	10	40
10.	15	40
11.	25	35
12.	30	55
13.	20	50
14.	15	40
15.	10	35
16.	25	50
17.	35	65
18.	30	50
19.	40	55
20.	25	50

APPENDIX B

HOOL	G.S.S Rigasa and Kaduna Polytechnic Demonstration Schools
ASS:	SSII (of school A and B)
UBJECT:	Mathematics
OPIC	Logarithms of numbers
UB-TOPIC:	Logarithms of number greater than 1
ATE:	20/05/2015
URATION:	1hr 20mins
ERIOD:	Double periods
VERAGE AGE:	17years
UMBER OF STUDENTS:	30 and 50 (for sch. A & sch. B)
ENDER	Mixed
STRUCTIONAL MATERIALS	Text book and four figure table
EVIOUS KNOWLEDGE:	Students are familiar with multiplication and division laws of indices e.g. $2^3 \times 2^2 = 2^{3+2} = 2^5$
HAVIOURAL OBJECTIVES:	By the end of the lesson student should be able to: i. Identify integers from decimal fraction ii. Identify the number of characters iii. Calculate using their four figure tables

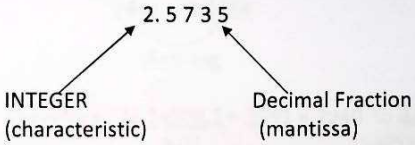
ntroduction:

tep I

iv. Able to solve multiplication and division of logarithms

Teacher presents the lesson with following steps

The logarithm of a number is in two parts; integer and fraction



If a number is in standard form it is easy to see what the integer of its logarithms is e.g. log 734 has the integer has the integer 2 because $734 = 7.34 \times 10^2$ and the log 5203 has the integer 3 because
$5203 = 5.203 \times 10^3$

tep II

Multiplication and division

Calculate $\frac{76.7 \times 308.2}{8.04}$

Solution

No	Log
76.7	1.8848
308.2	2.4889
	4.3737
8.04	Ō.9053
2941	3.4684

Anti-log

Therefore $\frac{76.7 \times 308.2}{8.04} = 2941 = 2940$ to 3 s.f

tep III

Powers and Roots

Evaluate

(a) 3.55^4

(b) $\sqrt[5]{40000}$

Solution

(a)

No	Log
3.55^4	0.5502x4
158.8	2.2008

Anti-log

$3.55^4 = 158.8$

(b)

No	Log
$\sqrt[5]{40000}$	4.6021÷5
8.326	0.9204

Anti-log

$\sqrt[5]{40000} = 8.326$

P IV

Evaluate $\sqrt{\frac{94100 \times 38.2}{5.68^3 \times 8.14}}$

Correct to 2 significant figure

No	Log	
$\sqrt{94100}$	4.9736÷2=2.4868	
	1.5821	
Numerator	4.0689	4.0689
5.68^3	0.7543x3 2.2629	-
8.14	0.9106	
	3.1735	3.1735
7.859		0.8954

Therefore $\sqrt{\frac{94100 \times 38.2}{5.63^3 \times 8.14}} = 7.859$

= 7.9 to 2 s.f

valuation

The teacher evaluates the lesson by given class work **evaluate in 3 s.f**

(a) $\left[\frac{184.8}{6.2}\right]^3$ ans 26500

(b) $\sqrt{62.1}$ ans 7.88

ummary

Teacher summarizes the lesson based on what he taught the students and provides solution to the class work.

onclusion

Teacher concludes the lesson by given assignment to the students. **Simplify the expression**

$\log_{10} 18 - \log_{10} 2.88 + \log_{10} 16$

CHOOL	G.S.S Rigasa and Kaduna Polytechnic Demonstration Schools
LASS:	SSII (of school A and B)
UBJECT:	Mathematics
OPIC	Quadratic equation
ATE:	21/05/2015
URATION:	1hr 20mins
ERIOD:	Double periods
VERAGE AGE:	17years
UMBER OF STUDENTS:	30 and 50 (for sch. A & sch. B)
ENDER	Mixed
STRUCTIONAL ATERIALS	Text book
REVIOUS KNOWLEDGE:	Students are familiar with linear equation
EHAVIOURAL BJECTIVES:	By the end of the lesson student should be able to: i. Factorize ii. Rearrange where necessary iii. Find the coefficient of the value given
TRODUCTION	The teacher introduces the lesson by asking students questions based on their previous knowledge
RESENTATION	The teacher presents the lesson with the following steps
EP I	A quadratic equation is an expression of the form $ax^2 + bx + c = 0$ in which a,b,c are numerals and also the highest power of x is 2 and that the power of x will neither be fraction nor negative.
EP II	**Solution of quadratic equation by factorization**

Solve by factorization

Example 1

$x^2 + 7x + 10 = 0$

Solution

$x^2 + 7x + 10 = 0$

$\Rightarrow x^2 + 2x + 5x + 10 = 0$

$\Rightarrow x(x+2) + 5(x+2) = 0$

$\Rightarrow (x + 5)(x + 2) = 0$

$\Rightarrow x + 5 = 0$ or $x + 2 = 0$

$\Rightarrow x = -5$ or $x = -2$

Example 2

Solve $2x^2 + 13x = 15$

$\Rightarrow 2x^2 + 13x - 15 = 0$

$\Rightarrow 2x^2 + 15x - 2x - 15 = 0$

$\Rightarrow x(2x + 15) - (2x + 15) = 0$

$\Rightarrow (x - 1)(2x + 15) = 0$

$\Rightarrow X - 1 = 0$ or $2x + 15 = 0$

$\Rightarrow X = 1$ or $2x = -15$

$-X = 1$, or $-7\frac{1}{2}$

Solve $y^2 = 2y + 15$

$y^2 = 2y + 15$

$\Rightarrow y^2 - 2y - 15 = 0$

$\Rightarrow y^2+3y - 5y - 15 = 0$

$\Rightarrow y(y+3) - 5(y+3) = 0$

$\Rightarrow (y - 5)(y+3) = 0$

$\Rightarrow y-5 = 0$ or $y+3 = 0$

$y = 5$ or $y = -3$

Example

Solve $(x-3)^2 = 25$

Solution

Solve $(x-3)^2 = 25$

$\Rightarrow x^2 - 6x + 9 - 25 = 0$

$\Rightarrow x^2 - 6x - 16 = 0$

$\Rightarrow x^2 + 2x - 8x - 16 = 0$

$\Rightarrow x(x+2) - 8(x+2) = 0$

$\Rightarrow (x-8)(x + 2) = 0$

$\Rightarrow x - 8 = 0$ or $x+2 = 0$

$\Rightarrow x = -2$ or 8

The teacher evaluates the lesson by given students class work

Solve the following

i. $t^2-6t + 9 = 0$ ans t = 3twice

ii. $h^2+5h+4 = 0$ ans h = - 1, - 4

mary

clusion

ne work

Teacher summarizes the lesson by providing solution to the exercise and gives room for questions.

The teacher concludes the lesson by given the students assignment

Solve the following:

i. $y^2 + 7y - 30 = 0$

ii. $x^2 + 4x - 21\ 0$

iii. $9x\ (x+1) = 4$