EFFECT OF CLASS SIZE ON TEACHING AND LEARNING OF MATHEMATICS IN SECONDARY SCHOOL IN BOSSO LOCAL GOVERNMENT AREA, NIGER STATE

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ABSTRACT

This research work is based on the Effect of Class Size to the Teaching and Learning of Mathematics in Bosso Local Government Area of Niger State. To this, two research questions and two hypotheses were made. The research design adopted for the study is a quasi-experimental research design. There are two groups i.e. experimental and control group. The experimental group consist of a small class-size of 20–25 students while the control consists of a class-size of 40–60 students. A stratified random sample technique was adopted in choosing two secondary school in the Local Government Area out of about 21 secondary schools in Bosso Local Government Area Niger State. A stratified random sample technique was used because the researcher wishes to divide the students into two groups i.e. the control group and experimental group. The data used in this was obtained through pre and post achievement tests. The scores of the students were used as data collection. The data collected were analyzed using Percentages, Mean, standard deviation and statistical packages for social sciences (SPSS) was used to analyze the hypotheses at 0.05 level of significance. The result revealed that there is significant difference between mean achievement scores of the control and experimental group in the pre and post mathematics achievement test. The study revealed the following findings; from Hypothesis one using t-test showed that there is a significant difference in the performance of students taught in a class size of 25-30 students as their performance was better than those taught in a class size of 40-60 students with P=0.003. Hypothesis two showed that there is no significant difference in the performance of males and females students on the effect of class size on teaching and learning of mathematics with P=0.387. In view of the findings, the researcher recommended that for effective teaching and learning of mathematics the teacher should be professionally trained, and that class-size should be reduced to 20-30 students per class and with the teacher having not more than three (3) streams, and that governments should also help secondary schools to establish mathematics laboratories.

TABLE OF CONTENTS

LIST OF TABLE

APPENDIX

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

There is still little consensus on whether and how teaching is affected by small and large classes, especially in the case of students in the later primary years.

Individual attention in smaller classes, is more active for students, and has beneficial effects on the quality of teaching. It is suggested that teachers in both small and large classes need to develop different strategies for more individual attention but also recognize the benefits of other forms of learning, for example, the group work.

Adesina (2000) defined mathematics as the science that draws necessary conclusions and also the manipulation of the meaningless symbols of a first order language according to explicit, syntactical rules.

The trend towards individualization in small classes did not seem to be reflective of a passive role for children, the opposite seemed more likely, that is, children in large classes spend less time actively interacting with the teacher in terms of responding or initiating.

Therefore, teachers play a major role in the educational sector and their role is a major determinant of educational attainment of any students. However, for anyone to qualify to be a teacher he or she must obtain degree or National Certificate in Education, during the course of study the pre – service teacher will be exposed to both pedagogy and content knowledge in his or her field of study; psychology and philosophy courses that will prepare him or her for the teaching assignment.

These components suggested that class size affected the amount of individual attention, the immediacy and responsiveness of teachers to students, the sustained and purposeful nature of interaction between teachers, knowledge of students in their classes, and sensitivity to individual particular needs.

As school population increases, class sizes also increase, without corresponding number of classes therefore the performances of students become an issue. According to Dror (2010), class size has become a phenomenon often mentioned in the educational literature as an influence on pupil's feelings and achievement, on administration, quality and school budgets. In his words he noted that class size is almost an administrative decision over which teachers have little or no control. Most researchers start from the assumption that the size of the class would prove a significant determinant of the degree of success of students. In fact, with the exception of a few, many studies have reported that an ideal situation, class size in itself appears to be an important factor.

Nigeria Educational Research Council (NERC) published a review of 41 studies of the effects of class, concluding that reducing class size alone would not increase student achievement. In classes of 25-34 pupils at the primary level, the studies show some support for the hypothesis the smaller classes are related to higher achievement reading and mathematics, particularly if the pupils are socially or economically disadvantaged or remain in small classes for at least two years (NERC, 2006).

The National Policy on Education (Revised 2004) states that Mathematics is one of the core subject in the curriculum which every student must take in addition to his/her specialties. Continuing, the policy stated that those core subjects are basic subjects which will enable a student to offer arts or science in Higher Education. The implication of the compulsory nature of the subjects' demand much most especially from the teacher.

Inspite of the importance of Mathematics, the general performance of student in Mathematics examinations are low; and the class-size has been identified as one of the major cause of this low performance, specifically large class-size.

As class size increase, achievement decreases. Students who would score at about the 63rd percentile on a math test when taught individually, would score at about 47th percentile (when

taught) in a class of 40 students. A follow-up study by the Educational Research Development Council using meta-analysis was published in 2000. Non-achievement effects on class size such as effects on students, effect on teachers, and effects on the instructional environment and processes ever investigated.

The results indicated that decreasing class size had a beneficial effect on the classroom environment. In the review, class size was shown to have a more "substantial effect" on teachers than on students or the instructional environment. The effect of class size was more significant for students below the age of twelve (NERDC 2002).

Filby and Colleagues published "what happens in smaller classes?" A summary report of a field study" in 2000 in which they reported that teacher attitudes improved in smaller classes. Teachers in small class size environments were able to reach a child and help him/her when the help was needed, in larger classes the teachers felt that they could not get there to help. These teachers stated that with large class size, the workload was much and overburdened.

When such overloading decreased, as smaller classes becomes reality, the teachers were able to relax more, feel less frustrated, and were able to create a more positive learning climate that also discourage classroom disruptions. They found that the attention rates for students increased as class size decreased. The range of those paying attention was increased. Increased attention meant less time waiting for help or causing disturbances in the classroom.

The researchers suggested that the class size reductions alone do not necessarily bring about change.

However, teachers experience improved conditions, and this development brings about greater enthusiasm on the part of teachers. Such enthusiasm can lead to changes that benefit everyone. Teachers usually do what they are inclined to do anyway however; smaller classes allow them to do a better job. This was supported by an earlier teacher survey. The Nigeria Research Council Conducted a teacher opinion poll in 2000. It reported that more teachers named

lowering class size than any other item as the one improvement that would create better teacher morale and jobs satisfaction. Teachers also saw improvement in the behaviour of students, increased productivity, and more hand-on participation learning.

Research has begun to focus upon what actually happens in smaller classes as opposed to larger ones. The ministry of Education in Nigeria as concerned with this question in a two-year study. Students from the fourth grade were assigned, in the first year, to some thirty-four different classes, some with sixteen students, some with twenty-three, some with thirty, and some with thirty-seven. During the second year they were all reassigned to different sized classes.

This allowed the re-searchers to study the same students and the same teachers in different settings and to observe changes in classroom processes. The overall findings indicate that even though class size did not change the degree of individualized instruction, the teacher did spend up to twice as much time per student in the reduced size classes (Klein, 2008).

In a 2004 review for Education Research Council they suggested a Related Cluster Analysis approach designed to:

1. Identify and summarize all the research studies available on the effects of class size, and
2. Group the research findings into clusters related to each of several major areas in which problems, issues, and decisions relating to class size are likely to it sorts out from the large body of research findings on class size into those finding that related directly to specific areas and it made the research understandable and useful for application to specific decisions.

The most comprehensive review, meticulously conducted for the Nigeria Educational Research Council concluded that:

It is now recognized by many that we need to know more about effects of class size on classroom interactions and students behaviour. This extends research in several ways:

(a) It compares effects on two main types of behaviour student's classroom engagement a teacher to student interaction.

(b) It examines if effects vary by student attainment level.

(c) It examines effects of class size on classroom process across the whole of the primary and secondary school years.

(d) It studies effects across the full range of class size found in Nigeria schools.

(e) It uses systematic observation data to capture effects of class size on moment by moment behaviour and employs sophisticated multilevel statistical analyses that controls for possibly confounding factors and deals with that clustered nature of observation data within student and within classroom within schools.

Results showed that as class sizes become smaller, there were more times when students were the focus of a teacher's attention, and more times when they were engaged in active interaction with teachers. This effect was found in all groups at both primary and secondary levels. It was also found that student's classroom engagement decreased in larger classes and this problem was particularly marked for the students who are already attaining at lower levels. This also affects mathematics lesson students have been found to perform low due to the increased class size.

The National Policy on Education revised (2004) stipulates the maximum number of students in each class to be 30-40 students. For effective teaching, teacher/student ratio should conform to this stipulated order. Today class size has bloated due to explosion of population of children of school age. There is a limit to which a teacher can effectively control anything more than their will affects the achievement of school objectives.

This spurs the researchers into carrying out this project on the effect of class size to the teaching and learning of mathematics in secondary school in Bosso Local Government area of Niger State.

1.2 Statement of Problem

There has been increase in student's enrollment in secondary schools with corresponding increase in the staff strength. Few studies have shown that class size has played a major role in the performance of students. Due to the low performance of students in mathematics examinations in secondary schools, using Bosso Local Government Area Niger State as case study, the researcher tends to research on the effect of class size on teaching and learning of mathematics. Therefore, the study is aimed on knowing what the difference is between students' performance in small–size and large–size classes using mean achievement scores and standard deviation, and the difference in the level of students' attention and supervision based on class–size due to gender? And how teacher can manage and teach a class with students of about 40–60 in secondary school.

1.3 Purpose of study

Since the teaching and learning of mathematics is affected by class-size, it then becomes relevant to;

1. Find out if students learn more when the class size is between 25–30 students or If they learn more when the class size is above the 25–30 students.
2. Find out if teachers teach more effectively when the class-size is between 25–30 students or above and Find out if the students receive maximum attention and supervision from the teacher when the class-size is between 25–30 students or above.

This is with a view to identifying the problem of large class-size i.e. 40–60 students and possible give necessary suggestion for improvement.

1.4 Significance of the Study

The study will be beneficial to the students and to the teachers:

The research will expose the students to see reason in what they are supposed to be doing and needs to receive maximum attention and supervision at all time. Above all, it will enable them

to understand, appreciate science, live meaningfully and effectively especially in this age of science and technology.

The research work will also enable the teachers to know their student's problems and help in solving their problems. At sometimes give student's the right assessment as at when the need arises. This will expose the teachers to the needs to follow the stipulated policy of student per teacher ration as stipulated in the national policy of Education.

1.5 Limitation of the Study

As a result of Jam-packed seats the teacher movement around the class is limited and the truancy played by the students.

1.6 Scope of Study

Due to the scope of mathematics, and because the whole topics in mathematics cannot be used for this research purpose, one topic was selected by the researcher which is (Set Theory) to be taught in two secondary schools in Bosso Local Government Area of Niger State respectively. The area covered by the study are secondary schools in Bosso Local Government Area of Niger State. There are about 21 schools with a population of 30260 students (male and female) based on statically data gotten from Niger State Ministry of Education Minna. The study was carried out on SS1 (ONE) students only with a population of 5449 students (male and female).

1.7 Research Questions

1. What is the difference between students' performance in small–size and large–size classes using mean achievement scores and standard deviation?
2. What is the difference in the level of students' attention and supervision based on class–size due to gender?

1.8 Null Hypothesis

The following hypothesis, formulated in the null form was tested in this study at the 0.05 significant level.

HO_1. There is no significant difference between the mean scores of students in the small–size and large–size.

HO_2. There is no significant difference between the mean scores in the level of students' attention and supervision based on class–size due to gender?

CHAPTER TWO

2.0 REVIEW OF RELATED LITERATURE

In this chapter, the researchers review the opinion of different authors and research on the effect of class-size on teaching and learning of mathematics in Bosso local government area of Niger State. The review is done under these headings: - Conceptual Framework, Theoretical Framework, Empirical Studies and Summary.

2.1 Conceptual Framework

In the conceptual framework, the researcher desires it necessary to explain some relevant terms in the topic under investigation. They are: effect, class size, learning and teaching, and the mathematics.

2.1.1 Effect: The word 'effect' according to BBC English Dictionary (1992) states thus: 'An effect is a change, reaction, or impression that is caused by something or is the result of something' The Chambers Dictionary (New Edition, 1999) summarized the word 'effect' as the result of an action; the impression produced; the meaning conveyed; reality; (inpl) goods or property; (inpl) sound and lighting devices contributing to the illusion of the place and circumstance in which the action is happening (theatre, cinema, etc), to produce; to accomplish or bring about.

2.1.2 Class Size: A formal teaching of a language takes place in the classroom. Language teaching audience could vary from one to several people. In order words, a language class could be small, normal, or large. A Language class is large when its membership swallows up the available resources and creates immediate management problems for the teacher and impairs the learning process. Otaburuagu (1998) observed that normal growth in class size is not enigmatic. What is puzzling is the growth, which hampers teacher effectiveness and the learning process. In Nigeria, the range varies from 40 plus to 200 depending on the level of the educational system. Virginia Locastro (1989:5) reports that in Japan, the average largest class

size is 45 and the normal 38, while small class sizes range from 24 to 19. She went further to assert that small class size falls between 4 and 7. The introduction of UBE into the Nigerian nation is one of the steps in improving the literacy level of the Nigerian citizens. This is because UBE is directed towards sustainable and efficient education of all cadre of the Nigerian populace. The broad objectives of UBE are such that there would be increased enrolment in the school system. In other words, the implementation of UBE will lead to an astronomical rise in educational enrolment. The rise in the number of school children will mean an increase in class size and, thereby a rise in the pressure on the class teacher, (Ngonebu and Oluikpe 2000). Ozochi, (2008) outlined that class size affects both the teachers and students in many ways:

1. Arrangement of seats: Proper arrangement of seats can help the teacher control the class adequately. In the orderliness of a class, the teacher at a glance can see the entire class. It the teacher the opportunities to move in and out of the rows and columns thereby making sure that the students are not engaging in activities different from the lesson. There should be enough space in-between seats to allow free movement in the class. This affect the class size because when the class is too large it will hamper the teacher's movement in and out of the class and this affects students' performance.
2. Involvement: The teacher must ensure that every student is involved in the class activities. If only the bright students are permitted to either ask or answer questions in the class, the slower learners will enter into the shelves and become more frustrated as they are not catching with the lesson. Therefore, a good teacher should strike balance between these categories of students by trying to understand the individual differences among these students and try to use it during teaching so that all will be involved in the classroom activities. When the class size is increased, this will hamper the teacher's effort to involve all students.

3 Known your students: Teachers should personally have direct contacts with their students. By this act they should be able to appreciate student's individual differences and also various socio-economic backgrounds which may likely affects their academic proficiencies in the classroom. This affect class size because when the class size increase the teacher cannot have direct contacts with their students because of large class size.

4 Give attention: Students expect that their teachers accord them the respect irrespective of the fact that they are students. In a large class size the teacher cannot interact with their students one-on-one, and this will definitely affect the teaching and learning processes. This affect class size because children in large classes spend less time activity interacting with their teacher in terms of responding or initiating.

5 Class size: The National policy on Education revised (2004) Stipulates the maximum number of pupils in each class to be between 30–40 pupils. For effective teaching, teacher/student ratio should conform to this stipulated order. Today class size has bloated due to explosion of the population of children of school age and this affect teaching and learning especially in math's classes. There is a limit to which a teacher can effectively control the class and that will affect the achievement of school objectives. This spurred the researcher into carrying out this project on the effect of class size.

2.1.3 Learning and Teaching:

2.1.3.1 Learning: Learning is a relatively enduring change in behaviour, which is a function of prior knowledge (Practice). The main objective of school as an institution is to bring certain desirable changes in the behaviour of children through the process of learning. As a process, learning has four attributes.

i. Learning is a permanent change in behaviour. This does not include changes due to illness, fatigue, maturation, use of intoxicants, etc.

ii. Learning is not directly observable, but manifests in the activities of the individual

iii. It results in some changes of enduring nature.

iv. Learning depends on practice and experience.

2.1.3.2 Types of Learning:

a. Visual (Spatial): This is a learning process that involves the use of pictures, image, and spatial understanding.

b. Aural (Auditory – musical): It's a learning process that involves the use of sound and music.

c. Verbal (Linguistic): This is the use of words, both in speech and writing in learning process.

d. Physical (Kinesthetic): this learning process involves the use of once body, hands and sense of touch.

2.1.3.3 Teaching: In education, teaching is the concerted sharing of knowledge and experience, which is usually organized within a discipline and, more generally, the provision of stimulus to the psychological and intellectual growth of a person by another person or artifact. The activities involved in facilitating or educating to impact knowledge or skills to learners. Teaching is an instruction or delivering a particular skill or subject or something that someone tells you to do. For teaching in this case may refer to showing or explaining to a student how to do something.

2.2 Theoretical Framework

Learning is a relatively enduring change in behaviour, which is a function of prior knowledge (Practice). The main objective of school as an institution is to bring certain desirable changes

in the behaviour of children through the process of learning. As a process, learning has four attributes.

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The emphasis of this study is on how the class size (environment) will influence teaching and learning of mathematics in secondary schools (academic activities). In education, two major groups of theorists have dominated discussion in connection with the learning process. These are the stimulus-response (S-R) associations who stressed mechanistic learning and the development of psychomotor aspect of the learner. The Psychomotor learning involves the use of manipulative skills, the hands, and the minds, etc. The cognitive field theorists emphasize that any new idea or experience is embedded on already known one. In the view of J.B. Watson, when a stimulus and response (S-R) occur at the same time in close contiguity, the connection between them is strengthened. The strength of connection between stimuli – response (S-R) depends upon the frequency of S-R repetitions. Watson stressed law of frequency, but not of effect. He emphasizes the importance of frequency or exercise in learning. He pointed out that for the explanation of learning, understanding of brain and its function is very essential. He stresses that behaviour is learned by interacting with external environmental stimuli. In the case of this research, the researcher focuses on class size as the external stimuli. Watson's theory has great impact on the education system; hence, emphasis was laid on providing conducive environment in school for efficient and permanent learning through sufficient practice and exercise. It is pertinent to state here, that, sufficient practice and exercise which Watson advocates is the major focus of the researcher, hence, the researcher feared that large class size

undermines the supposed sufficient practice in classes amongst students in schools. The cognitive field theorists – the Gestalt Psychologists believe that man reacts to pattern of his own perception when he faces a problem, depending upon the set of stimulating conditions in the environment. Cognitive learning theory aims at a comprehensive theory of learning from the simplest to the most complex occurring in the organism. Again, cognitive learning theory is not based on what a person knows, but on the response or functions in terms of what he perceives or believes and the explanation of this functioning must be sought in terms of the factors, which govern such perception.

2.2.1 Availability of competent personnel to teach mathematics: -

John 2002 stated that competent teacher of mathematics understands the dynamics of working collaboratively with others, understands learning styles and learning strategies.

The competent teacher of mathematics communicates verbally and in written, visual and symbolic forms using appropriate technology and also creates effective learning environments where students in mathematics class will be able to work collaboratively in one-to-one, small group, and large group to affect class-size in the teaching and learning of mathematics. The competent teacher teaches also to analyze the thinking and learning strategies of all students and to extend mathematical knowledge, to develops and utilizes a variety of problem solving techniques. He uses many strategies for problem solving to effect the class size in the teaching and learning of mathematics. Class size reduction alone does not necessarily bring change but the availability of competent teachers and teachers experience do.

Williams (2004) in his article said that the effect of class size to the teaching and learning of mathematics should be improved and this can be done by seminars on modern ways of teaching mathematics.

Dave (2000) outlined the problems of teaching modern mathematics as follows: -

1. Lack of availability of instructional materials such as textbooks, audio-visual aid, mathematical games and math's lab.
2. The inadequate method of evaluation and selection of textbooks by teachers.
3. Lack of competent mathematics teacher and limited amount of time at teacher's disposal.

These contribute to the effect of class size to the teaching and learning of mathematics in secondary school Bosso local Government Area of Niger State.

Fakunde (2001) stressed the need for qualified teachers in the teaching of modern mathematics in primary school with large class size. He said that teacher's factors are important to be examined with respect to effect of class size on teaching and learning of mathematics because lack of competent and qualified teachers of mathematics contribute to the effect of teaching and learning of mathematics. There are not enough qualified mathematics teachers in our secondary schools to handle these students per class.

Yager (2003) said that most of our mathematics teachers do not teach with aids even when the use of teaching aids is obvious. The teachers fail to construct teaching aids due to class size which is more than normal, and this affects the teaching and learning of mathematics.

Furthermore, the federal ministry of education realized the implication of this big gap in student/teacher ratio established National Mathematical Research Centre (NMRC) at Abuja in 1989. At the same time (NMRC) document promised that any student who gained admission into the university to read mathematics or physics will enjoy automatic scholarship. All these efforts geared towards providing qualitative and quantitative mathematics teachers. The issue is not on producing competent and qualified teachers of mathematics but how many of them are willing to take up teaching as a profession. If this is not well taken care of, few teachers will be produced and this will affect the class size in teaching of mathematics.

Ogbonna (2004) observed thus:

> In our schools, interests in Mathematics, Biology, Chemistry and physics seems to be almost a thing of the past mathematics, Biology, Chemistry and Physics are now like new industrial products which must be bought by those in our primary and post primary schools.

2.2.2 Socio-Economic Background of Students:

Socio-economic status (SES) is often measured as combination of education, income and occupation. It is commonly conceptualized as the social standing or class of an individual or group.

Furthermore, an examination SES as a gradient or continuous variable reveals inequities in access to the distribution of resources which affect class size to the teaching and learning of mathematics. SES is relevant to all realms of behavioral and social science, including research practice, education, and advocacy. SES affects class size to the teaching and learning of mathematics and it's also affect such as lower education, poverty, and poor health, ultimately affect class sizes to the teaching and learning of mathematics and our society as a whole.

SES and educational issues Research indicates that children from Low- SES households and communities develop academic skills more slowly compare to children from higher SES groups and this affect class size (Morgan, Farkas, Hillemeir, and Maczuga, 2009). Initial academic skills are correlated with the home environment, where low literacy environments and chronic stress especially in mathematics class.

The school systems in Low-SES communities are often under resourced, negatively affecting student's academic progress and it affect to the teaching and learning of mathematics. (Aikens and Barbarin,2008). Inadequate education and increased dropout rates affect children's academic achievement, perpetuating the Low-SES status of the community and it affect class size. Improving school systems and early intervention programs may help to reduce these risk factors, and thus increased research on correlation between SES and education is essential.

SES and family resources families from Low-SES Communities are less likely to have the financial resources or time availability to provide children with academic support and this contributed to the effect of class size in learning math. Children's initial reading competence is correlated with the home literacy environment, number of books owned, and parent distress (Aikens and Barbarin, 2008).

However, parents from Low-SES Communities may be unable to afford resources such as books, computers, or tutors to create this positive literacy environment and this affects class size to the teaching and learning of mathematics in Bosso Local government (Orr, 2003). SES and the school environment research indicates that school conditions contribute more to SES differences in learning rates than family characteristics and this affects class size in learning of maths (Aikens and Barbarin, 2008).

Schools in Low-SES Communities suffer from high levels of unemployment, migration of the best qualified teachers, and low educational achievement and this is caused by large class size during the learning process (Muijs, Harris, Chapman, Stoll, and Russ, 2009).

Yet, children in Low income schools are less likely to have well-qualified teachers and it affects class size to the teaching and learning of mathematics. High school math's teachers in Low income school districts 27% majored in mathematics in college as compared to 43% of teachers who did so in more affluent school districts and this affects class size (ingersoll, 1999). SES and Academic Achievement Research continues to links Lower SES to affect class size to the teaching and learning of Mathematics to lower academic achievement and slower rates of academic achievement and slower rates of academic progress as compared with higher SES Communities.

Children from Low-SES environment acquire language skills more slowly, exhibit delayed letter recognition and phonological awareness, and are at risk for reading difficulties and this is caused by large class size (Aikens and Barbarin, 2008). Children with higher SES

backgrounds were more likely to be proficient on tasks of addition, subtraction, ordinal sequencing, and math's word problems than children with lower SES backgrounds (Coley, 2002). Identifying a part of a lower/working class in college has been associated with feelings of not belonging in school and intention to dropout of school before graduation as a result of class size which affected their performance (Langhout, Drake, and Rosselli, 2009). Perception of family economic stress and personal financial constraints affected emotional distress/depression in students and their academic outcomes and this also affects mathematics lesson, students have been found to perform low due to socio-economic background of students and it affect the class size (Mistry, Benner, Tan, and Kim, 2009).

2.3 Empirical Studies:

Efe M. Omwirhiren, Ph.D and Faith E. Anderson in their work titled Effect of Class Size and Students' Attitude on Academic Performance in Chemistry at Demonstration Secondary School. It was guided by three research questions and three hypotheses. The sample of the study was made up of 50 students and 5 teachers. The research instrument was structured questionnaire for both the students and teachers. The data collected were analyzed using Percentages, Mean, standard deviation and t-test statistics was used to analyze the hypotheses at 0.05 level of significance. The study revealed the following findings; there was significant difference in student's attitude to chemistry on their academic performance. There was a significant difference in class size on student's academic performance in chemistry. There was significant difference between male and female student's academic performance in chemistry. As a result, the boys performed better than the girls. Boys had a stronger affinity and interest towards Chemistry. Recommendations based on the findings were made among which include; Parents as well as chemistry teachers should encourage the students to develop positive attitude towards chemistry.

Ojo, Yetunde Abiola Ph.D and Ogunmilugba Bamidele Joke in their work titled "Effects of Teachers' Teaching Experience and Class size on Achievement of Social Studies Students in Oyo, OyoState, Nigeria" The subject of the study were 350 junior secondary school students and twenty social studies teachers selected from ten public secondary schools in Oyo, Oyo state. The study adopted descriptive research design and two null hypotheses were formulated and tested at 0.05 level of significance. Three experts carried out face and content validation on the three instruments namely: Teachers' Teaching Experience Questionnaire, Student Class size Questionnaire and Social Studies Achievement Test which were used for data collection and responses were analyzed through t-test statistical analysis. Result of the study revealed that there was significant difference in the achievement of social studies students in large and small class ($t=3.031$; $p<0.05$). Social studies students in small class performed better than those in the large class. Teachers' teaching experience did not have influence on the academic achievement of social studies students. It was therefore, recommended that government should build more classrooms in public secondary schools and policy makers must ensure that schools comply with a maximum of 40 students per class.

Eke (1991) carried out research on large class and students‟ academic achievement in the English Language and mathematics. The researcher sampled 10 secondary schools using stratified proportionate random sampling technique. WASSCE results from the schools served as instrument. Chi-square was used for data analysis. The researcher found out that class size does not affect students' achievement, but variables such as the quality of teacher, economic background of parents, school equipment, access to libraries, location of schools, supervision by inspectors of education to name but a few do affect students' achievement. However, Eke could not stipulate the aspect of the Mathematics on which his research was carried out, thereby prompting the present researcher to investigate Effect of Class Size on Teaching and Learning

of Mathematics in Senior Secondary School in Bosso Local Government Area Minna Niger State.

2.3.1 Classroom Management

Ademola and waheed (2006), described classroom organization as the orderliness in the way and manner the items found in the classroom are arranged by the classroom teacher. They also state that classroom management implies the mobilization and organization of resources to achieve the expected objective of the school system. It involves the utilization of material resources and security. The cooperation of people for performing the function of planning, organizing, directing and coordinating at classroom level by teachers. Teachers are classroom mangers. They are expected to perform the managerial functions in the classroom to affect class size just like mangers in other organizations.

Abdullahi (2000) defines thee term classroom management as what teacher do to create an atmosphere that ensure meaningful interaction between students and students, students and the teacher during teaching and learning processes. This system of interaction can be affected by some factors e.g. class size. In a large class (40 and above) for instance, the classroom is congested that the teacher hardly sees a place for his table and choir, let alone some space for the teacher to more round to supervise students work individually. This implies that individual attention is not possible.

Highlighting the importance of individual attention

Tyler (2001) asserted that:

> Experiment have shown that students Who are given special practice in deciding are given special practice in deciding on relevant facts needed where and how to get then show grater improvement in learning to solve problems.

Abdullahi (2000) quoting Schaller and Wittich remarked that:

> Hearing, seeing, touching and listening are the gate way of human learning adding that they thus believe that material Meant for learning should be presented in a manner as to provide Students with opportunity to become actively involved intellectually, perceptively and physically.

In large class, the effectiveness of student participation can be better imagined the described. This is because the class will not only be noisy but crowdy. All in all, some students can hear, see and listen to the teacher especially those in the front row but the "back benchers" will no doubt be in a different world in the same classroom irrespective of the methods adopted by the teachers.

2.3.2 Evaluation and Marking

According to Okpala (2000) Evaluation is the process of giving evidence of effectiveness, suitability or goodness of a program. It is the process of giving values of grades or scores that result from testing.

According to Enyi (2006) Evaluation however, connotes judgment of merit, for example, which is better, general science, or integrated science, modern mathematics or traditional mathematics? It is a determination of the results of some activities (social programmers, curriculum packages, teaching strategies, etc.) designed to accomplish some valued goals. Evaluation is also interested in the process used in gathering any information on which judgment is too based.

He stated types of Evaluation:

1 Placement Evaluation: it is Evaluation of the student's entry behaviour in a sequence instruction.

2 Diagnostic Evaluation: It allows teachers gain detail know ledge of student's weakness and strengths, the causes of learning difficulties and remediation of such learning instructions.

3 Formative Evaluation: Is that type of evaluation concerned with improving an on-going education program or instruction.

4 Summative Evaluation: Is undertaken at the end of a unit of instruction, end of a terms or years' work or when a program has been in existence for a number of years.

The process of the evaluation goals cannot easily be achieved in a large class-size unlike a smaller one.

According to procedure for comparing the performance of an individual with a designated standard of performance. It is also instrument for the measurement of student's level of achievement.

He categorized the functions of the classroom test under three major groups namely.

(a) Instructional functions of test:

Testing of pupil's progress in the class provide the instructor with information on the pupil's rate of learning thus enabling the teacher to provide more appropriate instructional guidance. Also test construction for the purpose of evaluation remind the teacher of the objectives for the course. In some cases, the process of constructing a test helps the teacher to re-define the course objective in clear terms. Test can motivate learning especially when a pre-test is administered before a new material is taught. The pre-test furnishes pupils with the scope of the new materials thus the pupils pursue the learning diligently. Regular scheduling of classroom test stimulates the review of materials previously mastered. This type of relearning, aids retention.

(b) Guidance functions of a test:

1. Information from tests can be helpful in the counseling process especially on matters relating to choice of career.

2. Test can be used to discover pupil's special abilities and aptitudes.

(c) Administrative functions of tests:

The important question here is how possible is the above functional test be achieved in a large class-size. Ideally it is possible with a small class-size. For instance, discovering pupil's special abilities and aptitudes require high degree of individual attention. And this cannot be possible in a large size. Thus irrespective of the knowledge of the subject matter, he cannot effectively monitor the rate of learning of this students in a large class-size.

2.4 SUMMARY

Experience have shown that teachers with large class-size do not give assignments as and when do. And when given, they do not finish their marking early enough before subsequent lesson especially in mathematics which is every day subject. Thus the extent to which learning had taken place cannot be validly determined. This can also be attributed to the fact that cheating cannot be ruled out due to congestion of students in the classroom (a class meant for 30 students be used for a class of between 40 and above).

This and more, no doubt makes teachers work more strenuously. The research work has undertaken to identify these problems and give recommendations for solving them. Thus in order to determine the extent these problems influence the effect of class-size on teaching and learning of mathematics in secondary schools in Bosso Local Government Area data must be collected. As such, chapter three becomes inevitable.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research Design

The research design adopted for the study is a quasi-experimental research design. There are two groups i.e. experimental and control group. The experimental group consist of a small class-size of 20–25 students while the control consists of a class-size of 40–60 students.

3.2 Population of the Study

Population of this study consist of 5449 secondary school students in Bosso Local Government Area Niger State. The average age of the student to be used for the study is 15. Two schools were used in this study with a population of 1021 student (male and female).

3.3 Sample and Sampling Technique

The study was carried out in four secondary schools in Bosso Local Government Area of Niger State. A stratified random sample technique was adopted in choosing two secondary school in the Local Government Area out of about 21 secondary schools in Bosso Local Government Area Niger State. A stratified random sample technique was used because the researcher wishes to divide the students into two groups i.e. the control group and experimental group.

3.4 Instrument of Data Collection

The data used in this was obtained through pre and post achievement tests. The researcher taught the topic Set Theory with lesson note to the experimental and control classes. The group was taught for a period of two weeks. The same method of teaching was used for both experimental and control groups.

The demonstration and explanation teaching method was used. The lesson plan was the same for both groups. The same pre and post mathematics achievement tests was used for experimental and control groups and the same teacher taught in the two schools selected in Bosso Local Government Area.

In each school there was an experimental group of 25–30 students and a control group of 40–60 making total of four (4) classes.

The following instrument were used:

(1) Pre – Achievement Test

(2) Post – Achievement Test

Pre – Achievement Test: This is a test that was administered to both experimental and control groups before teaching.

Post – Achievement Test: This is a test that was administered to both experimental and control groups after teaching all the topic intended to be taught. It reserves the same content as pre-test. A copy of the test is attached in appendix.

3.5 Validation of the Instruments

The test and lesson plans were constructed on the topic taught, they were sent to two experts in mathematics, measurement and evaluation the department of Science Education, Federal University of Technology Minna for comments and constructive corrections. Their advice was used in revising the items where necessary.

3.6 Administration of the Instrument

Pre – test on the contents taught was administered to both experimental and control groups before teaching starts. The students were taught Set Theory after the pre – test was given to them. The essence of administering a pre – test is to ensure that the base – rate performance of the group was known. The test consisted of ten questions to be answered in 35mins. The pre – test also serve as the post – test which was also given to the students after the researcher finish teaching the topic. The same test question was given to the control and experimental group.

3.7 Method of Data Analysis

The Data collected in this research were analyzed using some statistical tools such as percentages, frequency count, and mean statistics using statistical packages for social sciences (SPSS). The null hypothesis was answered using statistical package for social sciences (SPSS).

CHAPTER FOUR

4.0 DISCUSSION OF RESULTS

This chapter presented the result of data analysis based on the two research questions and two null hypotheses that guide the study. The results were presented individually in the tables for the two research questions and two hypotheses.

4.1 Presentation of Results

4.1.1 Pre-test Result for the Experimental and Control Group.

The reason for the test was to determine the equivalent of the two groups (experimental and control) before treatment. To analyze the pre-test data, the mean and standard deviations of the two groups were computed and compared using t-test statistics. The result of the comparison is as presented in table 4.1

Table 4.1 Pre-test Result of the Experimental and Control Group.

Group	N	Df	$\bar{x}$	S.D	t-value	p-value
Control	60		6.10	2.14		
		88			1.15	0.18
Experimental	30		9.11	2.79		

No significant at P- Value> 0.05

Table 4.1 shows the pre-test comparison of experimental and control groups. The result in the table shows that the experimental group has mean score of 9.11 with SD of 2.79 while the control group has a mean score of 6.10 with SD of 2.14 with the $t_{\text{-value}}$ of 1.15 with 88 degree of freedom and $P_{\text{-value}}$ of 0.18 ($t_{\text{-value}}$ =1.15, $P_{\text{-value}}$=0.18 > 0.05 with df= 88) since the computed value is greater than the $P_{\text{- value}}$, it implies that there is no significant difference between the experimental and control group of the pretest. Thus the two groups were equivalent.

4.2 Research Questions 1: What is the difference between students' performance in small–size and large–size classes using mean achievement scores and standard deviation?

Table 4.2: Mean ($\bar{x}$) and Standard Deviation (SD) showing the effects of class size on the academic achievement of mathematics students taught in a class size of 30 students than those taught in a class size of 60 students.

Group	N	Pre-test		Post-test	
		$\bar{x}$ **1**	$S.D_1$	$\bar{x}$ **2**	$S.D_2$
Control	60	6.10	2.14	9.11	2.79
Experiment	30	9.11	2.79	10.87	2.91

Table 4.2 shows that the mean achievement scores and standard deviation for the experimental group were 10.87 and 2.91 while that of control group are 9.11 and 2.79. Therefore, those students taught in a class size of 30 students performed better than when compared to those students taught in a class size of 60 students. In order to determine whether the difference in mean is significant, the corresponding hypothesis is tested in table 4.4.

Research question 2: What is the difference in the level of students' attention and supervision based on class–size due to gender?

Table 4.3: Mean ($\bar{x}$) and Standard Deviation (SD) on the influence of gender on students mean achievement scores taught in class size of 25-30 students than students in a class size of 40-60 students.

Gender	N	Pre-test		Post-test	
		$\bar{x}$	S.D	$\bar{x}$	S.D
Male	15	3.96	1.22	7.49	1.97
Female	15	3.53	0.95	7.01	1.92

Table 4.3 shows that the mean achievement scores and standard deviation for the males are 7.49 and 1.97 while that of the female students has mean achievement scores and standard

deviation of 7.01 and 1.92. Therefore, this indicated that male students performed a little better than the females' students in Mathematics. In order to determine if the difference in mean is significant, the corresponding hypothesis is tested in table 4.5.

4.4 Post-test Result for the Experimental and Control Group

4.4.1 HO_1: There is no significant difference between the mean scores of students in the small–size and large–size.

Table 4.4 Summary of t-test Analysis of the Mean Achievement Score of Experimental and Control Group.

Group	N	Df	$\bar{x}$	S.D	t-value	p-value
Control	60		9.11	2.79		
		88			2.79	0.003
Experimental	30		10.87	2.91		

Significant at $P<0.05$

Table 4.4 shows the summary of t-test analysis of the mean achievement scores of the experimental group is 10.87 and standard deviation is 2.91; df is 88, while that of the control group is 9.11, SD is 2.79. The result in the table indicated that $t_{\text{-value}}= 2.79$, $P_{\text{-value}}=0.003$ at 0.05 level of significance, ($P< 0.05$) the result of the analysis shows that there was significant difference between the mean achievement scores of students taught in a class size of 25-30 students than those in a class size of 40-60 students.

4.4.2 HO_2: There is no significant difference between the mean scores in the level of students' attention and supervision based on class–size due to gender?

Table 4.5 Summary of t-test Analysis of Mean Achievement Score of Male and Female Students in Experimental Group.

Gender	N	Df	$\bar{x}$	S.D	t-value	p-value
Male	15		7.49	1.97		
		28			0.52	0.23ns
Female	15		7.01	1.92		

Not significant at P-value >0.05

Table 4.5 shows the summary of t-test analysis of the mean achievement scores of male and female students in the experimental group. The mean achievement score of the male is 7.49, standard deviation is 1.97; df is 28 and that of the female students is 7.01, standard deviation is 1.92. The result in the table indicated that $t_{\text{-value}}$= 0.52, $P_{\text{-value}}$=0.23 at 0.05 level of significance, (P> 0.05) the result of the analysis shows that there was no significant difference between the male and the female students taught in a class size of 25-30 students than those in a class size of 40-60 students. Therefore, males and females were at equivalent.

4.5 Summary of Major Findings.

The following findings were derived from the study:

1. Findings from hypothesis one using t-test showed that there is a significant difference in the performance of students taught in a class size of 25-30 students as their performance was better than those taught in a class size of 40-60 students with P=0.003
2. Result from hypothesis two showed that there is no significant difference in the performance of males and females students on the effect of class size on teaching and learning of mathematics with P=0.387

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Summary

Having come to the final part of the project work, the researchers therefore summaries the findings. It was in view of the increase in student enrollments in our secondary schools with corresponding decrease in staff strength that prompted this research work. The problem is the effect of class–size on teaching and learning of mathematics in secondary schools.

Research questions were set and hypothesis formulated with the topics taught to the students.

Furthermore, thirty-six (36) secondary schools in Bosso Local Government Area were sampled, our target population were selected by randomization.

A stratified random sample technique was adopted in choosing two secondary school in the Local Government Area out of about 36 secondary schools in Bosso Local Government Area Niger State.

The data collected were analyzed using mean and standard deviation and the hypothesis were tested using t- test distribution.

In analyzing the data, it was seen that large class size has an adverse effect in the performance of the students.

Also that evaluation is found to be poorly done with a large class. The research examined the educational implications critically made recommendations and suggested that the study of class size in our schools and its corresponding staff strength should be extensively studied using all classes in the state.

5.1 Conclusion:

Based on the results of this research the following conclusions could be draw. That teaching and learning of mathematics is done more effectively when the class size is small as shown in

table one where the experimental groups has a higher mean score and standard deviation in both pre and post-tests.

Having seen from the hypothesis that there is a significant difference between the mean achievement scores of students in the experimental and control group. In mathematics achievement test, it is recommended that government should reduce the class size in secondary school, sponsor seminars/workshops for in-serving mathematics teachers for improved technique and methods and thus improve performance.

5.2 Recommendations:

In view of the findings of the researcher, the following recommendations are made:

That for effective teaching and learning of mathematics the teacher should be professionally trained.

That class-size should be reduced to 20-30 students per class and with the teacher having not more than three (3) streams

That mathematics teachers should be relieved of every other school activity to enable then concentrate in the teaching of mathematics.

That attendance to mathematics association of Nigeria (MAN) Meeting, seminars and workshops should be made compulsory to all mathematics teachers.

That governments should also help secondary schools to establish mathematics laboratories.

That government should increase the present mathematics allowance to deserving members.

5.3 Educational implications: The educational implications of these results to education are as follows:

That class-size has an impact in effective teaching and meaningful learning of mathematics.

This in effect implies that the teachers are over stretched in large class-size. But small class size demands reasonable amount of work load for the teacher.

That evaluation is always difficult and boring to a mathematics teacher especially where the class size is large.

The implication of this is that either that the teachers spend most of their teaching time in assignments or do not give them at all, however it is not good for effective learning of mathematics. That the large class-size makes the effective use of teaching aids impracticable. This is because the aids can hardly be sufficient to go round for meaningful learning. And worst still the back benchers will continue to loose. The implication of this is that some abstract concepts which would have been made real to the students with the help of teaching aid can never be understood by the students.

5.4 Suggestions for Further Studies or Researchers

At this point I wish to suggest the following.

That the same study of class size should be carried out using Jss1 and Jss11 and all the senior secondary classes respectively for better generalization

That the study should be extended to other local government area, educational zones in the state. The research should be carried out using other subjects such as English language, Igbo, Sciences etc. The importance of mathematical laboratory in our secondary schools should also be studied and emphasized.

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MATHEMATICS ACHIEVEMENT TEST

CLASS: SS1

SUBJECT: MATHEMATICS

TOPIC: SET THEORY

DURATION: 35 MINS

INSTRUCTION: ANSWER ALL QUESTIONS

1) Define a set.
   a) Collection of objects b) name of set c) a type of objects d) name of people
2) Which of the following is not a type of sets?
   a) Union sets b) universal sets c) null sets d) none sets
3) The null set {} is usually denoted by
   a) $ b) & c) $ d) Ø
4) The universal set is usually denoted by
   a) $ b) & c) ξ d) Ø
5) Given a set A={1,2,3,4,5} and B={1,6,9,3,7}, find the intersection of the sets AnB.
   a) {1,4,6,8,8} b) {1,3} c) {2,3} d) {1,4}
6) Given a set A={1,2,3,4,5} and B={1,6,9,3,7}, find the union of the sets AuB.
   a) {1,3,6,9} b) {2,4,6,8} c) {1,2,3,4,5,6,7,9} d) {3,6,9,12}

   Choose true or false in question 7-10

   For two sets A and B,
7) Number of (AuB) is the number of elements presents in either of the sets A or B.
   a) True b) False
8) Number of (AnB) is the number of elements presents in both the sets A and B.
   a) True b) False
9) The universal sets contains all the subsets of a sets.
   a) True b) False
10) The empty sets contains some sets
   a) True b) False

Answers

1) a
2) d
3) d
4) c
5) b
6) c
7) a
8) a
9) a
10) b