RELATIONSHIP BETWEEN CLASS SIZE AND MATHEMATICS ACHIEVEMENT IN SECONDARY SCHOOL CERTIFICATE EXAMINATION, IN BOSSO LOCAL GOVERNMENT, MINNA, NIGER STATE.

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NOVEMBER, 2019

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A RESEARCH PROJECT REPORT SUMITED TO THE
DEPARTMENT OF SCIENCE EDUCATION
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

IN PARTIAL FULFILMENT OF THE RQUIRMENT FOR THE AWARD OF BACHELOR OF TECHNOLOGY (B.TECH) DEGREE IN MATHEMATICS EDUCATION

NOVEMBER, 2019

ABSTRACT

The purpose of the study is to determine the relationship between class size and mathematics achievements in SSCE in Bosso LGA, Niger state. The research adopted a correlational research design. The total population was sixteen senior secondary schools in Bosso LGA and the whole sixteen schools were sampled as sample size. A checked list was used as instrument of data collection and was validated by the supervisor and some other expert from the department. The research was guided by two research questions and a null hypothesis. The research questions were answered using a multiple bar-chart and the research hypothesis was tested using PPMC. The researcher discovered that as the number of class size increases the achievement of the students' decreases and as the class size decrease the achievement increases. The researcher recommended that the government should allocate more budgets to building of more classrooms in Niger State.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

As the world population continues to increase, the class sizes are also affected. Mokobia and Okoye (2011) explained that educators universally have identified class size as important and desirable attribute of effective educational system. Consequently, debate has continued in the educational literature stakeholders such as academics, policy makers and parents over the educational consequences of class size. It is considered as one of the important determinants of achievement over which teachers in schools have little or no control. Class size may be defined as the number of students per teacher in a given class or the population of a class (Ajayi *et al*., 2017).

In Nigeria however, the class size is becoming increasingly unmanageable, putting teachers in an impossible position of giving individual student required attention. In Nigeria public schools, the teachers' eye contact with the students in class has become so reduced that some of the poorly motivated students can form number of committees at the back of the class while teaching is going on to engage in non-school discussion. Regular assignments and home works are dreaded by teachers considering the staggering number of books to mark and to record. A research by Bosworth (2014) revealed that, the correlation between class size and student achievement is complex with many disagreeing results. The study concluded that class size has tiny impact on student achievement. The findings were inconsistent with the results of Rubin (2012) in that the later indicated that as the class size increases, student achievement declines. Contributing to exiting studies, conclusion from a study by Allen *et al*. (2013) was that 62 students per teacher was a threshold number and once class size went beyond 62, learning effectively stopped. Thus, as the number of students in a class was more than

62, teachers find it difficult to teach effectively and efficiently leading to students not being able to also learn effectively since low participation of class activities were possible. Despite this finding, Allen *et al*. (2013) indicated that large class sizes do have moderate adverse effect on teaching and learning. The finding however contradicts the earlier studies and conclusions by Bosworth (2014).

Achievement According to Black and William (2014) achievement is past oriented. It is based on a specific body of knowledge and it reveals areas of weakness, which can result in remedial action. Achievement can also reveal competence and such results can be used to predict future performance. Mathematics achievement in secondary schools has an influential effect on their achievement in college and their future careers. Having a solid background in mathematics help students to develop strong views and offer more career options. Mathematics achievement is the competency shown by the students in the subject, Mathematics. It measures the score on an achievement test in mathematics. The present study is based on the mathematical achievement of students in senior secondary schools.

1.2 Statement of the Problem

Schooling has multiple purposes, for instance, higher levels of schooling are associated with higher earnings and economic mobility, better health, lower mortality rates, and greater participation in the leadership process in one's immediate and the global community. In an attempt to put sound education on ground worldwide, many factors have been identified as being responsible for falling standard of education where it is perceived and established. Among such factors is the issue of class size. A lot of argument has gone on the impact of class size on performance, some fingering large class size as the main factor responsible for falling standard of education, most

especially in the elementary or secondary level of education in Nigeria (Adeyemi, 2008). Fabunmi, BraiAbu and Adeniyi (2007) pointed out that classroom congestion and low utilization rate of classrooms are common feature of secondary schools in Nigeria. Following the trend of educational system in the country, particularly in Niger State, population explosion without a commensurate increase in infrastructure in our schools has constituted a great problem which has threatened the essence of learning(Kedney, 2015). The Federal Republic of Nigeria (FRN, 2007) recommends an average class size of 40 students to a teacher, but hardly is this attained in Nigerian schools. Duyilemi (2004) observed that in most Nigerian schools what exists in the class ranges from 50 to a large number of 120 students to a teacher in many secondary schools; consequently, many students received their lessons while standing. It is based on the foregoing that this study aims to investigate the relationship between class size and mathematics students' achievement in SSCE examination in Niger State.

1.3 Aim and Objectives of the Study

The main aim of this study is to determine the relationship between class size and Mathematics achievement in SSCE. The specific objectives are to;

i. Determine the relationship between class size and mathematics achievement in Mathematics in Senior Secondary Certificate Examination in Bosso LGA.
ii. Find out the average class size in mathematics classes in Bosso LGA Senior Secondary Schools.

1.4 Research Questions

In an attempt to come up with relevant findings in this study, the following questions were raised to guide and give focus to the study:

i. What is the difference between class size, and mathematics achievement in Senior Secondary Certificate Examination in Bosso LGA?

ii. What is the average class size of mathematics classes in Bosso LGA?

1.5 Research Hypothesis

$H0_{1:}$ There is no significant difference between class size and mathematics achievement in Mathematics

1.6 Significance of the Study

This study will also assist the government and educational stake holders to provide adequate school infrastructures so as to improve students' achievement in mathematics; it will also be of great importance to school management so as to be able to determine the best class size that can bring out the best achievement of students in mathematics. And also study will be of great importance to teachers and administrators (Principals) of Senior Secondary Schools. Small class sizes lead to one on one attention from the teacher with small class size, teachers can get to know each student as an individual working with them to enhance their strength and improve their weaknesses. This study will as well be a good reference point giving direction to those who want to effectively size their classes (not necessarily Senior Secondary School).

1.7 Scope of the Study

Due to the time factors distance and the financial involvement of this type of research, the research is restricted to Bosso Local Government. The researcher concentrated on SSCE result of SS3 students on the study of Mathematics. The population of the study is based on the sixteen senior secondary schools in Bosso. Hence, this study concentrates

on the relationship between class size and mathematics achievement in SSCE in 16 senior secondary schools in Minna metropolis.

1.8 Operational Definition of Terms

i. **Class-Size:** This is referred to as the number of students that occupies a classroom

ii. **Academic Achievement:** This is referred to as the students' ability to understand what they have been taught in class and use such knowledge to sit for and pass an examination

CHAPTER TWO

2.0 REVIEW OF RELATED LITERATURE

2.1 Conceptual Frame Work

This chapter reviewed existing literatures under the following themes:

- Concept of class size
- Achievement in mathematics
- Effects of class size on students' performance
- Theoretical frame work
- Empirical framework
- Summary.

2.2 The Concept of Class Size

Researchers see the concept of class size in different perspectives and, therefore, seem to have no universal acceptable definition. For example, class size, according to Florida School Indicators Report (2004) means the number of students meeting in a particular classroom for a class section, engaging in a particular activity. Class size is determined by bringing the total number of students in the classroom and dividing it by the number of teachers assigned to the students (Florida School Indicators, 2004). Adeyemi (2014) defined class size as an average number of students per class in a school. Similarly, Lewit and Baker (1997) as cited in Bassey (2014) described class size as an administrative measure typically defined as the number of students assigned to a teacher with the primary responsibility to take charge of given instructions and direction of learning to students. Researchers further stated that available statistics on class size do not properly address the availability, adequacy and type of physical shape used for instruction in the teaching/learning situation.

The Federal Republic of Nigeria (FRN, 2004) stated that educational needs and training facilities should be catered for in order to meet the response of societal needs and which will progressively extend to the satisfaction of individual student's wants and aspiration. In line with this, researchers stated that the numerical strength of a class should not be more than forty student per teacher on average. As cited by Bassey (2009), Charleston (1994) described large class size as one teacher to fifty students" average. He believed that a teacher with high numerical strength of students will not be permitted to handle the class effectively and adequate attention to individual student will certainly be lacking. That is, individual problems of the students will certainly be buried in a large class, which will consequently affect achievements in mathematics and other subjects.

Responding to the problem of large class size, some state governments such as Oyo State, Osun, and Ekiti State in Nigeria embarked on correcting this anomaly. Numbers of students per class were reduced especially at the Senior Secondary School level and more -classrooms were built to cater for this reformation (Tobih, Akintaro and Osunlana, 2013). This brought a great relief upon teachers and administrators of schools and there was a great expectation that with this reformation, there should be an improvement in the output of teachers and this should consequently improve the academic performance of the students especially at SSCE level. Keil and Partell (2009) found that increasing class size has a negative effect on students' achievement, that is, it lowers students' achievement at a decreasing rate. This means that adding 10 students to a class of 10 has a larger negative impact on grade than adding 10 students to a class of 200. Ding and Lehrer (2008) found out from their study that higher ability students gain the most from class size reductions while many low ability students do not benefit from class reduction. According to them, class size has no relationship to grades and that effect of class size on grades differs across different categories of students. Furthermore,

Adeyemi (2008) in his findings revealed that schools having an average class size of 35 and below obtained a better result than schools having more than 35 students in senior secondary schools. Small classes may benefit students more when instruction relies on discussion, by allowing more students to participate and be recognized, than when lecture and seatwork are the main modes of instruction.

According to National Educational Research Development Council (NERDC; 2002), mathematics teachers are bordered by the teaching of mathematics in a large class size. Significantly, the current situations in our schools in Nigeria are that which contains uneven as 1:20 teacher to students in some rural schools and uneven as 1:80, 1:220 teacher to students in some urban schools. Mathematics is recognized as an important tool for engineers, scientists, architects and many other professionals. Hence, mathematics is considered as knowledge indispensable to all fields of study. Therefore, it needs to be taught in a good and conducive environment. Thus the need for sizeable classes is prerequisite for effective teaching and learning of mathematics.

It is however evident that in most schools, classes are overcrowded such that effective teaching/learning of mathematics is difficult under this situation, students consequently device poor attitudes towards learning of mathematics.

Many educationists accept as axiomatic that there is maximum class size which determines the quality of learning in the classroom. This assumption generally unsupported by researchers, has been expressed in professional literature and has become one of the criteria of the quality of education for crediting agencies and for the public at large to use in assessment.

Keil and Partell (2009) found that increasing class size has a negative effect on students' achievement, that is, it lowers students' achievement at a decreasing rate. This means that adding 10 students to a class of 10 has a larger negative impact on grade than

adding 10 students to a class of 200. Ding and Lehrer (2008) found out from their study that higher ability students gain the most from class size reductions while many low ability students do not benefit from class reduction. Furthermore, Tennessee's Project Star (Student –Teacher Achievement Ratio) showed that smaller class students substantially out-performed larger class students on both standardized (Stanford Achievement Test) and curriculum based tests (Basic Skill Test). Again, Adeyemi (2008) in his findings revealed that schools having an average class size of 35 and below obtained a better result than schools having more than 35 students in senior secondary schools. Small classes may benefit students more when instruction relies on discussion, by allowing more students to participate and be recognized, than when lecture and seatwork are the main modes of instruction.

Nevertheless, there are both economic and empirical problems with class size reduction policies. It is conventional to estimate the relationship between educational inputs (like class size) and outputs (achievements) and to call the relationship on education production function. This nomenclature suggests that inputs transmit systematically into achievement as they do in the production functions of profit-maximizing firms. The analogy is a false one, however, because firms' production functions are not just a result of their ability to turn inputs into outputs. A firm production function is as a result of maximizing an objective (profit) that gives a production possibilities set. It is not obvious that schools have stringent achievement maximization objectives imposed on them as described above, class reduction can fulfill a variety of objectives, not all of which are related to achievement. Thus while class size reduction always afford opportunities for increased investment in each child's learning, it is not obvious that every school takes up such opportunities.

The actual effect of reducing class size will depend on the incentives a school faces. Put it in another way, if a policy maker wants to predict the effect that a proposed class size reduction would have, she should rely on evidence from schools that have faced the incentives that are similar to the incentives that schools would face under the proposed policy. Schwartz (2005) opined that, the vast majority of variation in class size is correlated with determinants of students' achievement. In order to support the above claim, a number of educational researchers such as Bassey (2002) and Waitutu (2006). They all have attributed students' poor performance in mathematics to large classroom size in our secondary schools. They further listed a number of other factors that can be considered to be responsible for contributory factors to the trend of poor performance of students in mathematics. These include:

i. Work over-load by teachers
ii. Dissatisfaction with the little or no infrastructural materials
iii. Experience or disposition of teachers to use child-centered method of teaching
iv. Lack of initiative on the part of the teachers to improvise – using the locally available materials as an improvisation in the teaching/learning process
v. General teaching skills (subject mastery) by the teacher
vi. Poor perception and negative attitude of students towards mathematics.
vii. Compulsory nature of the subject
viii. Finally, the poor control of candidates' admission due to the introduction of UPE (1979) and UBE (1999) of Obasanjo's administration.

The above factors have also been shown to produce or generate similar effect on students' achievements/performance in a number of researches from various parts of the world, for instance, the work of Osobonye (2000) in Nigeria. Kogolla (2005) observed that a number of teaching strategies have been employed to teach mathematics to large groups of heterogeneous students such as child centered and activity based teaching. This is done to involve and draw attention of student(s) to the subject matter in order to perform better. This is achieved through ownership of ideas generated by the student(s) themselves. Despite the use of various teaching approaches in the attempt to impact knowledge using effective strategies, Waitutu (2006) further reported that slight changes were noted in students' academic performance in mathematics.

2.3 Achievements in Mathematics

The concept of achievement is the level of development essentially applied to what an individual or group has gained from the learning outcomes. Scholfield (2000) sees achievement as a student's relative growth in a given field of study, that makes him to have an in-depth knowledge and skills possessed as a result of instruction that have been administered either formally or informally. Achino (2000) and Uba (2004) considered achievement to be a level of an individual's educational growth in a test when compared with the scores of others of the same level. The word achievement, according to Webster's International, is "a result brought about by resolve persistence or endeavor". According to Titua (2002), large class sizes are significant concern to teachers in schools and also for an increasing number of parents whose children attend such schools. His findings have shown that annual budgets in Nigeria do not accommodate large class sizes especially with dwindling and inadequate funding in schools. The private schools take advantage of this to have a reasonable class size which

encourages the parents to enroll their children there. They opined that the engagement and participation that small class size brings could very well increase the feelings and affection of responsibility that students require to succeed.

2.4 Effects of Class Size on Students' Performance

According to Doyle (2014), in modern day education, the focus is on the needs, interest and comfort of the students. Thus, managing class size allows students to learn effectively without disturbing one another (Garret, 2008). While a number of studies have found support for the importance of class size on student achievement, others strongly disprove this claim concluding that class size has little or no impact on objective student outcomes. Copious studies have investigated the influence of class size on student attitudes, behaviors, and outcomes. The devastating issue is that limited number of these studies has focused on elementary school effects of class size on student achievement (Altinok and Kingdon, 2012). The orthodox wisdom among parents, teachers, school administrators, and policy makers is that, smaller class size translates to improvements in student learning and outcomes. This orthodox wisdom, however, has not been universally supported by realistic evidence (Aturupane *et al*., 2013). It has been argued that increasing the intake of senior secondary school students in a large class has numerous benefits for the schools and the country as a whole. It helps to reduce the cost of building additional classrooms of which few schools as well as the country have the resources to fund additional classrooms and teachers. Also there is usually high energy, fun and excitement in large class size in public senior secondary schools. In addition, students learn to work well in groups since group work is a necessity in large class size (Azigwe *et al*., 2016; Owolabi *et al*., 2012).

In a related study, Evans and Popova (2015) established that there is a negative non-linear relationship between class size and student evaluations stronger than the relationship to student achievement, and with less concavity. This supports findings including an analysis of studies which revealed a similar negative relationship between class size and student evaluation, particularly in regards to instructor interactions with students as demonstrated by Altinok and Kingdon (2012). Besides, the literature has argued that pedagogies specifically designed for teaching smaller classes sometimes overlap with pedagogies employed when teaching larger classes but have distinct characteristics that differentiate them from those employed when teaching larger class (Aturupane *et al*., 2013; Azigwe *et al*., 2016). Small class pedagogies can include project work where students are individually monitored and provided with continuous feedback on investigative tasks designed to develop higher order thinking skills (Altinok and Kingdon, 2012; Bosworth, 2014). Additionally, these studies suggested that advantage should be taken of having fewer students in a class to provide learning experiences that facilitate increased collaboration and communication among students, provide helpful learning opportunities and foster student met cognitive skills through the development of information discovering and help-seeking behaviours According to Amadahe (2016), one of the most essential parts of the teaching and learning process is assessment and evaluation of students. Large classes call for large volumes of marking to be done and feedback given to students. This is a major challenge, especially in Nigeria public senior secondary schools. In the face of large classes, instructors are upset with the workload and resort to traditional teaching and assessment methods. Teachers are unable to finish marking assignments, exercises and examinations on time, and this delays the feedback given to students.

2.5 Theoretical Frame Work

2.5.1 Bloom Taxonomy

According to Jonassen, Hannum, and Tessmer (1998), Blooms' taxonomy concurs with the above theorists and espouses that in order to create an enabling environment for deep learning, it is vital to structure and scaffold the tasks in line with a ranking which identifies and acknowledges three learning domains. The major domain, the cognitive one is based on intellectual skills and is rarely influenced by external factors such as class size. The cognitive domain is further divided into six distinct levels that encourage the learner to develop increasingly critical abilities so that they progress. Fowler (2002:12) concurs with Blooms in this regard and states that these levels as ranked by Blooms are loosely packaged as knowledge, comprehension, application, analysis, synthesis and evaluation. Fowler believes that by structuring the tasks so that they start with the focus exclusively on knowledge and through a progressive process include questions from the upper parts and students are given the aptitude to learn effectively. Thus students can easily identify and then consult the lecturer, tutors or peers in order to revise those areas where they have not performed well, further reducing the focus on class size numbers but bringing the problem down to the individual level.

2.5.2 Cooperative learning and scaffolding

Vygotsky (1978:90) holds that "mental functioning is the internalized and transformed version of the accomplishments of a group". The work of social psychological theorists such as Vygotsky (1978) and Johnson and Johnson (1999) has influenced cooperative learning more than any other theoretical orientation. Their contribution comes in the form of the social interdependence theory. The social dependency theory is based on the work of Koffa in Vygotsky (1978) who is credited as being the first researcher to

propose that groups should be viewed as dynamic wholes in which interdependence among group members could vary. Social constructivism, pioneered by theorists such as Vygotsky (1986) highlights the notion that learning is an inward process of forming understanding. In relation to what he refers to as "internal pedagogical engagement", he adds that learning is not a purely internal process, nor is it a passive shaping of behaviors but describes learning as being shaped by the unique environment prevailing at any given time and embedded within social events in the environment (Vygotsky, 1978:90). He suggested that learning environments should involve guided interactions where appropriate and should always reflect on the inconsistency of basic environments. This aspect of adaptability is important as he believes it is such flexibility that allows all the stakeholders in HEI's the opportunity to conform to the specific demands of different class sizes and to change their conceptions accordingly.

In the same vein, David and Roger Johnson, quoted in Moll (2002:147) extended the work into the social interdependence theory. The theory proposes that the way in which social interaction is structured within learning groups determines how individuals interact with one another, which in turn determines achievement. This theory further categorizes interdependence as positive interdependence where an emphasis is placed upon cooperation which results in promotive interaction and negative interdependence where an emphasis is placed upon competition. This may result in oppositional interaction and the absence of interdependence where an emphasis is placed upon individualistic efforts, which according to Johnson and Johnson (1999) results in no interaction. All of the aforementioned theorists are heralded as foundational theorists for cooperative and large-group focused learning. According to Sherman (2000) their work is more than adequate to support the adoption of large group interaction as a valid instructional practice to facilitate wide based learning. Sherman (2002:113) asserts that

the sheer numbers present in a large and extended group are enough motivation to the other learners as they feel that "so many people would not be wrong by seeking an education".

Cooperative learning is distinguishable from other forms of group interaction in a number of ways. The work of Johnson and Johnson (2002) discussed some of the defining aspects of cooperative learning groups which include the following: the structure of group learning activities should promote individual accountability, group-processing, teach social skills, and facilitate group processing. The theories come into sharp focus when dealing with class size and achievement because ultimately the size of the class determines the learning style to be employed at any given instance.

2.5.3Phenomenography

Some educationists such as Kennedy and Siegfried (1979:189) understand learning to be transformative, for example Escrow's theory of perspective transformation suggests that learning occurs as a result of 'critical reflection' on prior assumptions whilst Freire's critical pedagogy uses 'conscientization' to change the way learners see the world and act on it. Ramsden (2001:74) believes that "phenomenography" has contributed an additional perspective on learning in higher education, namely that how students perceive particular learning task demands largely determines whether their approach to learning will be 'deep', 'strategic' or 'surface'. It is only the deep approach to learning that results in transformative learning and achievement. This is because it is characterized by a focus on underlying meaning, the use of a well-structured knowledge base, relating new knowledge to old knowledge, working conceptually and relationally as opposed to learning isolated facts, which is dubbed (the surface approach). These processes occur within the cognitive capacity of the individual concerned therefore

suggesting that class size would not be of any consequence when dealing with the mind. In the midst of an audience of one or one thousand your cognitive faculties should still operate on the same level.

Biggs (1987) solidly agrees with this concept and concurs with the same three approaches to learning which are: surface, deep and strategic, each differing according to motivations and strategies. In each scenario he believes students need to be able to apply their new knowledge and understanding to actual real-life situations and are assessed on their abilities to do this. Surface learning is when a student attempts to learn subject matter word for word. While students can get away with this learning method in some areas, it is virtually impossible to use it in Applied Communication as it requires students to apply the subject matter to the theory and case studies. This often results in poor academic performance as lecturers would have expected students to do extra reading and research, which can be done outside the confines of the lecture halls. They are expected to show extra knowledge beyond the content of actual lectures. This throws away the class situation factor as learning is not confined to the four walls.

According to the findings of Chilles *et al* (1993) reducing class size does not necessarily reduce the teacher's workload, or even the number of students they teach each day. If a teacher is assigned to teach more classes because the number of students in each class is reduced, the teacher spends more time teaching and has no fewer students. Such problems might be resolved by strategies such as year-round schooling, but this still implies either that teachers teach all year or that more teachers get hired. The common assumption is that smaller classes allow teachers to increase the time devoted to each student, either individually or in smaller groups, and thereby improve the quality of the students' education. If this assumption is true, successful class size reduction programs will therefore have to attend to the impact on teachers' workloads. School arrangements

that reduce class size only for particular students or subjects may achieve greater results with lower costs, depending on how they are organized and what exactly makes the smaller class experience better. It may be more important to reduce class size for one section or task, and the research suggests that minority and economically disadvantaged students benefit most from smaller classes. Educators and policymakers should not blindly assume that an across-the-board, across-the-school-day approach to class size reduction is best. Mitchell (1989) concluded that:

> *For all student populations, class size research, while difficult to synthesize offers convincing evidence of an important link between lowered student/teacher ratios and higher achievement (Mitchell et al, 1989:169).*

School officials and policymakers also have to face the problem of the effect of class size reduction on the supply of teachers. If the supply of teachers remains the same and class size reduction increases the demand, then it would seem that class size reduction policies will result in the hiring of less qualified teachers. Right now many schools are having trouble finding qualified teachers to hire. With the current concerns about teacher quality in general, and the call for professional development focusing on teaching in smaller classes, policymakers want to strengthen teacher quality, not weaken it. It may be, however that class size reduction policies will not have such a detrimental effect on teacher quality. Currently, many teachers leave the classroom after only a few years to pursue some other profession. Class size reduction might lessen this problem of teacher attrition, because of its popularity. If teachers find teaching in a smaller class more personally rewarding, they may stay in the profession longer, decreasing the frequency of the need to hire and train new teachers. Only the future will tell if this potential benefit of class size reduction will come to pass.

2.6 Empirical of the study

In Nigeria however, the class size is becoming increasingly unmanageable, putting teachers in an impossible position of giving individual student required attention. In Nigeria public schools, the teachers' eye contact with the students in class has become so reduced that some of the poorly motivated students can form number of committees at the back of the class while teaching is going on to engage in non-school discussion. Regular assignments and home works are dreaded by teachers considering the staggering number of books to mark and to record. A research by Bosworth (2014) revealed that, the correlation between class size and student achievement is complex with many disagreeing results. The study concluded that class size has tiny impact on student achievement. The findings were inconsistent with the results of Rubin (2012) in that the later indicated that as the class size increases, student achievement declines. Contributing to exiting studies, conclusion from a study by Allen *et al*. (2013) was that 62 students per teacher was a threshold number and once class size went beyond 62, learning effectively stopped. Thus, as the number of students in a class was more than 62, teachers find it difficult to teach effectively and efficiently leading to students not being able to also learn effectively since low participation of class activities were possible. Despite this finding, Allen *et al*. (2013) indicated that large class sizes do have moderate adverse effect on teaching and learning. The finding however contradicts the earlier studies and conclusions by Bosworth (2014).

From the social perspective, studies on large class size exist in developing countries but the results are often questionable. Aturupane *et al*. (2013) reviewed 96 studies that tried to link various educational inputs to student performance in developing countries and found out that nearly a third (31) of the reviewed studies specifically considered the effect of pupil-teacher ratio. Out of the investigation, only eight found reduction in class

size to significantly explain improved academic achievement. This study is consistent with Stephens *et al*. (2014) study on learning competencies in five francophone sub-Saharan African countries (Burkina Faso, Cameroon, Cote d'Ivoire, Mali and Senegal) which demonstrated that an inverse relationship existed between class sizes and learning outcomes. That is, student learning decreased as class sizes increased. This means that the higher the total number of students in a class, the lower the level of concentration which leads to poor performance of the students. Azigwe *et al*. (2016) revealed that students' engagement, behaviour, and retention are affected in so many ways by the size of the class. This conclusion was drawn when reviewing studies on the link between student engagement and class size conceptualized student engagement in two forms, namely, social engagement (how a student interacts socially with other students and teachers in either pro-social or anti-social ways) and academic engagement (students' attitude towards schooling and the learning process). The study indicated that when students are placed in smaller classes, they become more engaged, both academically and socially, and argue that with strong social academic engagement, academic achievement improves.

2.7 Summary of literature Review

The reviewed of literature in this chapter indicated that mathematics is a very important subject which any nation with positive intention for development in science and technology will not afford to trifle with (Francis 2002). Reducing class size to increase students' achievement is an approach that has been tried, debated, and analyzed for many years. The premise might seem logical, with fewer students to teach, teachers should achieve better academic outcome for all students. For those who choose private education for their children, it is often cited as a major consideration. However, for

policymakers there are three major questions to answer with the adoption of any change on new program: how effective will the change be, how much will it cost, and what the problems of implementation are, including the support or the oppositions of the stake holders.

CHAPTER THREE

3.0 RESEARCH METHOD

This chapter contains research design, population of the study, sample and sampling techniques, research instrument, validity of instruments, procedures for data collection, and method of data analysis.

3.1 Research Design

This is a correlation design where a researcher seeks to understand what kind of relationship naturally occurring variable have with one another.

3.2 Population of the Study

The population for this study consists of 16 senior secondary schools in Bosso LGA of Niger State that writes SSCE.

3.3. Sample and Sampling Techniques

The whole 16 Senior Secondary School in Bosso LGA was used for the sample of the study. This is in accordance to Morgan table for sample size (2006) which says when there is a total population of twenty is given; a sample size of nineteen is used. So in this case the population is less than twenty as such all the population were used.

3.4 Research Instrument

The research instrument adopted for data collection of this study was a structured checklist which comprises of WAEC and NECO results and the average class size.

3.5 Validity of Instruments

The research checklist was designed to obtain necessary data pertinent to objectives of the study and the research questions. The checklist was constructed and given to the supervisor to identify the ambiguity of the checklist which would be reconstructed and modified by the supervisor with some other necessary factors to validate the research instrument. (All errors, observations by the supervisor were embodied to form the final checklist.)

3.6 Procedure of Data Collection

The researcher collected an introductory letter from the department which was taken to the Ministry of Education Niger State to collect the WAEC and NECO results from 2015 to 2018 and also went to the schools to collect the average class size per school.

3.7 Method of Data Analysis

Statistical Package for Social Science (SPSS) was used to analyze the data collected. A vertical bar-chart was used to answer the research questions while the hypothesis was tested using PPMC.

CHAPTER FOUR

DATA ANALYSIS AND RESULTS INTERPRETATION

4.1 Presentation of results

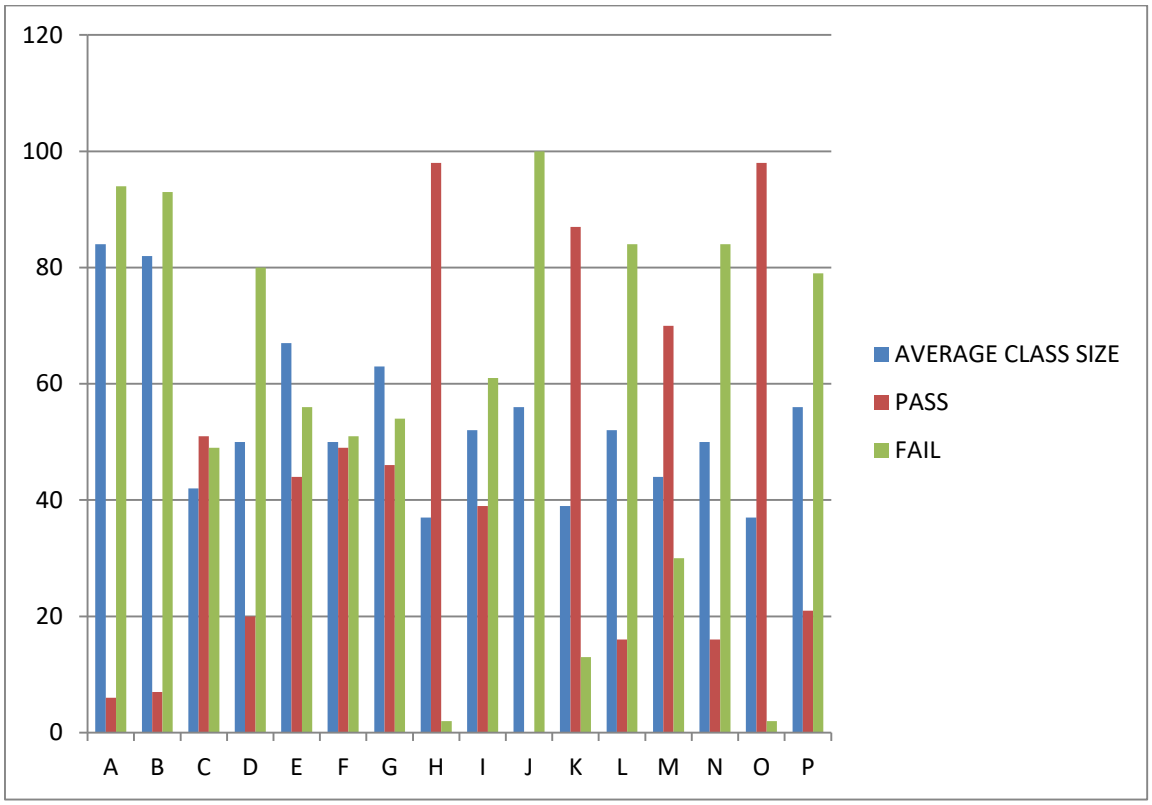
The essence of this research is to find the relationship between class size and mathematics achievement. The result shows the class size and mathematics achievement in WAEC and NECO. Results were computed using SPSS tool for windows and it also correlate the relationship between class size and academic performance.

4.2 Research Questions

4.2.1 Research Question One

What is the difference between class size and mathematics achievement in WAEC and NECO?

Table 4.2.1 Graphical representation difference in class size and mathematics achievement in WAEC



Horizontal Axis Represent: Schools in Bosso

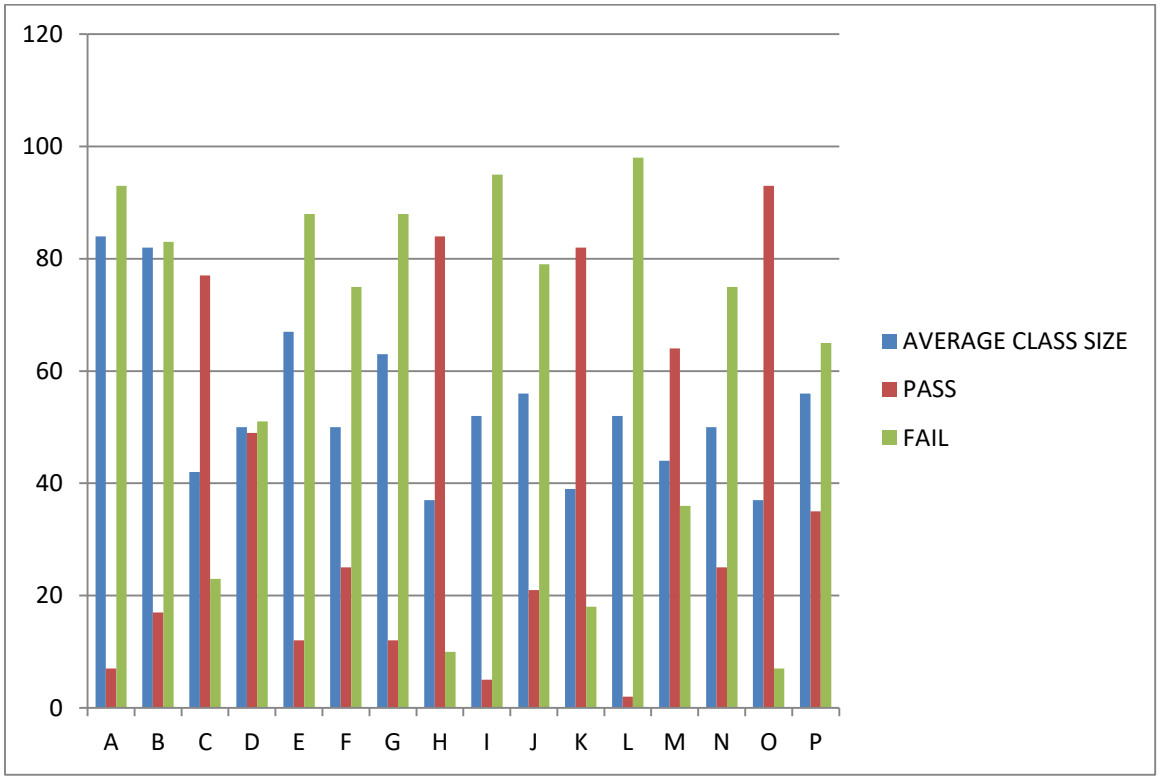
Vertical Axis Represent: Average Class Size

Table4.2.1 shows the graphical representation of class size and mathematics achievement in WAEC. From the graph, school A and B has the highest-class size of about 80 and it also has the highest performance fail along with lowest performance pass. School D has the class size of 50 but the performance fail is much higher than the performance fail. School E has class size of 67 and the performance fail is higher than the performance pass. School H has the class size of 37 and the performance pass is higher than performance fail. School K has an average class size of 39 and the performance pass is higher than the performance fail.

Generally, we can say that school with an average class size of 40 or below tends to have performance better than school with average class size above 40. The higher the

class size in a school, the lower the performance pass in the school and the higher the performance fail in the school.

Table 4.2.2 Graphical representation of class size and mathematics achievement in NECO



Horizontal Axis Represent: Schools in Bosso

Vertical Axis Represent: Average Class Size

Table 4.2.2 shows the graphical representation of class size and the achievement of students in NECO School A and B have an average class size of above 80 and can be seen that their performance fail is higher than their performance pass. From school C, it can be deduced that the average class size is about 40 and it has a very high-performance pass and a low performance fail. School D has an average class size of 50 and the performance pass and fails is almost the same. Therefore, it can be said that a lower-class size gives a higher performance pass and a higher-class size gives a higher performance fail.

4.3 Research Question two

What is the average class size of mathematics classes in Bosso LGA?

Table 4.3 Average class size

	Mean	**Std. Deviation**	**N**
Average class size	54	14.246	16

Table 4.3 shows that the average class size of mathematics classes in Bosso LGA is 54.

4.4 Research Hypothesis

There is no significant difference between class size and mathematics achievement in SSCE

Table 4.4.1Correlation between class size and mathematics achievement in WAEC

		Average class size	Performance
Average class size	Person correlation	1	-.702
	Sig. (2-tailed)		.002
	N	16	16
Performance	Person correlation	-.702	1
	Sig. (2-tailed)	.002	
	N	16	16

**. Correlation is significant at the 0.01 level (2-tailed).

From the correlation output in table 4.4.1, the correlation coefficient r = -0.702, shows a strong negative correlation.

Table 4.4.2Correlation between class size and mathematics achievemen2 in NECO

		Average class size	Performance
Average class size	Person correlation	1	-.741
	Sig. (2-tailed)		.001
	N	16	16
Performance	Person correlation	-.741	1
	Sig. (2-tailed)	.001	
	N	16	16

From table 4.4.2, it shows a very strong negative correlation (r = -0.741). That is, as the class size decreases, the students' achievement (pass) increases and vice versa.

4.5 Discussions of Results

The results of this study indicates that class size affect mathematics achievement and the results from the analysis shows that schools with average class size of 40 performed better than schools with higher average class size.

The result also shows that there is a relationship between the class size and students' performance, the higher the class size the lower the performance and the lower the class size the higher the performance.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The study investigates the relationship between class size and mathematics achievement in Senior School Certificate Examination (SSCE) in Bosso LGA, Niger state. The purpose of this study was to determine the relationship between class size and mathematics achievement in examination such as WAEC and NECO. Two research questions and a null hypothesis was structured in the study and they were answered in accordance to the studies aim and objectives. The study covered the whole sixteen senior secondary schools in Bosso LGA. The related literature was reviewed in this study. Also, research design adopted in this study is a descriptive survey design. The instruments adopted for the data collection in this study is a structured checklist. Data was analyzed using SPSS 16. The statistical tools use to analyze the data were Pearson correlation, mean and standard deviation. The result showed that there is a negative relationship between class size and mathematics achievement which means, as the class size increases, the performance decreases and as the class size decreases, performance increases. The result also revealed that the average class size in Bosso LGA is 54.

5.2 Findings of the study

The study findings include:

1. As the class size increases, the student's academic performance decreases. Also, as the class size decreases, the student's academic performance increases.
2. The average class size of mathematics classes in Bosso LGA is 54.

5.3. Conclusion

Results from the finding had shown that class size affect mathematics achievement in SSCE. It was revealed from the results that schools with a lower average class size have a higher mathematics achievement in mathematics examination. Evident of these findings in this study show that class size significantly affects mathematics achievement. This implies that large class size (above 40) is one of the causes of poor performance in mathematics examinations. However, insufficient classrooms have been the major causes of large class size in senior secondary schools in Niger state. Also, teachers will find it very difficult to manage classes with a large class size due to the overcrowdings of it as such it can be said that class size a critical factor in determining the quality of academic performance from secondary schools in Niger state.

5.4 Recommendation

1. Budget allocation should be given to building of more classrooms in Niger state by the government.
2. Public school administrators should be encouraged to adopt the maximum of 40 students per class (small class size) for effective classroom teaching.
3. Workshops, conference and seminars should be organized by ministry of education for school administrator for the need to adopt small class size.
4. Ministry of education and school administrators should recruit more qualified teachers.
5. Government and school administrators should renovate old classroom to control the effect of class size.

5.5. Contributions to knowledge

The researcher was able to bring to light that maximum of 40 students per class should be adopted for effective classroom teaching.

5.6. Suggestions for further Research

The following suggestions are made for further research based on the research work.

1. Similar study could be carried out in another subject.
2. Similar research can be done with same topic in a different state.

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