IMPACT OF LARGE CLASS SIZE ON STUDENTS' PERFORMANCE IN MATHEMATICS IN COLLEGE OF EDUCATION MINNA, NIGER STATE

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NIGER STATE

SEPTEMBER 2018

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A PROJECT SUBMITTED TO THE DEPARTMENT OF SCIENCE EDUCATION, SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION, FEDERAL UNIVERSITY OF TECHNOLOGY MINNA,

IN

FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF BACHELOR IN TECHNOLOGY EDUCATION BTech (Mathematics Education)

SEPTEMBER, 2018

ABSTRACT

This study is aimed at establishing the impact of large class size on students' performance in Mathematics in College of education Minna, Niger State. It is designed to identify the factors that contribute to increase in the number of students in a class and to find out the negative effect of large class size on the performance of students. This study used pretest-posttest quasi-experiment design to obtain information from randomly selected groups of 300level students of the department of Mathematics in College of Education, Minna, Niger State. the total population is 906 which cut across six options but after using Krejcie and Morgan sampling techniques a total of 269 respondents were used for the survey work. Two research questions and two hypotheses were formulated and they were answered. The researcher designed a Mathematics Achievement test (MAT) with help from lecturers in Federal University of Technology Minna and College of Education Minna which was used to collect data that was administered to the students. The data was analyzed using t-test statistical tools. The results showed that large class has a negative effect on the achievement of Mathematics students and also on the comprehension by mathematics students which means the null hypotheses were rejected. It was recommended that tertiary institutions should endeavor to divide classes into groups to enhance better comprehension and the federal ministry of education and other agencies involved in policy formulation in tertiary institutions should ensure that schools give admission to particular number of students commensurate with the facilities on ground in such schools so as to avoid the resultant effects of overpopulated classes.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The impact of education presently cannot be overemphasized. Most schools have used the importance of education as a means of making more money by admitting a lot of students that the facilities available will not be able to satisfy the admitted students. This in turn leads to the overpopulation or large class size and such prevent the efficient teaching and learning of Mathematics in our higher institutions (Ejeh, 2015).

Learning means the act of creating new knowledge or improving on existent knowledge which can be in values, behavior, attitudes and skills (Ajibade, 2015). Learning to human is a branch of education is where training or individual development takes place. Human, plants, animals and even machines have the singular capacity to learn (Lawal, 2010). Human learning can start before birth and continues until death as a result of continuous interactions between persons and their environments. Learning may occur volitionally or without volition. People can learn from their brain, mind, experience and also from school (Jiboweya & Umar, 2015). Learning is a way through which we use our experience to deal with new situations or problems and develop relationship (Ajibade, 2015).

Some experiences in life provide us with a chance to improve learning from which we decide whether we want to learn or not. Learning is not something that can be observed in a straight forward way in ourselves and others, this is why in formal learning situations assessments is a crucial part of the teaching process. Learning brings about change in the way we do a lot of things which include how we think, we act, feel about ourselves and people around us and also the world at large (Ejeh, 2015).

Teaching is the act of educating or adding knowledge or it is a process of communicating or directing as to how to do something or understand something. Teaching is engaging in certain activities or goal with the purpose of instigating learning. Teaching is the act of taking actions to help people learn a particular thing after close study of the people's experiences, needs and feelings (Ubi, 2017). Teaching should involve setting out with the aim of making or helping someone learn something considering their different state, upbringing or mind set. Teaching is only teaching if people can understand what is taught. Ejeh (2015) defined teaching as a move to help people gain essential ideas, skills and knowledge.

Population, in sociology refers to the collection of human beings (Gideon, 2016). Also population can be seen as the number of people that dwell in a city, town, region, country or world. According to Merriam-Webster Dictionary (2018), large class size can be defined as the population of students in a class relative to a number of factors such as size of classroom, capacity of instructor or teacher and teaching aids and materials. Large class size can also be described as the scenario whereby the number of students or learners in a class are higher than the facilities and equipments to be used in such a class or lesson (Safeopedia, 2018). Hence large class size can be referred to a high number of students in a class compared to the teaching materials, teacher's ability and capacity, among many other factors (Yusuf, Onifade & Bello, 2016). This is worrisome, hence the need to undertake this research work to examine the effect of this large class size and seek ways to address it.

Mathematics is the study of topics which include quantity, structure, space and change. It has no general accepted definition. A new international journal of research in Mathematics which was published in the year 2015 stated that Mathematics is the mother of all subjects. According to Oxford Advanced Learners Dictionary, Mathematics is defined as science of numbers and size.

James Newman in his book on Mathematics and imagination defines Mathematics as a tool which is useful and capable of been understood both in banks, insurance companies, industries, ministries and a host of other organizations. Ubi (2017) stated that we can't have a meaningful progress in science and technology without the use or involvement of Mathematics.

Class size which is a concept in educational research is defined as the average number of students in a class to a teacher (Yusuf *et al.,* 2016). Talking about what class size can do to the performance of students in Mathematics; it is worthy of note that the increases of class size can be affected by the increase in the population of the school which will in turn affect the academic performance of the students (Owoleye, 2011). Any school with very high population of students may prevent the teachers/lecturers from been able to supervise the academic achievement of the students. Also the availability of educational resources at the disposal of the students will also affect their academic performance. Adeleye (2002) stated in her study that large class size is not good for serious academic work. In a large class size it is very difficult to observe the students who do not understand the subject and those who do understand. Having a good relationship between teachers and students isn't very efficient in a large class size, students are likely to be more efficacious when self standing attention is given to them but in a large class teacher tends to use up more time trying to manage the classroom rather than providing teaching which in turn will affect students' performance (Yusuf *et al.*, 2016).

With a small class size teachers will have more time conscientiously to each student in terms of breaking down the topic and giving response to their questions, Yusuf *et al.* (2016). According to Nwanneka and Amaechi (2012), better quality of education can be achieved by having lower number of students in a particular classroom.

With this large class size should be considered as a virus ready to eat up the standard of education in this part of the world because it has made students to lose great attention and concern in a course or in a school, since academic performance of students depends amply on the school environment (Yusuf *et al.*, 2016). In spite of the value of Mathematics, the achievement of students performance in Mathematics in Nigeria tertiary institutions over the years have gone worse and also with the increase in population of students as one major factor (Ajibade, 2015).

1.2 Statement of the Problem

According to Epri (2016), lack of adequate planning as well as lack of basic infrastructure, limited teaching and learning materials, limited classroom furniture and limited Mathematics teachers combine to affect the entire process of teaching and learning of Mathematics. These, in variably, have led to overcrowding of classes and even present a daunting task for the teacher in effectively managing his or her classroom often resulting to limited time in effectively imparting knowledge and basic mathematical skills on the students. Nye, Konstantopoulos & Hedges (2004) posited that the nature of a classroom (including physical setting and the population of students) goes a long way in determining the effectiveness in teaching Mathematics as a subject. But they argued further that despite the challenges of inadequate infrastructure and overpopulation of students, a very good Mathematics teacher can still impart knowledge on the students. Despite recent studies into the effect of overpopulation of students or high class size, there is a gap to fill in the sense that most of the studies undertaken have been in large areas of Nigeria and mostly concentrated on secondary schools with no specific effort made to investigate its effect on tertiary students. Therefore, this study is aimed at determining the impact of large class size on students' performance in Mathematics in College of Education, Minna, Niger State.

1.3 Aim and Objectives of the Study

This study is aimed at figuring out the impact of large class size on students' performance in Mathematics in College of Education, Minna, Niger State. Specifically, it intends to:

- Determine the effect of large class size on the achievement of students in Mathematics.
- Determine the effect of large class size on the comprehension of students in Mathematics.

1.4 Research Questions

These research questions have been formulated as a guide to investigate the effect of student population explosion and its impact to teaching and learning of Mathematics.

- What is the difference between the average achievement scores of Mathematics students who were taught in a class with small size and those taught with large size?
- What is the difference in the average comprehension scores of Mathematics students who were taught in a class with small size and those taught large size?

1.5 Null Hypotheses

Hypotheses are explicitly defined assertions by a researcher for a specific research work; these assertions went through a test to ascertain definitely if they are workable and credible.

The following hypotheses to be tested were stated in null form:

- There is no significant difference in the average achievement scores of Mathematics students who were taught in a class with small size and that with large size.
- There is no significant difference in the average comprehension scores of Mathematics students who were taught in a class with small size and that with large size.

1.6 Justification of the Study

This research project is carried out to reveal the causes of over population and its effect on the learning and teaching of Mathematics and also the causes and effect of students' large class size on the teaching and learning of Mathematics. This research work will be of benefit to the students, teachers/lecturers, government and institutions. The students will gain more knowledge when carrying out subsequent researches in the area. The students will also benefit from the information which will be obtained to know how to overcome the challenges they face in overcrowded classes. The teachers/lecturers will also discover ways to handle large class size and effectively conduct a successful learning process from the information which will be obtained in the study. Government and its various educational regulatory and policy making agencies will discover the impact of large class size and how to effectively address the challenge. Tertiary institutions will also discover ways via which the impact of large class size can be mitigated and how to handle large class size. The study will be beneficial to them in a way that there will be improvement in the admission of students into tertiary institutions to improve the effective teaching and learning of Mathematics, as well as enhance the performance of the students.

1.7 The Scope of the Study

Minna was used as a case study because of its fast growing rate in population of people both migrants and indigenes mostly for educational purposes. The study tests the effect of large class size on Mathematics students which is a much smaller scope with less complexity compared to a general educational scope. The study also covers only undergraduate students of Niger State

College of Education enrolled in the Nigerian Certificate of Education (NCE) level but only 300 Level students were utilized in the study. All these were carefully chosen to reduce the complexity that may arise as a result of wider scope.

1.8 Operational Definition of Terms

The following are the operational definition of terms as used in the study:

Population Explosion: A sudden increase in the number of Mathematics students in a College of Education, Minna Niger State.

Learning: The activity or process of gaining knowledge or skill on Mathematics by studying, practicing, being taught, or experiencing something.

Class Size: the number of Mathematics students being taught by a lecturer in College of Education, Minna, Niger State, in a particular period of time

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In order to acquire more knowledge or understanding to this topic under research, diverse significant literatures were retraced and their relations to this study were well recorded in this chapter. Thus, this chapter contains the overview of students; performance and also the theoretical framework that was discussed or centered on in this study.

2.2 Conceptual Framework

2.2.1 Overview of Large Class Size

Class size can be defined as the number of students being taught by teacher in a particular period of time (Osuji, 2011). Class sizes can either be large or small but this is dependent on factors such as the capacity of infrastructures and the available of methods of teaching that can accommodate certain numbers. Large class size has been reported as being the prevailing norm in most secondary and tertiary public schools in Asia especially China and Africa especially the Sub-Saharan Africa (Epri, 2016). The main reasons for large class size is the rapid increase in the number of students in an institution without a corresponding increase in the number of teachers or lecturers, as well as infrastructures especially classrooms to cater for such increase (Hodges, 2016). Despite the enormous challenges faced as a result of large class size, the situation is not unique to developing countries, large class size can be found in most developed countries as well (Welsh, Coghlan, Fuller & Dauter, 2012). It is crucial to note that the perception of large class size is not always the same everywhere around the globe. Classes considered to be large in some locations, might not be so in other locations due to some reasons such as variation in the system

being adopted, existence of incentives for teachers and students, level of allocation of resources and the quality of teachers (Bakasa, 2011). Because these variations depending on location or institution, more basic educational production functions might be discarded; functions such as adequately teaching challenging topics, students-centred learning, and receiving immediate feedback from students to test level of understanding (Dabo, 2015). According to Hodges (2016), some of the effects of large class size include passive attitude of students, alienation of some students especially slow learners, and the negative perception of lessons conducted in overcrowded classes.

2.2.2 Inadequate Facilities

The rapid increase in the population of students in any institution ultimately leads to the overbearing pressure on the resources hitherto available in the institution (Jiboyewa & Umar, 2015). Though the resources such as infrastructures and learning materials might be enough for the number of students before the population explosion era, such resources might become inadequate as a result of the increase in the population of the learners. For instance, a lecture theatre or classroom built to contain about 50 students becomes grossly inadequate when utilized by about 300 students in a lesson. According to Harbaugh & Cavanagh (2013), no matter the incentive for having a large class size, no teacher or educator can perform his or her duties quite effectively in a jam-packed classroom. This is so due to the fact that such an educator will face certain difficulties which include inability to coordinate the class and inability to effectively discover those students who are having difficulties understanding what is been taught and cannot indicate for fear of being tagged as dull students by their colleagues (Nwosu, 2014). There is also the concern for the health of these students in a jam-packed classroom, ranging from ventilation issues and psychological issues arising from lack of concentration (Tunde, 2012).

2.2.3 Workload of Educators

One of the direct effects of population explosion in institutions of learning is the amount of work it puts on the educator. The educator finds him or herself putting in more effort in classroom management and control because of the increased class size. Also, the educator is left with a heavy workload in designing how to effectively pass on knowledge to the different types of students with different levels of intelligence (Jiboyewa & Umar, 2015). Another workload on the educator is the test of understanding via tests and assignments. Though the teacher might be able to give out tests and assignments, it becomes a burden assessing the students' performance due to their large number. Studies have shown that most educators concentrate on marking and assessing tests and just award marks for assignment because of the stress involved in going through each of the work submitted by the overbearing number of students in his class (Illegbinosa, 2013). According to Osuji (2011), most Nigerian higher institutions have limited academic staff and this constitutes a big challenge when such institutions are faced with population explosion as teacher to student ratio will be too high, thereby making the workload of the educators unbearable.

2.2.4 Overview of Performance

Performance can be described as the accomplishment of an undertaking set out from the beginning of such a task or endeavor (Maduane, 2016). There are certain avenues via which performance can be assessed and they are called performance indicators and they differ from one system to another (Rogers, 2012). Performance indicators and student outcomes are often misunderstood to be the same. Student outcomes help to give the student a direction in which to channel his or her study or learning process while performance indicators are measurable

parameters that a student's achievement can be ascertained as regards a certain program or subject (Rogers, 2012). The two basic performance indicators in analytical subjects such as Mathematics are the cognitive indicator and the affective indicator.

2.2.4.1 The Cognitive Indicator

The cognitive indicator is based on the level of cognitive learning a learner is able to achieve at the end of the learning process and this is displayed by the ability to recall what has been taught as well as the logical reasoning in the practical demonstration of what was recalled (Rogers, 2012). In Mathematics, the cognitive indicator includes the ability of the learner to logically make sense of the set of instructions contained in each topic being taught (De Guzman, 2015). According to Rogers (2012), the cognitive indicator can be further broken down into ability to remember and understand, practical application of what is remembered, breakdown of a system into component parts, make assertions based on standard rules and creating tangible and understandable results from what has been analyzed and evaluated.

2.2.4.2 The Affective Indicator

This indicator helps to access the performance of the learner as regards his or her responsiveness, interest, apprehension and responsibility in the field under study or the subject or program being learnt (Rogers, 2012). The affective indicator in the study of Mathematics includes the keenness of the learner to study the topic, learner's active participation in the learning process, learner's recognition of the intricacies of the topic, as well as the learner's recognition of his or her ability in respect to the topic being taught (Benjamin, 2014).

2.2.5 Factors Affecting Performance of Students

According to Agu (2007), the performance of students cannot be effectively assessed with any system of assessment adopted without the consideration of some factors which might be considered external in regards to the academic work undertaken. These factors include social factors, institutional factors, results of the learning process, the demographic attributes of the student, psychological attributes of the student, and prior performance in similar subject.

2.2.5.1 Social Factors

These factors refer to the various social orientation and awareness of the students. Agu (2007) opines that the social awareness, affinity and placement of a student can affect his or her academic performance, negatively or positively. When a student's social orientation gives a sense of belonging and high self esteem, he or she can fit in into any institutional society and thus can have the necessary emotional and psychological base to perform well (Khan & Iqbal, 2012). Also, a student's ability to connect with fellow students and have a sense of belonging especially among his or her peers, or belong to a particular social group on campus, goes a long way in boosting his or her all-round performance especially as peer group student-to-student interaction have been discovered to be a very effective form of learning (Welsh *et al.*, 2012). Another social factor that enhances a student's commitment in school is the family support factor. Studies have shown that students who perform well have a good family support system and in turn are devoid of stress emotionally (Khan & Iqbal, 2012).

2.2.5.2 Institutional Factors

The commitment of an institution to the provision of basic facilities to enhance the learning capacity of students has been discovered to influence the performance of the students (Agu, 2007). Endeavours such as the adequate maintenance, repair and upgrade of infrastructure, as

well as provision of basic amenities such as water and electricity go a long way in enhancing the students' performance. But according to Khan & Iqbal (2012), some students can still perform well and adapt to any environment personally when there exist an inherent interest in the course they are studying but they noted that this is not prevalent among most students. Agu (2007) also noted that the organization of activities, both academic and extra-curricular, is vital in enhancing the performance of the students. The institution should ensure the proper arrangement of the academic activities, as well as the extra-curricular activities in such a manner that will bring out the best from the students. Also, institutional factors include the administration of the institution, whereby administrative functions are carried out with great attention to detail and high professionalism (Welsh *et al.,* 2012). In a well administered institution, administrators need to ensure that more qualified and competent educators are employed to cater for the academic needs of the students to boost their all-round performance. A good grading system in an institution helps the students to know their level of performance per time and work towards sustaining or improving on their performance. This can only be achieved when institutions employ qualified and competent educators, as well as adopt a good grading system (Agu, 2007). Qualified and competent teachers can be able to use different teaching methods in conducting more effective lessons.

2.2.5.3 Products of the Learning Process

Most of the products or outcomes of the learning process are measured according to grades or pass rates, not much emphasis is placed on the intellectual, personal and social development of the student (Agu, 2007). Studies have shown that grades and pass rates are not the main parameters in testing the level of comprehension and understanding of a topic or course by a student but rather just part of the holistic assessment of the success of a learning process (Khan

& Iqbal, 2012). Students' performance can be tested in many ways including grades, pass rates, level of intellectual growth, rate of personal development, as well as social development of the student, among others (Welsh *et al.,* 2012). Studies have shown that when institutions allow recognize other means of assessing students' performance other than grades and pass rates, the students are encouraged to develop more practical skills along the way and reduces the tension that arises as a result of fear of failure in examinations and tests (Gideon, 2016).

2.2.5.4 Demographic Attributes

The demographic attribute being referred to in this study is the age. The age of the student goes a long way in influencing the performance of such students. Studies undertaken have reported that students of more older or matured ages obtain higher grades in tertiary level of education (Agu, 2007). But few studies also discovered little or no significant difference in the performance of younger and older students (Nwosu, 2014). Studies have reported that the high performance of older students as compared to the younger ones in tertiary institutions can be attributed to better study habits, social experience and increase level of motivation exhibited by the more matured students (Illegbinosa, 2013). Welsh *et al.* (2012) reported that older students are more likely to adopt effective cognitive approaches to problem solving especially in analytic subjects such as Mathematics and these older students are more likely to structure, reorder or amalgamate information obtained in the course of learning (Agu, 2007).

2.2.5.5 Psychological Attributes

Psychological attributes being considered in this study is self-set goals. Studies have suggested that self-set goals invariably motivates a student to performance better especially when such a student possesses the required ability to act on the set goals (Harbaugh & Cavanagh, 2013). A student who has self-set goals is more likely to carefully select the tasks he or she undertakes and

the learning strategies to adopt to attain his or her set goals. Agu (2007) opines that self-set goals not only motivates the student to perform better but also influences the all-round behavior of the student. The attainment of a successful performance is a direct result of effective studying, as well as other motivation factors as a result of self-set goals (Dao, 2012). It is noteworthy that students who have self-set goals are mostly influenced to do so from self-motivating, self esteem, attitude of their parents and their perception of the importance of their course of study (Agu, 2007). Another factor that influences a student into setting personal goals is the academic orientation of such a student. Academic orientation includes how a student perceives the entire academic process, how a student prepares for lessons and the attendance rate of a student (Khan & Iqbal, 2012).

2.2.5.6 Prior Performance

According to Welsh *et al.* (2012), the prior performance of a student in any course or subject related to the present one he or she is studying will greatly impact his or her performance in the present course of study. Studies showed that when a student obtains good grades and all round performance in a particular subject or course, he or she develops a positive perception concerning such a subject or course and this makes him or her develop interest and keenness to study other related courses (Agu, 2007). As reported by Khan & Iqbal (2012), the previous performance of a student in a course can effectively motivate such a student either positively or negatively towards a similar course and such prior performance can be used to forecast the expectant performance of such a student. But worthy of note is the postulation of Harbaugh & Cavanagh (2013) who stated that a student with a poor secondary level grades and performance can still go on to perform much better in the tertiary institution but this can influenced by other

factors such as social and institutional factors, as well as psychological reorientation of the student.

2.3 Review of Related Theories

Three theories relating to the study were reviewed in the study and they include – Walberg's Theory of Educational Productivity, Maslow's Theory of Needs and the Theory of Cognitive Restructuring and Intrinsic Motivation.

2.3.1 Walberg's Theory of Educational Productivity

This is one of the few theories of education that have been test empirically and extensively via the analysis of about 180 handbook chapters and reviews, as well as about 100 researches (Wang, Haertel & Walberg, 1997). The theory identified certain factors that influence learning which include social-emotional factors, student-teacher communications, classroom organization, social-behavioral attributes, school environment, parental support, peer group, curriculum, teaching strategies, and school policies (Greenberg *et al.,* 2003). The theory opines that these factors hold sway in determining the level of performance of learners in an institution and greatly influences the cognitive, affective, social, meta-cognitive and behavioural competencies of the students (DiPerna, Volpe & Stephen, 2002). The theory also recognizes the importance of other factors such as motivational orientation, self-controlling approaches to learning, social attributes of the learners, as well as the interpersonal ability of the learners; the theory opines that these factors also influences the performance of learners (Greenberg *et al.,* 2003). Most of the studies reviewed agreed that certain variables are basic in attaining successful performance; these variables include ability, motivation, quality of teaching, and number of educators per student (Watson & Keith, 2002). Other factor considered influential but not basic

were age, school environment, home environment, peer group, social exposure, prior knowledge and performance (DiPerna *et al.*, 2002).

2.3.2 Maslow's Theory of Needs

The theory of needs as postulated by Abraham Maslow suggests that the behavior and actions of individuals are influenced by their needs per time. The theory follows a specific order – from the psychological needs to the safety needs, then the social needs, the self-esteem needs and finally, the self-actualization needs (Child, 2001). In explaining the relation of the theory to performance of students, the theory suggests that when the need for food, clothing, shelter and conducive learning environment of students are met, they tend to concentrate more on their academics. Also, if the students feel safe and protected from their fellow students, vindictive lecturers and external sources of concern, they are more likely to perform better. Likewise, the theory suggests that the students are of a greater degree to perform appropriately academically if they fulfill their social needs by being accepted into the school society and by their peers. Also, the students have a desired level of self-esteem, they are more likely to participate freely and effectively in the learning process of the institution and in turn perform better. Finally, the theory suggests that if the students are given enough avenues to pursue and actualize their set goals in the school environment, they are more likely to perform well academically (Agu, 2007).

2.3.3 Theory of Cognitive Restructuring and Intrinsic Motivation

The theory combines the theories of cognitive restructuring and the theory of intrinsic motivation. The cognitive restructuring opines that certain policies help facilitate better performance from students. Policies such as informal curriculum which encourages the utilization of previous knowledge in assisting students attain better understanding of certain courses; new knowledge are often discouraged and replaced by the development of students'

present knowledge (DeJong, 2010). The theory opines that by challenging the present knowledge of the students, the students are afforded opportunities to adjust their ideas to look like what they already know and this sustains the students' willingness to learn. The theory also opines that teaching should be broken down into steps and movement to the next step should be only when a student understands the previous step (Willingham, Hughes & Dobolyi, 2015). The intrinsic motivation suggests that the self-desire to find out new things and assess one's capacity to observe and gain knowledge influences the performance of such a person (Phillips & Soltis, 2009). The theory opines that a student that possesses intrinsic motivation has both self-determination and perceived competence (DeJong, 2010). The theory of cognitive restructuring and intrinsic motivation thus suggests that for a student to attained successful performance academically, such a student must possess self-determination and certain level of competence which will should be supported by certain school policies (Willingham *et al.*, 2015).

2.4 Theoretical Framework

From the related theories reviewed, the study was fully formed on the foundation of the Walberg's Theory of Educational Productivity. The theory is in line with what this study intends to achieve such that it identifies certain factors that influence learning such as social-emotional factors, student-teacher communications, classroom organization, social-behavioral attributes, school environment, parental support, peer group, curriculum, teaching strategies, school policies, motivational orientation, self-controlling approaches to learning, social attributes of the learners, as well as the interpersonal ability of the learners; all these utilized in determining the level of performance of learners in an institution and greatly influences the cognitive, affective, social, meta-cognitive and behavioural competencies of the students (DiPerna *et al.*, 2002). The

theory also recognizes the importance of certain variables such as ability, motivation, quality of teaching, number of educators per student, age, school environment, home environment, peer group, social exposure, as well as prior knowledge and performance, which are vital in attaining successful performance (Watson & Keith, 2002).

2.5 Empirical Review

Olatunde (2010) investigated the relationship between students' academic achievement and class size in some selected secondary schools in Southwestern Nigeria. The descriptive survey that was designated was adopted and data obtained from QMT and MAT tests administered to 123 Mathematics teachers and 1750 senior secondary students was analyzed using simple percentages. Findings showed that there was low academic performance from students in classes with large size as compared to that of students in classes with small size. Also, the academic performances of male and female students varied.

Adunola (2013) conducted an analysis of the relationship between class size and academic achievement of secondary school students in Agege Local Government Area of Lagos State. Data was obtained via a special achievement test administered to the students and the simple percentage was utilized to analyze the data obtained. Findings showed that large class size negatively affects the academic performance of the students.

Adeyemi (2008) examined the influence of class-size on the quality of output in secondary schools in Ekiti State, Nigeria. The descriptive survey method was adopted and data was obtained from a semi-structured interview. The data obtained was analysed using chi-squared test, correlation analysis and t-test. Findings showed that students in classes with average sizes of 35 performed better than students in classes having more 35 students.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter talks about the course of action and the methods that was used in carrying out this research work. Which include population of the study, sample size, research design and sampling technique, sources of data collection, method of data analysis and instrument for data collection.

3.2 Research Design

This is the detailed procedure of the researcher which the researcher will use to find answer to the research problem. The design that was used in the research work is a quasi-experiment design. The pretest-posttest quasi-experiment design was adopted by the researcher to obtain information from randomly selected groups of Mathematics students of College of Education, Minna, Niger State.

3.3 Population of the Study

The population of this study is the units or individuals size that this research finding adopted i.e. the entire research subjects number (Reitsma-Street, 2007).The population used for this study is the 300 level Mathematics students of the College of Education, Minna, Niger State. The total population is 906 Mathematics students cut across six (6) options which are: Mathematics / Economics, Mathematics/Geography, Mathematics/Physics, Mathematics/Computer Science, Mathematics/Special Education, and Mathematics Chemistry.

3.4 Sample Size and Sampling Technique

Sample size will be used to emit feasible mistake in handling the population. The population size will be restrictive to ascertain the sample size. This study made use of the Krejcie and Morgan method of obtaining sample size. And the sample size for the population was obtained from the Krejcie and Morgan Table as 269, thus, the study will undertake survey of 269 respondents from the actual population of the study.

Sampling technique is the process which helps to constitute the sample by using the method of choosing the components. The researcher administered the questionnaires after selecting the purposive sampling technique to the intended respondents.

3.5 Method of Data Collection

The instrument used for the collection of data for all kinds of research study is of high relevance and depends largely on the data type to be gathered. The data were acquired through a set of specific questions which were contained in a model named Mathematics Achievement Test (MAT) administered to the respondents. The Mathematics Achievement Test (MAT) was administered to two groups of students, the control and experimental groups. The control group contained 50 Mathematics students in a class while the experimental group contained 219 Mathematics students.

3.6 Method of Data Analysis

Data that were gathered from the respondents elaborated above was analyzed using t-test statistical tools which enabled the study to test for differences between the control and

experimental groups. In carrying out the t-test statistics of the two groups, and also two different age groups, that is, ages 20 to 25 and 26 and above, it enabled the study to discover how large class size affects the performance of Mathematics students of College of Education, Minna, Niger State.

3.7 Psychometric Properties of Research Instrument

3.7.1 Reliability of Research Instrument

The researcher designed the Mathematics Achievement Test (MAT) with help from the project Supervisor and other relevant Mathematics authorities in the Federal University of Technology, Minna and College of Education, Minna.

3.7.2 Validity of Research Instrument

The researcher organized the questions and with help from the project supervisor and other authorities executed a pre-test of the questions to guarantee its validity. Mathematics Educators from the College of Education, Minna, and Federal University of Technology Minna, Niger State decided the face validity of the MAT; a hasty review of the questions to find out definitely if the designed questions are important and well comprehended.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION OF RESULTS

4.1 Introduction

The data analyzed in this chapter was obtained from the Mathematics Achievement Test administered to groups of students, the control group (with small class size) and the experimental group with large class size.

4.2 Presentation of Results

4.2.1 Demographic Characteristics of the Respondents

The respondents were 300 Level Mathematics students of College of Education, Minna, Niger State from the six different Mathematics options available in the institution, that is, Mathematics/ Economics, Mathematics/Geography, Mathematics/Physics, Mathematics/Computer Science, Mathematics/Special Education, and Mathematics Chemistry. The respondents were all between the ages of 20years and above.

4.2.2 Research Questions

4.2.2.1 Research Question 1: Research question one was raised to find out if there exists any difference in the average achievement scores of Mathematics students who were taught in a class with small size (the control group) and those taught in a class with large size (experimental group).

Table 4.1: Mean(x) and Standard Deviation (SD) showing the difference in the average achievement scores of Mathematics students who were taught in a class with small size and those taught in a class with large size.

Group	N	Pre-test		Post-test	
		$\bar{x}$	S.D	$\bar{x}$	S.D
Control	50	10.32	4.098	11.12	5.05
Experimental	219	7.04	3.095	10.08	4.21

Table 4.1 shows that the mean achievement score and standard deviation for the experimental group were 10.08 and 4.21 while that of the control group were 11.12 and 5.05. Therefore, those that were taught in a small class (control) size performed better than those taught in a large class size (experimental).

4.2.2.2 Research Question 2: Research question three was raised to find out if there exists any difference in the average comprehension scores of Mathematics students who were taught in a class with small size (the control group) and those taught in a class with large size (experimental group).

Table 4.2: Mean(x) and Standard Deviation (SD) showing the difference in the average comprehension scores of Mathematics students who were taught in a class with small class size and those taught in a class with large class size.

Group	N	Pre-test		Post-test	
		$\bar{x}$	S.D	$\bar{x}$	S.D
Control	50	9.34	5.43	12.74	6.45
Experimental	219	8.45	4.50	11.09	5.39

Table 4.2 shows that the mean comprehension score and standard deviation for the experimental group were 11.09 and 5.39 while the control group were 12.74 and 6.45. Therefore, those taught in a small class size (control) have better comprehension than those taught in a large class size (experimental).

4.2.3 Post-test results for the experimental and control group

4.2.3.1 Hypothesis One

A hypothesis, in its null form, was assumed in to find answers to the research question. The hypothesis tested was:

$H0_1$: *There is no significant difference in the average achievement scores of Mathematics students who were taught in a class with small size and that with large size.*

To test this hypothesis, post test data of the experimental group, as well as that of the control group were tested using the T-Test Statistics tool and the results are given below:

Table 4.3 t-Test Statistics Result of the Post Test Scores of the Experimental and Control Groups

Group	N	Df	$\bar{x}$	S.D	t-value	p-value
Control	50		28.2	6.9		
		260			1.0	0.4
Experimental	219		21.5	5.7		

At $P \leq 0.05$ Significance

Source: *Field Survey (Microsoft Excel, 2018)*

From Table 4.3 above, the average achievement score of the experimental group who were taught in a class with large size is 21.5 which is significantly lower than the average score of the control group who were taught in a class with small size, which is 28.2. Thus, we can confidently answer the research question and assert that there is difference in the mean achievement scores of Mathematics students taught in a class with small class size and those taught in large class size. From Table 4.1 as well, the T-test probability of 0.00000000304769 falls within the set probability margin of $P \leq 0.05$ and thus is statistically significant. As a result, the null hypothesis is rejected and it can be asserted that there is significant difference in the mean achievement scores of Mathematics students who were taught in a class with small size and that with large size.

4.2.3.2 Hypothesis Two

A hypothesis, in its null form, was assumed in to find answers to the research question. The hypothesis tested was:

$H0_2$: *There is no significant difference in the average comprehension scores of Mathematics students who were taught in a class with small size and that with large size.*

To test this hypothesis, comprehension data of the experimental group, as well as the control group, were tested using the T-Test Statistics tool and the results are given below:

Table 4.4 t-Test Statistics Result of the Comprehension Scores of the Experimental and Control Groups

Group	N	Df	$\bar{x}$	S.D	t-value	p-value
Control	50	260	19.3	6.6	0.9	0.4

Experimental	219	15.3	6.3

At P $\leq$ 0.05 Significance

Source: *Field Survey (Microsoft Excel, 2018)*

From Table 4.4 above, the average comprehension score of the experimental group who were taught in a class with large size is 15.3 which is significantly lower than the average score of the control group who were taught in a class with small size, which is 19.3. Thus, we can confidently answer the research question and assert that there is difference in the average comprehension scores of Mathematics students taught in a class with small class size and those taught in large class size. From Table 4.3 as well, the T-test probability of 0.000170582 falls within the set probability margin of P $\leq$ 0.05 and thus is statistically significant. As a result of this, the null hypothesisthat was ascertained is rejected and it can be asserted that there is significant difference in the average comprehension scores of Mathematics students that were taught in a class with small size and that with large size.

4.3 Discussion of Results

4.3.1 Hypothesis One

The t-Test statistics of the post test scores of the control and experimental groups showed that the achievement scores of students in the experimental group (that is, those who were taught in a class with large size) is significantly lower than those who were taught in a class with small class size. Thus, large class size had a negative effect on the achievement scores of Mathematics students. This is in agreement with the findings of Olatunde (2010).

4.3.2 Hypothesis Two

The t-Test statistics of the comprehension scores of the experimental and control groups showed that the comprehension scores of students in the experimental group (that is, those who were taught in a class with large class size) is significantly lower than those who were taught in a class with small class size. Thus, it was revealed that large class size affected the ability of Mathematics students to comprehend what they were being taught. This is in agreement with the findings of Adunola (2013).

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

Contained in this chapter are the summary of the findings, conclusion drawn from the findings, as well as recommendations and suggestions for further studies.

5.2 Summary

The study examined the impact of large class size on students' performance in Mathematics in College of Education, Minna, Niger State. From the analysis of data gotten from specific groups of students involved in the experiment, findings revealed that the average achievement score of the experimental group who were taught in a class with large size was 21.5 which was significantly lower than the average score of the control group who were taught in a class with small size, which was 28.2. Thus, it was asserted that there is difference in the mean achievement scores of Mathematics students taught in a class with small class size and those taught in large class size. The T-test probability of 0.00000000304769 also fell within the set probability margin of $P \leq 0.05$ which showed its significance statistically. As a result, the null hypothesis was rejected and in the discovery large class size had a negative effect on the Mathematics students' achievement scores.

Also, the findings revealed that the average comprehension score of the experimental group who were taught in a class with large size was 15.3 which was significantly lower than the average score of the control group who were taught in a class with small size, which was 19.3. Thus, asserted that there is difference in the average comprehension scores of Mathematics students taught in a class with small class size and those taught in large class size. The T-test probability

of 0.000170582 fell within the set probability margin of $P \leq 0.05$ and thus the null hypothesis was rejected and this revealed that large class size affected the ability of Mathematics students to comprehend what they were being taught.

5.3 Conclusion of the Study

From the findings of the study, it is safe to conclude as thus:

1. Large class size has a negative effect on the achievement of Mathematics students.
2. Also, large class has a negative effect on the comprehension by Mathematics students.
3. The age of Mathematics students determines their ability to cope with the resultant negative effect of large class size on their performance especially when they are much older.
4. It was also discovered that the students could not perform better in a large class due to lack of facilities to aid hearing and comprehension.

5.4 Contribution to Knowledge

The study will be of immense benefit to researchers who will carry out further researches into large class size and performance of students of tertiary institutions in Nigeria who shall benefit from the wealth of knowledge and information which the study will possess. Also, lecturers will gain vital knowledge on how to handle cases of large class size. Government and its relevant educational supervisory ministries, departments and agencies would also gain valuable information on the effect of large class size and how to tackle the menace.

5.5 Recommendations

Based on the conclusions drawn from the study, the following were recommended:

1. The senate and other statutory boards of tertiary institutions should ensure that they provide adequate facilities to eradicate or mitigate the effect of large class size such as public address systems and electronic boards.
2. The federal ministry of education and other agencies involved in policy formulation in tertiary institutions should ensure that schools give admission to particular number of students commensurate with the facilities on ground in such schools so as to avoid the resultant effects of overpopulated classes.
3. The various options in the department of Mathematics can be taught by different lecturers concurrently so as to reduce the number of students in each class.

5.6 Areas for Further Research

It is very vital to conduct further studies into the following:

1. The impact of large class size on the performance of lecturers in tertiary institutions.
2. Large class size and its effect on the performance of practical-based courses.

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APPENDIX

APPENDIX I: MATHEMATICS ACHIEVEMENT TEST (MAT)

INSTRUCTION: Please, tick [√] beside the option you choose

SECTION I: Personal Data

1. Sex: A. Male [ ] B. Female[ ]
2. Which age bracket do I belong to?
   A. Below 20 years [ ] B. 20 – 25 [ ]
   C. 26 – 30 [ ] D. 31 and Above [ ]
3. Marital Status: A. Single [ ] B. Married [ ]

SECTION II: Answer all questions in this section and write your answer on the answer booklet.

History of Mathematics Questions:

1. (a) Discuss prehistoric Mathematics. (2marks)

(b) Why do we study the history of Mathematics? (8marks)

2. (a) What is Egyptian Mathematics? (4marks)

(b) Mention and write comprehensive notes on Egyptian Mathematical text. (6marks)

3. (a) Write short notes on Greek Mathematics. (3marks)

(b) Mention one of the Greek Mathematicians, stating his contribution to Mathematics. (7marks)