RELATIONSHIP BETWEEN CLASS SIZE AND STUDENTS PERFORMANCE IN BIOLOGY IN SENIOR SECONDARY SCHOOL IN GUSAU LOCAL GOVERNMENT AREA ZAMFARA STATE NIGERIA

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APPROVAL PAGE

This research project has be tactically supervised, critically read and duly approved by undersigned as meeting the rules and regulation governing the award of Bachelor of Science Education degree of the Department of Science Education, faculty of Humanities and Education, Federal University Gusau, Zamfara State, Nigeria.

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DEDICATION

This research is dedicated to Almighty God that provides us with strength, knowledge, wisdom and understanding since from the beginning to the end of this project.

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ABSTRACT

The study investigated the relationship between class-size and student academic performance in biology in senior secondary school in Gusau Local Government Area, Zamfara State, Nigeria. The study has Seven (7) secondary schools in gusau as it target population. Out of the Seven (7), five (5) schools were selected as the sample for the study. One hundred (100) students were selected using random sampling technique. The research instruments were Biology Achievement Test (BAT). Descriptive survey design was used. Three null hypotheses were tested. Spearman's Rank order and t-test statistics were used to determine relationship and differences at $p \leq 0.05$. The objectives are to: (i) Examine the relationship between class size and academic performance of student in biology. (ii) Discuss the effects of overpopulation on classroom management (iii) Analyse the impact of overpopulation on school resources and facilities.

TABLE OF CONTENT

CHAPTER FIVE: Summary, Conclusion and Recommendation

CHAPTER ONE

1.0 Introduction

The competence that students demonstrate during or by the end of a teaching/learning experience in science is of major concern to scholars and science educators Alike. In this regard, the level of performance of students in specified areas of learning is general used as the barometer to measure such competence.

Literature in science education is replete with report of studies which showed that students generally perform poorly in the sciences in school system, especially at the secondary school level (Akpam, 1986, Adeyegbe, 1988, Olorundare, 1993, Usman 2001). Lamenting the ugly situation of poor performances in school biology. Akpan, for example, observed as follows:

- Almost every students with or without ability is enrolled for the subject.
- Poor quality of Science teachers.
- Overcrowded classroom.
- Lack of suitable and adequate Science equipments.
- Over-loaded syllabus.
- Poor and careless diagrams.
- Poor labeling and poor use of biological terminology.

The problem of poor achievement in science, technology and mathematics (STM) has been too obvious, and has been the concern of many conferences, policies and strategies at correcting the situation. Continued underachievement

of students at the secondary school level of education poses an enormous problem and constraints for getting qualified candidates to read science and science-based programmed in the university. According to PWOL (1993), this state of affairs does not augur well for the desired scientific and technological development of the nation.

A number of scholars from the reports of their studies have pointed to number of factors as being responsible or at least contribute significantly to the incident of poor performance in the schools. Such factors, which were considered as widely prevalent include the following:

(a) Non-availability of resources materials (Tambawal, 1991)

(b) Parents' apathy towards the education their children or wards (Madugu, 1977)

(c) Overloaded curriculum (Adeyegbe,1993).

(d) Lack of clearly philosophical framework for instructional strategies (Shaibu, 1993).

(e) Constant use of traditional lecture method of teaching.

(f) Poor classroom management (PWOL, 1993).

In this study the phenomenon of class size, with respect to whether or not it also constitute factors that plays a role in the performances of students in science is considered. It is the report of a study that focused on the effect, if any of class size on the achievement or performance of science student at the Senior Secondary School Level. The Encyclopedia of Education (1971) defined class

size as the number of students assigned to and enrolled in a specific class under the direction of a specific teacher.

Class size for the purpose of this research can be defined as the number of students enrolled in a school and put together as a group to study in a particular class under the same roof of a building. Generally, such classes of students are assigned to a teacher who has charge over them. Class size gives an indication of the work load that the teacher(s) of that class has to contend with. The larger the class, the more the workload that the teacher has to carry and the less the chances of personal attention by the teacher to the individual student. In this study (research) a large class is conceived and defined as one having a student's population of 50 – 70 students to one teacher. A medium sized class i.e. a normal class size is considered as one with student population of 30 – 50 students, while a small class size is considered as one with 20 – 29 students assigned to one teacher (Glass and Smith 1982, Molnar, 1998 Booze, and Maloney 2001 Shaibu 2003).

It is based on this background that the researchers carried out the study to investigate the relationship between class size and students performance in biology in senior secondary schools in Gusau Local Government Area, Zamfara State, Nigeria.

1.1 Background of the Study

For the past decades some considerable researches have focused on the relationship between class-size and student performance. In most third world countries enrolment exceed provision for secondary education, most of the secondary schools in the state experience class rooms congestion. This situation may likely affect secondary school academic performance generally or in specific subject. This research sought to establish the relationship between class-size and student performance in biology of some selected secondary school in Gusau Local Government Area.

The number of students passing through secondary schools system in Gusau Local Government Area is a serious problem to the school administrations and the teachers at large. The national policy on education prescribed a maximum of 30 students in a class. Moreover, the all Nigeria conference of principals of secondary school (ANCOPSS) recommends a maximum of 40 students per class for effective management and better controls.

The relationship between class size and academic performance has been a perplexing one for educators. Studies have found that the physical environment, ethnicity, socioeconomics, overcrowding and teaching methods are all variables that affect student achievement (Molnar, 2000). Other factors that affect student achievement are school population and class size (Gentry, 2000; Swift, 2000; Krueger and White Moore, 2007). The issue of poor academic performance of students in Nigeria has been of much concern to all and sundry. The problem is

so much that it adds to the widely acclaimed fallen standard of education in Lagos state and Nigeria at large. In order to better understand the skill levels of students, it might be necessary to evaluate factors affecting their performance. These include: school structure and organization, teachers' quality, curriculum and teaching philosophy (Driscoll, Halcoussis and Svomy, 2008). Overtime, students' academic performance in both internal and external examinations had been used to determine excellence in teachers and teaching (Ajao, 2001). As school grows, they typically become more bureaucratic, resulting in more formalized human relations and increased curricular specialization. Another stand, typically conducted by economist directs attention to the potential for increased efficiency and cost reductions as schools get bigger. Conclusions from these two streams are not consistent. Although, the studies with an organizational focus generally favour smaller schools, research with an economic focus tends to suggest benefits from increased size. Overpopulation classrooms have increased the possibilities for at risk students, as well as others, to lose interest in school and do poorly on test. There identifies for specific problems regarding overcrowding, students not getting individual attention, low reading scores, frustration and stress felt by the teachers and the inability of students to concentrate or stay on task while in class. The problem identified can be that teachers are unable to give individual attention to students. Teachers' aides are not always available and sometimes students have to share textbooks. It can take the entire class time for students to find seats, make sure everyone has a textbook to look at and then explain the next

assignment. This leaves no time for individual attention to explain assignment and answer questions. Thus, with teacher unable to help individual students, those who need extra help in gaining or maintaining their reading skills get left behind. They are unable to keep up the reading or in class discussions because of many students in one class.

Overpopulation in schools and classes is a serious problem in many schools systems, particularly in the inner cities where space for new construction is limited. As a result, students find themselves trying to learn while jammed into spaces never intended as classrooms, such as libraries, gymnasiums, laboratories, lunch rooms and even closets. Although, research on the relationship between overcrowding and student leaving had been limited, there are some evidence particularly in high poverty schools, that overcrowding can have adverse impact on learning. A study of overpopulation in schools found that students in such schools score significantly lower on both mathematics and reading exams then did similar students in underutilized schools. In addition, when asked, students and teachers in overpopulation schools agreed that overcrowding negatively affects both classroom activities and instructional technologies (Krueger and Whiteman, 2001).

Crowded classroom conditions not only make it difficult for students to concentrate on their lessons, but inevitably limit the amount of times teachers can spend on innovative teaching methods such as cooperative learning and group work or on teaching anything beyond the barest minimum of required

materials. In addition, because teachers must constantly struggle simply to maintain order in an overpopulated classroom, the likelihood increase that they will suffer from burn out earlier than might otherwise be the case.

The objectives of mathematics education programme explicitly include an affective component addressing the desirability for students to emerge within positive attitude toward the scientific enterprise and its practitioners (Bolaji, 1997). This many well be appropriate, for a study concluded just prior to the appearance of one of the earliest Mathematics project curriculum in 1977, reported that secondary school students at that time generally held negative attitudes toward mathematics and other related science subjects (Bolaji, 2002).

Bojuwoye (1996) in his research outlined factors affecting secondary student academics performance as follows: Large class-size (too many student or over population), In adequate resource material for teaching, Physical appearance and facilities small room space, poor lighting ventilation, School location (class or noisy environment), Co-curricular activities (spurting/social), Teacher – shortage (not enough to go round all subject), Frequent changes of teacher (yearly or biannually), Poor teacher's attitude to work including non commitment, Poor trained / sub-standard teachers, and Poor instructional strategies / poor teaching methods.

The idea that school population and class size might affect students' performance is consistence with the growing literature on the relationship between public sector institutional arrangements and outcome. The purpose of

this study is to further examine the relationship of class size, school population and student academic achievement.

1.2 Statement of the Problem

The performance of secondary school students in NECO, WAEC, several scholars have proposed various factors responsible for the poor performance of students, few research have been dedicated to the correlation between class size, school population and academic achievement. This study therefore looks at how class size, school population and over population affect students' academic performance in biology of some selected secondary school in Gusau Local Government Area between 2014 and 2018 school years.

1.3 Objectives of the Study

The general purpose of this study is to find out the relationship between class-size and student performance in biology using some selected secondary school in Gusau Local Government Area of Zamfara State, Nigeria as a case study. The objectives are to:

- Examine the relationship between class size and academic performance of student in biology.
- Discuss the effects of overpopulation on classroom management
- Analyse the impact of overpopulation on school resources and facilities.

1.4 Research Questions

The following research questions are formulated to guide the study

1. Is there any relationship between class-size and academic performance of students?
2. To what extent does the class size relate to students performance in biology?
3. To what extent does over population in the class room relate to student performance in biology?
4. Is there any relationship in the performance of student who are taught biology in the class that overcrowded and those taught in normal class-size?

1.5 Significant of the Study

This study is important for several reasons. First, the findings will help teachers to identify the reason for the academic performance of students in large classes with high population and how they can address the problems.

Secondly, is to provide information as to whether relationship between class-size and student performance in biology have any influence on the overall performance of student in biology.

Thirdly, it will provide comprehensive information for educational planners, educators and parents on how they can assist students to cope in large classes.

Lastly, it will serve as a contribution to knowledge in the subject area. In the regard, it will be useful for other researchers who might want to carry out research in related areas.

1.6 Delimitation of the Study

Considering the important of the topic to educational advancement in the country generally and Gusau Local Government Area in particular the researcher will have love to cover the entire state, but due to time factor, financial constrains, and many more unforeseen situation, the researcher will limit the study of the following schools in the stable:-

1. Government Day Secondary School Sambo (GDSSS)
2. Government Girls Day Secondary School Samaru (GGDSSS)
3. Government Day Secondary School Millennium Quarters (GDSSMQ)
4. Government Girl Day Secondary School FOCAL (GGDSCF)
5. Government Girl Arabic Secondary School (GGASS)

1.7 Definition of Terms

Academic Achievement: knowledge attained or skills developed in school subject by test scores.

Secondary School/High School: is a term used to describe an educational institution where the final stage of schooling known as secondary education and usually compulsory up to a specified age taken place. It follows elementary or primary education, and may be followed by university (tertiary) education.

Overpopulation: This is when the numbers of students in a particular class exceed the standard of student-teacher ratio of 1:40

Research Work: Investigation or experimentation aimed at the discovery and interpretation of facts or practical application of such new or revised therein or laws.

Classroom: A room where classes are taught in a school, college or university.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The findings of the general ineffectiveness of reducing class size tend to be controversial if for no other reason than that it tends to defy common sense, conventional wisdom and highly publicized accounts of the scientific evidence. Unfortunately, in-order to support calls for class size reduction, there has been a tendency to pick and choose from the available studies and evidence. It is therefore useful to review the existing evidence and to reconcile the varying conceptions of what might be expected, gained or lost from class size reduction or increase.

This chapter presents definition of Biology, purpose of studying biology, factors affecting studying biology, concept of class size and conclusion.

2.1 Definition of Biology

Biology is the natural science that studies life and living organisms, including their physical structure, chemical processes, molecular interactions, physiological mechanisms, development and evolution. Various authors defined biology according to their understanding, for instance:

Ramalingam (2000) defined biology as the branch of science that involves the study of living things. It is a fascinating study that ranges from microscopes

cellular molecules to the biosphere encompassing the earth is surface and its living organism.

Bemu (1999) defined biology as study of life. Itself a human activity, involving observation, insight analysis, discovering and communication concerning living organism of all kinds from microbes to man. It is also an activity, of individual human nature of biological investigation many of the more notable discoveries are presented in the words of the discover.

Similarly, Fadden and Goodlier (1995) defines biology as the science of living things, so all living organism are chemically complex, are highly organized, utilized energy, undergoes development and reproduce. In addition, every living organism has a set of instruction resident in it genes that direct its metabolism, organization and reproduction is the new material on which natural selection acts.

Ogbonna (1988) in his own view defined biology as the science of life. The earth is in habited by two categories of living things namely – plant and animals.

2.2 Purpose of Studying Biology

The purpose of studying biology has been given different in different forms. Amalingam (2000) says, the purpose of studying biology is to enable student to acquire:-

i. Meaningful and relevant knowledge in biology

ii. The ability to apply biological knowledge to everyday life.

iii. Laboratory and field skills in biology.

iv. Scientific attitude that is pragmatic and environmentally conscious.

Finally, students of biology are made aware of the possible carrier opportunities that are open to them. Those interested in pursuing a biology related carries will find that, it is not only of great benefit and use to the country but also highly satisfying and beneficially.

Obgonnas (1998) says the purpose of studying biology courses equip us with diverse information about ourselves, our environment and varieties of every day natural happenings around us. Information of twins, why people behave the way they do, how the body functions, evolution of life etc.

1. We acquire scientific attitudes and techniques through the study of biology and these help us to solve numerous problems of daily life.
2. Knowledge of the principles of life and natural laws, influencing living things is acquired through the study of biology.
3. Our understanding of the science of agriculture, medicine, sanitation, textile and food technology, animal husbandry, conservation of resources for social and economic interests all depends on the knowledge of biology.
4. Biology has provided us with the knowledge of famous Scientifics

In view of different purpose above we can say, biology purpose is for the student to have the knowledge of the basic principles of life, understanding of science and knowledge of biology.

During the study of biology, students faces some problems which some time lead to poor performance in biology result, for the purpose of this research we look at the factors affecting students performance in biology as shown below.

2.3 Factors Affecting the Teaching of Biology

The factors affecting students studying biology refer to the weaknesses student encounter during the process of study.

1. **Poor Knowledge:** This is where the student is inadequately informed of the course by the lecturer due to lack of concentration.

2. **Lack of Qualified Teacher:** It is a situation where by the school does not have qualified teachers that are specialized in biology courses.

3. **Inadequate Instructional Materials:** This is where the school are lacking the appropriate instructional materials need for proper delivery and teaching of biology course e.g. for practical in biology or instructional materials for presentation; without that it will not give meaningful information to the student.

4. **Lack of Reading:** Some student finds it difficult to read and without reading biology the purpose will not be achieved.

5. **Finance:** Due to the poor financial background some students complain that they cannot afford to buy biology textbooks for their studies and this affects their performance in biology.

2.4 Concept of Class Size

Class size is an important factor in relation to academic performance of students. It is generally agreed upon by various researcher and educationalist that the lower the class size or teacher student ratio the higher or better academic performance. Oyedokun (2002) opined that poor result in Biology might be due to the fact that almost every students with or without ability is enrolled for the subject. It has been observed that poor performance in sciences is caused by poor quality of Science teachers, overcrowded classrooms and lack of suitable and adequate science equipment (Yusuf and Afolabi, 2010). According to them, students perform poorly in Biology because Biology classes are usually too large and heterogeneous in terms of ability level. In addition to that, the laboratories are ill equipped and the syllabus is overloaded. Class size is an educational tool that can be used to described the average number of student per-class in a school range between 35 or 40 student per class are uneconomical, as they do not make full use of space, teacher and teaching materials.

Adeyemi (2008) is of the view that average class size influence the costs of education while capital cost could be reduce by increasing the average class size in schools. Nwadiani (2000) argued that the higher the class-size the lower the post of education. However acknowledge that most class rooms are overcrowded spreading resources inadequately and there by affecting the quality of education. Ugbaja (2008) observed that over the years the performance of the students has not been impressive as evidenced from the School Certificate Examination results of the West African Examination Council (WAEC) and National Examination Council (NECO).

Oyebola (2008) observed that certain factors that influence academic performances are poor physical environment, shortage of personnel, learning facilities and poor quality of teaching. She identified other factors that influenced poor academic performance of students as overcrowded classrooms, lack of laboratories, inadequate instructional materials and poor library facilities. Ihejirika (2010) opined that some studies have demonstrated that students' academic performance in Senior Secondary School Certificate Biology and other Science subject examination since eighties have remained poor. She quoted Ukaegbu (2006) who reported that only 34%, 32%, and 35% of the entire candidates who participated in the West African School Certificate Examination (WASCE) in 2001,2002 and 2003 respectively obtained five credits and above. Among the reasons she listed for the poor performance are poor use of Biology terminology, poor diagrams, careless drawing and labeling,

incompetence and laziness on the part of the teachers. Ihejirika (2010) reported that candidates' performance was worst in Biology with 49.1% passes, compared with 55.4% passes in Chemistry and 62.5% passes in Physics. While Hills (2009) in Ihejirika (2010) attributed poor academic performance of students in Biology to poor state in which science is being taught in schools. "Chalk and talk" method has been the most widely used science teaching due to poor quality laboratory, large class size and much work load on the teachers.

Some researchers Ajayi, (1998); Oyedukun, (2002); Ahmed, (2008); Ihejirika, (2010); and Yusuf and Afolabi,(2010) identified the following factors for the poor performance of students in Biology as-

- Almost every students with or without ability is enrolled for the subject.
- Poor quality of Science teachers.
- Overcrowded classroom.
- Lack of suitable and adequate Science equipments.
- Over-loaded syllabus.
- Poor and careless diagrams.
- Poor labeling and poor use of biological terminology.

Colement (1997) opined that, for enthusiastic teachers, is classes are very possible, the teachers should be constantly busy and the tasks should function can tenuously without repealed intervention from the teachers.

2.5 Conclusion

The word biology is derived from the great word, bios means life and logy mean study, and is defined as the science of life and living organism. An organism is a living entity consisting of one cell e.g. bacterial or several cells e.g. animals, plant and fungi. Studying biology is the foundation of all characteristics of life on earth. Apart from creating organism face, it pares the way for invention and discoveries that improves the quality of life. Without studying biology, humans word probably never realize how important maintaining a healthy ecology is for themselves, animals and plant life.

Natriello (1987), Black and William(1998), Klecker (2002), Mcdonald and Boud (2003) suggest that larger groups can enhance students' learning if it is used appropriately, there are other analysts such as McMillan (2003) who believe that learning is more meaningful and effective if carried out in smaller groups. This has created a great challenge for educators to develop an optimum class size that yields positive results in order to enhance students' learning. Fabunmi and Okore (2000) also investigated their relationship between average class size and secondary school academic performance in Epe local government area of Lagos state. The researchers used both spearman rank correlation and Pearson product moment correlation to test the hypothesis, which was formulated. The analysis, which was done with Pearson product moment correlation, revealed negative and low relationship but that of Spearman ran correlation revealed significant and positive relationship between average class

size and student academic performance. Several scholar viewed class size and the overall performance of student differently, some are of the view that the lower the class size the better the performance of the student while as the other halved, other believed that blogging the number of students to 35 or 40 per class is not economical according to them. The numbers of student stipulated per class do not occupy the available spaces in the class. And other areas some statistical tools to find out the relationship, the result revealed that large class size posed some problem to the academic development of the students.

The preceding review has shown that class size as controversial educational tools that varied from one country to another, due to the way that particular country is system of education and curriculum were set. Therefore most of the African country school curriculum are combined or mixed up with various subject were attached to a particular course of study at every level of education starting from primary, secondary and tertiary institution respectively. Likewise student found it very difficult to learn especially the slow learner during teaching and learning situation, therefore it is the responsibility of the teacher to used different methodology during teaching and learning classes so as to make sure that their entire student are not left behind.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This study investigated the relationship between class size and student performance in biology in senior secondary school in Gusau Local Government Area, Zamfara State. In this chapter the research methodology employed for this study is described under the following sub- headings: Research Method, Population of the Study, Instrumentation, Data Analysis and Interpretation of Correlation Coefficient.

3.1 Research Design

Bbier and Mouton (2007) describe methodology as the methods, techniques and procedures that one uses in the process of implementing the research design. The design for this study is descriptive survey recommended by Sambo (2008), aimed at investigating the relationship between class size and students performance in biology Senior Secondary School in Gusau Local Government Area of Zamfara State, Nigeria. Essentially, a systematic sample survey was employed in selecting the five secondary schools with the area as sample for data collection. Sambo (2008) opined that the numbers of problems that can be studied through descriptive method are many and varied. They deal with many aspects of the educational endeavour ranging from simple record keeping to the collection of data from a sample in order to make inferences on the conditions

obtaining in a population. The majority of the problem types have similar method of data collection and analysis and this is in line with this study.

3.2 Population of the Study

The population of interest for this study comprised of seven (7) government owned secondary school (public school) in Gusau metropolis whose age is between 15 to 20 years in Zamfara State. out of which five (5) schools where selected base on the number of student enrolled for senior school certificate examination 2012 to 2016 conducted by WAEC

3.3 Sample and Sampling Techniques

There are many sampling strategies used in qualitative research. Qualitative samples tend to be purposely selected rather than randomly selected. According to Denzin and Lincoln (2000), "purposeful sampling is used as a strategy when one wants to understand something about certain select cases without needing to generalize to all such cases". As stated earlier, the sample to be sued in this research work consist of (5) five out of the total number of the seven (7) secondary school that was selected within Gusau Local Government Area of Zamfara State. Due to a number of limitations such as shortage of time and financial problems;

a. Government Day Secondary School Sambo (GDSSS)
b. Government Girls Day Secondary School Smaru (GGDSS)
c. Government Day Secondary School Danturai (GDSSD)

d. Government Day Secondary School Millennium Quarters (GDSSMQ)

e. Government Girls Day Secondary School Focal (GGDSSF)

Random sampling techniques was applied in selecting the respondents (the students) to the questionnaires. According to Simpson (1978) random sampling is the process whereby every member of the population has an equal and independent probability of either being or not being included in the sample at any point in time and in a sequence. In this respect, a total number of One hundred (100) student were selected randomly as the respondents.

Random sampling technique was employed in this study due to the fact that it ensures fair representation of the entire student's population in the area. Hence, it is assumed that no section of the entire students population is left unrepresented in the area.

In the selection, students who were been relatively the same were included in the sample. Also, the sample i.e. one hundred (100) students earlier selected were divided by simple randomization process into three classes which were designated as large (LG). Normal (NM) and small (SM). The large class has 50 students, Normal class 30 and small class has 20 students, totaling 100.

3.4 Instrumentation

Myriad numbers of research instrument are recognized for research purpose. These include: Verbal Interviews, Tests, Field Surveys, Questionnaires and Observation among others. The instrument used for collection of data for the study was the Biology Achievement Test (BAT) which comprised 20 items. The instrument consists of 20 test items in form of multiple choice type.

3.5 Validity of the Instrument

Kalgo (2008) aptly pit it that "Validity of a test (a research instrument) is a character or quality of the test which refers to the degree to which the test measures what it is supposed to measure at a particular period of time" in other words, it's the accuracy with which an instrument measures what is intend to measure in a giving time frame. The questionnaire to be used in this research work faces a series of refinements, editing and necessary corrections by the researchers, experts and resource persons on how it should be designed, how the questions should be asked and the way and manner it should be administered. This is done to ensure that the questionnaire possesses the necessary characteristics and becomes valid for measuring what it's meant for and providing the much needed data for the study.

3.6 Reliability of the Instrument

Reliability of an instrument is that attribute possessed by the instrument which qualifies it to continuously weigh what it is meant for and provide dependable information. As explained by Kalfo (2008) "reliability of a test (a research

instrument) designates a quality or character of the test which refers to the consistency in which the test measures what it is supposed to measure". A reliable instrument for data collection has to be spontaneously measuring same subject matter at almost all the times. In the same vein, for any instrument to be reliable, it has to be valid in the first place. This organization makes the questionnaire reliable in providing the data to be used in investigating the relationship between class size and students performance in biology by secondary school student in Zamfara State.

However, Split-half approach was employed in finding out how reliable the instrument. The items contained in the questionnaire were separated in to two equal halves on the basis of being even or odd numbered. These separate sets of items were then correlated using the Pearson's Moment Coefficient and the final reliability index or coefficient obtained happened to be 0.6

3.7 Method of Data Collection And Analysis

Dankani (2007) outlined three major methods of collecting data for research purposes. According to him, "these methods include: Census, Vital Registrations and sample survey". Of these three main methods, Sample Survey method is going to be applied.

The students in each of the three classes were pre-tested using the instrument described in section 3.4 above. Their script were marked, the scores collected

and computed, using relevant statistics i.e ANOVA. It was found that there was no significant difference between the mean scores of the 3 classes. After the pre-test the 3 classes were taught by the same teacher (the researcher) for six weeks. The topics taught them were Living Thing and Organization of Life from Essential Biology Text Book.

At the end of six weeks, a post-test was administered. The scripts of the students were collected and marked using a previously prepared marking scheme. The marks were collated for each class and the relevant statistical tools was applied to analyzed them. The statistical tools used were mean scores, standard deviation, ANOVA, and t-test.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION

4.1 Introduction

As its title depicts, this chapter seeks to analyze in details, the raw data obtained from the questionnaire administered for the research project. The main focus of this study is to investigate relationship between class size and students performance in biology in senior secondary school in Gusau Local Government Area, Zamfara State Nigeria. This provides for further presentation to portray the information obtained from the students' responses to the questionnaire. It concludes with general discussions on the research findings. The data collected were analyzed using Statistical Package for Social Sciences (SPSS) computer software package and the level of significance adopted for rejecting or retaining the stated hypotheses was $p \leq 0.05$.

4.2 Analysis of Data

Ballard and Bates (2008), state that the most important difference between the most and the least effective classroom is the educator. However, they stress that the most important variable is not what they know but rather, what they do. With this in mind, observation was conducted in the two groups taught by one lecturer, namely the large group and the small group classes where focus was placed on the role played by class size in the mediation of learning. The purpose of this chapter is to establish whether the mixed method survey data

collected answered the research questions that were paused at the beginning of the research.

The data gathered in this study will technically be analysed using the statistical tool of simple frequency table. The instruments used for the data collection were Biology Questions (BQ) containing twenty items (20) that investigated the level of relationship between class size and students performance in biology in senior secondary school in Gusau Local Government Area, Zamfara State. The data collected were analyzed and used to draw Tables 4.1, 4.2, 4.3, 4.4 and 4.5.

Table 4.1 Pretest Mean Scores and Standard Deviation of the subject according to the classes

Class	N	X	SD
Small	20	9.62	5.42
Normal	30	9.04	2.93
Large	50	7.92	3.64

Table 4.1 showed the pre-test mean scores and standard deviations of the subjects. It showed that the mean scores decreased as the size of the classes increase.

Table 4.2 Post test Mean Scores and Standard Deviation of the subject according to the classes respectively.

Class	N	X	SD
Small	20	66.80	14.00
Normal	30	61.70	8.04
Large	50	45.70	12.72

Table 4.2 showed that the mean score of the small size class is highest followed by the normal size class and the large class, the least. The mean difference among the three groups was 5.10 achieved in favour of students in small classroom size.

Testing the Hypotheses

HO_1 There is no significant difference in the achievement of the students in the small, normal and large classes.

Table 4.3 ANOVA of Pre-test Mean Scores of the Subject by Class before Instruction.

Source of variance	df	Sum of Square	Mean Square	F Value	P
Between groups	2	64.62			
Within groups	109	1915.34	32.31	1.83	0.16
Total	111	1979.96	17.57		

Not significant at P≤0.05

Table 4.3 showed an F-value of 1.83 and P-value of 0.16. This shows that there is no significant difference in the academic competences or abilities of the subjects in the small, normal and large classes.

Table 4.4 ANOVA of Post-test Mean Scores of the Subject by Class after Instruction.

Source of Variance	Df	Sum of Square	Mean Squares	F Value	P	Remarks
Between groups	2	9413.45				
Within groups	109	16543.23	4706.72			
Total	111	2596.68	151.77	31.01	0.00	Significant

Not significant at P≤0.05

Table 4.4 Showed an F-value of 31.01 and P-value of 0.00. This shows that the differences in the performance of the subjects according to their respective classes are highly significant statistically.

$H0_2$ There is no significant difference in the achievement of subjects in the small and large classes.

Table 4.5 Comparison of the Mean Score of the Small and Large Classes.

Class	N	X	SD	T	P	Remarks
Small	2	76.60	8.04			
Large	50	55.70	32.31	1.83	0.00	Significant

Not significant at P≤0.05

Table 4.5 showed there is no significant different in the academic achievement of small and large class when exposed to discussion method.

$H0_2$ There is no significant difference in the achievement of subjects in the small and large classes.

4.3 Discussion of Results

Foremost, the analysis and presentation of the data obtained for the study pervades the total of twenty (20) questions, upon which the students answered via ticking the right answered. The relevant results that pertain to this study are shown in Table 1- 5. Table 4.3 shows that there was no significant difference among the subject in the three classes at the commencement of the treatment i.e. instruction on living things and organization of life. That means that the groups in each class were equivalent with respect to their average academic abilities before the investigation started. The post-test mean scores, Table 4.4 were however different for each class. Analysis of Variance was used to test if the differences were statistically significant, and it was found that they were highly significant with F-value of 31.01 and P-value of zero. Hypothesis HO_1

was thus rejected. The most plausible interpretation we can offer here is that the only visible variable that had made the difference was the differences in the class size, since all other visible e.g. the teacher, the topic, mode of teaching etc. were kept constant. We find from that Table i.e. Table 4 that the quality of the performances of the subjects decrease with increase in the class size.

Also Table 4.5 showed the result of a t-test used to compare the mean scores of the small and the large classes. The results show that there is a statistically high difference between the performance of the subjects in the small and large classes. Those in the small class performed significantly better than those in the large class. This is demonstrated by the t-value of 8 at $P \leq 0.00$. In view of this result, the second hypothesis HO_2 was also rejected, and the alternative to the observed difference in performance between the two groups is their class sizes.

4.4 Summary of Findings

The instruments used in this research were a questionnaire in three distinct groups, one large, one normal and one small and semi-structured interviews with three teachers. Observations were also conducted in three target student groups, large, normal and one small. Data from the questionnaires, interview themes and interpretations of what was observed were analysed for overall emerging trends. The findings of this study as a result of data analysis were reflected upon. The final conclusions and proposed recommendations will be presented in the next chapter.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter presents summary, conclusion and recommendation of the findings of the study. In this final chapter, an attempt is made to summarize the totality of the research work and findings and to put thing in a nutshell for a better understanding.

The aim of this chapter is to demonstrate whether the investigation has provided answers to the problems that were initially stated at the beginning. A summary of the most significant results and findings of the research are discussed. The chapter also proposes recommendations on what needs to be done as a result of the findings. The conclusions and recommendations for enhancing academic achievement are discussed in detail in the paragraphs that follow and are listed in order of priority.

5.2 Summary

This research report presents the outcome of the researchers investigation on Relationship Between Class Size And Students Performance In Biology In Senior Secondary School In Gusau Local Government Area, Zamfara State. The work was presented in five chapters. The first chapter introduced the research work while the second chapter displayed the literature review. The third chapter explained the research methodology whereas the fourth one dealt with the presentation and analysis of data. The final chapter summarized and

concluded the entire work. It also provided recommendations and suggestions on how to minimize the effect of class size on student academic performance.

5.3 Conclusion

Base on the findings, it is concluded that class size is one of the critical factors that determine the performance of students in biology of researched schools conducted by the researchers.

Based on the information from the empirical study, it can be concluded that most students and Teachers alike, rather prefer smaller classes to larger ones. Consistent with existing research (Glass & Smith, 1979), a positive link between student achievement and class size was found to exist. Most teachers believed that student achievement and improved student behaviour was linked to decreased class size. The STAR project defined a small class size as 13-17 students and a regular class as 22 -25 students. While the majority of classes under investigation in this study constitute more than 100 students, the majority of students felt that a class size of 50 students would result in effective communication. However, Hanushek (1989) concluded that class size alone does not lead to an increase in student achievement. The three teacher who participated in the interviews had mean class sizes of around 80 students, which falls way out of the regular class size as defined in the STAR project.

The smallest class observed, which had twenty students present on the day of observation. The teacher admitted that this small group was a joy to teach as all

resources were enough to go round. There was also an opportunity for interactive facilitation, which is not possible with the much bigger classes. The teacher however was quick to add that her larger classes did not necessarily perform any worse than the smaller one, but that it was rather a matter of creating a conducive and enabling environment in the classroom. While most of the research conducted by several educationists is conflicting on whether class size alone can influence student achievement (Glass & Smith, 1979; Hanushek, 1989), the current study did find that class size has a connection with student achievement. The questionnaires administered to students examined qualitative data to investigate how effective educators engaged smaller and larger class sizes to facilitate learning and increase achievement. The core academic content area was different in each class as was the student body, but the teacher's delivery of the content was the main focus of the observations. It was important to look for the instructional techniques effective teachers used to engage different class sizes of students in learning and hence improve achievement.

The majority of students identified an effective environment as one in which teachers created diverse learning environments and teaching modes for their students. These teaching modes include face-to-face contact between teachers and students, the utilization of print materials, Power Point and document readers. If the different modes are used in an integrated manner and in a way that is appropriate to the students' needs as well as module and learning outcomes, the issue of class size will not play such a significant role. If the contact component of the topic makes provision for a variety of learning

opportunities such as lectures, group and individual tutorials as well as small - group discussions, all of which may make use of a variety of learning Material, the students will be able to develop their skills in different areas such as reliance on the individual but also being a team player. Student engagement refers to "active, goal-directed, flexible, constructive, persistent, focused interactions within the social and physical environments". Student -centered learning, while not necessarily a research-based practice, is parallel to the idea of contextualized instruction as teachers tap into students' interests to make learning more meaningful. This method was used by most teachers and also helped to mitigate the negative impact of large classes. However, most teachers expressed the feeling that students aren't used to open-ended learning, but rather they are used to being told instead of discovering.

~~From the results, the following conclusions are drawn.~~

1. Class-size is a paramount and dominant factor in students' academic achievement.
2. The quality of students' academic achievement tends to be improved when the class size is relatively small and manageable.
3. There seems to be a critical number of students per class beyond which their performance tend to begin to degenerate. From this study; that critical number is around 37 for secondary school.

5.4 Recommendation

The negative effects of class-size on students in biology cannot be overemphasized. The assertion is very essential in order to achieve the objectives of the study, the researchers therefore offer the following recommendations which if well implemented can help to minimize the problem:

1. Government at all levels should provide more infrastructure and facilities to schools, so that student population per class can be small enough for effective management.
2. Affluent individuals, group organizations, NGOs should lend as significant helping hand in the financing of education in Nigeria, so that infrastructure can be more available to bring about reduction in class size in our schools which is ridiculously over bloated presently.
3. Science professional organizations should spearhead the campaign for the need to reduce our class size to manageable sizes, while educating the populace of its benefits.
4. The average class size in secondary schools should be around 30 – 40.

The recommendations offered above are simply my best effort at putting together a plan that is responsible and affordable and, I hope, will represent a significant improvement in the general education of our students. General education is idiosyncratic, tailored to particular institutions and their needs. Good general education is associated with a culture that values high expectations, recognizes diverse talents and learning styles and emphasizes

early engagement. Good general education promotes coherence and wholeness, interdisciplinary and continuity, integration and synthesis (of instruction, practice and experience). It encourages active learning and collaboration and a commitment to inquiry beyond the curriculum. Educators need to keep in mind that effective educators are not made to order and are as individual as the students they teach. According to Lewis (2006:197) it is therefore vital to make a connection between student achievement, educator accountability and classroom instruction.

5.4 Suggestion for Further Studies

Based on the research carried out, the following suggestions were offered for further studies.

i. The study should be replicated in another geographical area in Nigeria to see if geographical location can be considered as a factor for relationship between class size and student academic performance in biology.

ii. Junior secondary school level should also be investigated for the availability, of infrastructure and functionality and utilization of integrated science in their classes.

iii. There is need to carry out similar studies in the post secondary institutions, that is Colleges of education, Polytechnics, Universities and Research institutions.

It was clear from the literature and the responses received in this research that there is real polarity of opinion on the issue of class size and achievement. The

debate boiled down, more than anything, to an issue of strategy, in other words, how best to deliver the curriculum and what models for teaching and learning will best accomplish those goals. On the one hand, it is argued that in a world where the knowledge base is expanding rapidly and has an ever increasing demand for education, we need to develop in students the key competencies and proficiencies that will allow them to discover and synthesize knowledge, both collaboratively and on their own initiative, using all the new and powerful tools that they now have, quite literally, right at their fingertips. Others argue that the knowledge base which all students need should be transmitted directly and presented to them coherently in order that they will be well prepared and informed, ready to think critically, deal with ambiguity, and be able to solve complex problems. Proponents of the latter approach towards education claim ~~that learning method, without sufficient attention to content, may diminish,~~ weaken or dilute the academic experience. Proponents of the former approach argue that an attempt to simply inoculate students with information in mass lectures will not and cannot produce real scholars or prepare students to be lifelong learners.

There is no perfect compromise between these two views that will lead to any real consensus in the democratic arena in which curricular decisions are made. Attempts to reconcile them run the risk of highly charged politicking that but ultimately does little to challenge or improve the status quo. Some

correspondents did, in fact, argue that either there was little to be "fixed" or that the risks of effecting any change could well outweigh the potential benefits.

The researcher does, however, conclude that specific strategies could be identified that would embrace both the learner - centered and transmission models and compromise neither, help to address the shortcomings identified through our consultation with stakeholders, and both preserve and build on the strengths of the current general education curriculum. Inevitably, we must confront the paradox that, even when we strive for a more leaner, learner - centered approach, we need to speak in terms of what we as educators can do to achieve it.

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APPENDIX A

BIOLOGY ACHIEVEMENT TEST (BAT)

SECTION A

BIO – DATA

Fill Appropriately

1. School: _____

2. Class: _____

3. Sex: Male ☐ Female ☐

Choose the correct alternatives by underling

SECTION B

BIOLOGY ACHIEVEMENT TEST (BAT)

1. Everything in the world can be classified as living thing and non living thing.

   True or False

2. Plants and animals are example of living thing.

   True or False

3. Living thing can be define as anything that have life and can move from one place to another.

   True or False

4. Everything in the world can be classified as living thing and non living thing.

   True or False

5. The process in which animals feed on plans and other animals is known as heterotrophic nutrition?

   True or False

6. The process in which green plant can manufacture their own food from carbon dioxide and water is called holozoic nutrition

   True or False

7. Rapid response to external stimuli is one of the characteristic of animal.

   True or False

8. System is the last level of organization of life in organism.

   True or False

9. Cells, Tissues, Organs, Systems are levels of organization of life in organism

   True or False

10. Organism that are made up of only one cell are called unicellular organism.

    True or False

11. Human being are example of unicellular organism.

    True or False

12. A tissue is group of similar cell specialized to perform a particular function.

    True or False

13. Skin, eye, stomach are examples of organs in animals.

    True or False

14. A cell is the structural and functional unit of life or is the basic unit of life.

    True or False

15. Growth in animal in apical.

    True or False

16. Plants have well developed organs of locomotion.

    True or False

17. There are two types of reproduction.

    True or False

18. The five stages of life are birth, growth, maturity, decline (old age), death

    True or False

19. Living thing must compete for food, light, space, water for them to survive

    True or False

20. Removal of metabolic waste product from the body is refers to as reproduction.

    True or False