

## CLASS SIZE AS A DETERMINING FACTOR IN THE ACADEMIC ACHIEVEMENT OF SECONDARY SCHOOL STUDENTS IN MATHEMATICS IN PORT HARCOURT METROPOLIS OF RIVERS STATE

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### Abstract

*This paper examined class size as a determining factor in the academic achievement of senior secondary school students in Mathematics. It adopted pre test, post test, experimental design. A total of ninety Senior Secondary students were purposively selected from three Secondary Schools in Port Harcourt metropolis of Rivers state Nigeria. The instrument used for data gathering was Mathematics Achievement Test (MAT) with multiple choices option which was validated and had a reliability coefficient of 0.72. One research question and three hypotheses were formulated to guide the study. T-test analysis was used to test the hypotheses at 0.05 level of significance. The findings of the study showed that there was a significant difference between the achievement of the experimental group over the control groups. Gender had no significant influence on the achievement of the students exposed to the small class and large class in Mathematics achievement test. Recommendations included that the National Policy on education which stipulate that the maximum teacher per student ratio is one teacher to forty students should be enforced in schools. Also, class reduction approach should be adopted by schools and building of more classrooms with provision of adequate facilities for teaching and learning to ensure better achievement of students is advocated.*

**Key words:** *Academic achievement ,Class size, Mathematics education*

### Introduction

Effective teaching and learning seem to be the function of the teacher understanding the individual difference of each of the students as this forms the basis for the appropriate teaching skill to be applied. However, understanding individual difference for effective teaching may require having a standard class size. Celik and Koc (2015) properly states in this regard that the essence of having a manageable class size is to ensure that the understanding rate of the students; their respective general background is put into consideration by the teacher in the course of his or her teaching, hence, the class size is standard in a situation where the number of students in a class is neither too much nor too small. However, class size and adequate teaching aids have a long way to determining teachers productivity, students learning inputs as well as the student performance,

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its effectiveness in teaching and learning, among other factors depending on the size of the class which invariably, may have influence on the academic performance of the student. Learning is not independent of some factors, the issue of class size which has become one of the major concern of educational planners today, as a pointer to the essentiality of class size in ensuring effective teaching and learning and having excellent students' academic performance, the National Policy on Education stipulates that the maximum teacher-student ratio is one teacher to forty students NPE (2013) despite the stipulation of the National Policy on Education on teacher-student ratio and the fact that class size among some other factors has a lot to do with effective teaching and learning as well as the students' academic performance in senior secondary schools.

Class size refers to the number of student a teacher faces during a given period of instruction. Class size according to Yara (2015) means the number of student in a given course or in a classroom, specifically either the number of student being taught by individual teachers in a course or classroom or the average number of students being taught in a school, district or educational system. Increasing class size is a sacrifice many schools have to make in order to keep their doors open in an area where schools are underfunded. A combination of an increasing population and a decrease in funding has caused class sizes to soar higher (Yeikpier, 2013), Teaching and learning in an overcrowded class room can be frustrating, overwhelming and stressful. An overcrowded classroom presents challenges that can feel impossible to overcome, even to the most effective teachers, the challenges restrain teacher's effectiveness and make teachers less productive in dishing out what they have for the student. In order to put sound education on ground and improve the academic performance of the student in School and more especially towards the point of their leaving secondary school which is the senior secondary school, there is a need for effective teaching and learning within a control populated class.

Michaelson (2017) defined class size as the number of students for whom a teacher is primarily responsible for , during a school year. Adeyemi (2018) defined class size as an educational tool that can be described as an average number of students per class in a school. Class size according to Ehrenberg et al., (2015) refers to the actual number of pupils taught by a teacher at a particular time and these definitions implies that class size is the number of students per teacher in a class – that's student to tutor. This ratio is a tool that can be used to measure performance of the education system and work productivity. The impact between class sizes on academic achievement has been a surprising one for the students. Studies have found that the size of a class where students were found smaller in size performed better than those in large classes (Swift, 2015). Small class size often encourages better interaction between the teacher and the students which benefits students in terms of high performance (Schneidier, 2014). Cotton (2015) in a study observed that specific benefits associated with smaller class size are higher, students' performance in academics especially in test scores. Studies have indicated that schools with smaller class size performs better academically that schools with larger class size. Jenck and Philips (1998) reviewed a substantial number of randomized experiment which suggested that the smaller classes raises test scores. Larger classroom provide students with few opportunities to engage the teacher on one-on-one basis for meaningful conversation. Kraff (2015) concluded that the size of the class above 40 have negative effects on the students' academic performance criticizing large class size in schools. Weinstein (2014) stated that large group of individual who are packed so closely together for so many hours cannot be expected to perform at peak efficiency on difficult learning tasks and to interact harmoniously.

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Gender is the range of physical, biological, mental and behavioral characteristics pertaining to and differentiating between the feminine and masculine (female and male) population .Yara and Ndirangu (2012) stressed that cultural factors like sexual experience, early marriage, female genital mutilation and early pregnancy contribute to academic performance of female student. Ugwugwu (2016) found in his studies that female students achieved significantly better than male students in Mathematics subjects. On teaching methods and strategies, Robitaile and Garden (2013) pointed out some factors that influences effectiveness of teachers namely their teaching strategies, beliefs about teaching and the general classroom processes that provides an immediate learning environment for Mathematics. In this regard, Dreckmeyr (2019) defines a teaching strategy as an extensive teaching plan which includes all elements of the instruction – learning events, such as form content, classification, principles and aids.

Teaching strategies can be classified in several ways for example, teacher-centered or learner-centered. Teacher centered strategies are those methods in which the teacher has direct control. Learner Centered strategy are those strategies that allows learners to play a more active role.

Some of the instructional features that are related to improved learners achievement in Mathematics include:

- Direct and frequent monitoring of progress
- Corrective and motivational feedback
- Learner academic involvement
- Total length of time allocated for instruction

Classroom management implies controlling the classroom environment to achieve meaningful learning Thebereme (2016) opined that classroom management refers to the methods and strategies a teacher uses to maintain a conducive environment for pedagogical delivery. However, observation shows that teachers can hardly manage their classroom well so as to create a conducive teaching-learning environment because of the large class, students distracts themselves as well as teachers thereby affecting the teacher learning process negatively. Osim (2019) concluded that teachers tasks performance will improve if there are sufficient qualified teachers to match the over Populated schools. Reducing class size without any attention to teacher qualification and performance might reduce the positive effects on students achievement levels given the association that have been found between teacher qualification and children’s learning (Feinberg, 2020) However, the implementation of smaller classes has been found to reduce teacher stress levels which is important for teacher consistency and retention. Hattie ( 2015) stresses that in effect, it is possible that class size reduction might boost students achievements more over time as teachers remain in their classrooms. Studies have revealed that overcrowding of classrooms in Lagos state significantly affects teaching and learning of Mathematics (Ayanwoye, 2016 ; Olaleye et al., 2017). Class size was seen as an educational tool that can be described as an average number of students per class in a school.

This study therefore focuses on the effect of class size as a determining factor for academic achievement of senior secondary school students in Mathematics in Port Harcourt city metropolis area of Rivers State, Nigeria.

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### Statement of the Problem

Increasing class size is a sacrifice many schools have to make in order to keep their doors open in an era where schools are underfunded. An overcrowded classroom can be very frustrating and overwhelming or better still stressful. The challenges restrain teachers' effectiveness and make them less productive in carrying out their functions . In Nigeria, the National Policy on Education NPE (2013) stipulates that a maximum of 40 students in a class in Secondary Schools in the urban area, where there is population explosion. Overcrowding has made the directives unrealistic in most cases the class size ranges from 55, 60, 70, etc. and these are prevalent in Secondary school and, to reduce class size so as to achieve better academic performances is now difficult. Mathematics is a core subject from basic level up till secondary level of Education. Students in Nigeria are expected to have a minimum credit pass at their Senior secondary level of education before they can gain admission into any tertiary institution. Hence, senior secondary level is crucial to their forging ahead educationally. As Mathematics education is this important , the problem in focus is if class size has any effect on academic achievement of Mathematics students at senior secondary level in Port Harcourt metropolis of Rivers state in Nigeria . This study is aimed at determining the effect of class size in the academic achievements of secondary school students in Mathematics.

### Purpose of the Study

The main purpose of the study was to examine the influence class size has on the academic achievement of student in Mathematics, specifically, the study is aimed at:

- i. Investigating the effects of class size on the academic achievement of Senior Secondary School students in Mathematics of Port Harcourt metropolis of Rivers state ?
- ii. Investigate the effect on gender on class size in the academic achievement of senior secondary students in Mathematics of Port Harcourt metropolis of Rivers state

### Research Question

The following Research questions are provided to guide the study in achieving its aim. In this study, answers are provided to the following research questions.

- I. To what extent does the size of the class determine the academic achievement of senior secondary school performance

### Research Hypotheses

The following research hypothesis guided the study.

Ho<sub>1</sub> :There is no significant difference between the achievement of students in small and large class in Mathematics using MAT

Ho<sub>2</sub> :There is no significant gender difference in the achievement of student in small class size in Mathematics achievement using MAT

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Ho<sub>3</sub> : There is no significant gender difference in the achievement of student in large class size in Mathematics achievement using MAT

### Research Methodology

Experimental design was employed using pre test, post test analysis. Two groups : experiment and control group designs were adopted in conducting the research, the experiment and control groups were given same pre-test before the experiment and posttest after the treatment with the assistance of a Research assistant.

### Sampling and Sampling Technique

The target Population for the study consist of senior secondary school students in Rivers state .Purposive sampling techniques was used to select a total of ninety students in Port harcourt metropolis comprising of 45 male and 45 female .They were grouped into Experimental group (small group) comprising of 15 male and 15 female and control group ( large size) comprising of 30 male and 30 female .

### Instrument

Instrument designed and used for each group was Mathematics Achievement Test (MAT ) for the pre and post test sessions. MAT was validated and had a reliability score of 0.72. Each correct score in MAT yielded a point .The scores were collated at the end of the pretest and post test for analysis using mean, standard deviation and t-test statics analysis.

### Results

**Research Question I:** To what extent does the size of the class determine the academic achievement of senior secondary school?

**Table 1:** Mean and standard deviation on the effect on class size in MAT of senior secondary school students in Mathematics in Port Harcourt metropolis

Class	N	Mean	Std	Std Error
Small	30	56.8	21.6	3.9
Large	60	38.5	20.5	2.7

Table 1 shows that the student taught in small class size had mean score of 56.8 in MAT and the student in large class had mean score of 38.5.

### Hypothesis Ho<sub>1</sub>

There is no significant difference between the achievement of students in Mathematics in small and large class size

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**Table 2:** t-test analysis of achievement of senior secondary students in MAT for small and large class size

Class	N	df	Mean ( $\bar{x}$ )	Std	t-cal	t-crit.	Decision on Hypothesis
Small	30		56.8	21.6	3.9	1.98	Reject Ho <sub>1</sub>
Large	60	88	38.5	20.5			
P < 0.05							

Table 2: The test for significance of the hypothesis done at alpha-level revealed a t-cal value of 3.9 greater than critical value of 1.98 which infer that Ho is rejected while the alternative hypothesis was accepted. Hence, there is a significant difference in the academic achievement of senior secondary students in mathematics of Port harcourt metropolis in favour of small class size.

This indicated that there was a significance difference between the two Post-test scores of the student taught in a large and small class-size. It could be concluded that there was a significant difference in the achievement of students. Hence, there was a significant difference in achievement of students in Mathematics between the two groups showed that the students taught in smaller classes performed better than the students in large class. Thus class size had an effect in the performance of students in statistics.

Hypothesis Ho<sub>2</sub>

There is no significance gender difference in the achievement of students in small class size in Mathematics.

**Table 3:** t-test analysis of male and female students academic achievement in small class size

Gender	N	df	Mean ( $\bar{x}$ )	Std	t-cal	t-crit.	Decision on Hypothesis
Male	15		61.3	19.5			
Female	15	28	56.7	22.5	0.58	2.048	Accept Ho <sub>2</sub>
P < 0.05							

From Table 3, t-cal value of 0.58 was less than t-critical value of 2.048 at p < 0.05 level of significance, Hence, the null hypothesis Ho was accepted, which indicates that there is no significance gender difference in the achievement of students in the smaller.

Hypothesis Ho<sub>3</sub> : There is no significant difference in academic achievement between gender in a large class size.

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**Table 4** :t-test analysis of the academic achievement of male and female students in large class size using MAT

Gender	N	df	Mean ( $\bar{x}$ )	Std	t-cal	t-crit.	Decision on Hypothesis
Male	30		33	17.4			
Female	30	58	48	20.8	2.98	2.00	Reject $H_{03}$
P < 0.05							

From Table 4, t-cal value of 2.98 is greater than t-critical value of 2.00 at  $\alpha = 0.05$  level of significance, implying rejection of the hypothesis  $H_{03}$ . Hence, there is a significant gender difference in the performance of students taught in large class in favour of the female gender with higher mean score in Mathematics.

Therefore, this indicated that there is significant difference in the achievement of t-test using MAT.

### Discussion of findings

Findings from the study .Students taught in smaller classes performed better in Mathematics than those in large classes.The findings of the study showed that students taught in small class performed better in the pre test administered than their counterparts taught in a larger class size. This shows that the stipulated policy of National Policy of Education, thus maximum teacher-student has a lot to do with effective teaching and learning in the administered pre test instrument, the sampled students for the study have a lesser mean score while the students in small class size have higher mean score.In this study, two groups were employed and experimented designs was adopted. Furthermore, the study revealed that the students in smaller class had more advantage and is preferable to the large class size. Therefore it shows that the smaller the class, the better and the view is in line with Swift (2015) who found out class size affects academic performance where students who were found in smaller class size performed better. Therefore larger class size had negative effects on students in Port harcourt metropolis of Rivers state.The findings was in line with Ugwungwu (2016) who found in his studies that female students size in Mathematics achieved significantly better than male counterparts in Mathematics subjects.

### Conclusion

The findings of the analyzed results showed that students taught in smaller classes could enhance performances better in Mathematics than their counterparts. It could be concluded that Senior Secondary School students in small sized classes showed higher achievement in Mathematics relative to their counterparts in large sized classes. There is an inverse relationship between the class size and students achievement in Senior Secondary School. Therefore,, secondary school students should be taught Mathematics in a small class size

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## Recommendations

Hence, the following recommendations:

- i. Class size reduction approach should be adopted by schools where students are more than forty (40) in a class to enhance better academic performance on students especially in Mathematics.
- ii. Building of more classrooms with provision of adequate facilities for teaching and learning in schools with increasing population so as to segment classes of same level.
- iii. Government should give adequate attention to the educational institution, particularly, the public secondary schools to improve the status quo of public secondary schools.
- iv. The study did not involve larger number of public schools to ascertain the generalized ability of the study findings and concept. It is also possible that outcomes would vary if measured over a thousand or more participation which paves way for further studies.

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