

## **Class Size and Students' Mathematics Achievement of Senior Secondary Schools in Southwestern Nigeria**

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**Abstract:** The study found out the relationship between class size and student academic achievement in some selected secondary schools in Southwestern Nigeria. The study adopted the descriptive survey design and simple percentages were used in analysing the data. Two validated instruments (QMT and MAT) were used in collecting data for the study. The subject of the study was made up of 1750 senior secondary school students and 123 mathematics teachers selected from 2 secondary schools in each of the Senatorial districts in Southwestern part of Nigeria. The results showed that the performance of students in large classes was very low (23%) compared to those students in smaller classes (64%). There was difference in the performance of male and female students in either group. It was recommended that policy makers and government should ensure that more classrooms are built and number of students in a class should not be >30.

**Key words:** Class size, academic achievement, senior secondary school, national policy, Southwestern Nigeria

### **INTRODUCTION**

Teachers, administrators, parents and the research community have been debating the issue of whether smaller classes are better than larger classes. This debate persists because of the powerful commonsense appeal of small classes to alleviate problems related to the classrooms. Small classes are an integral component of nationally subsidized programs including special education classes for learning disabled students. Slavin and Madden (1995) said that small classes or small groups working with one teacher or tutor also are a key element of programs targeted most often at students at risk.

Class size issue also persists because of the tension between the research findings and the cost of implementation. As school population increases, so also the class size increases. According to Dror (1995), class size has become a phenomenon often mentioned in the educational literature as an influence on pupils feelings and achievement, on administration, quality and school budgets. He noted that class size is almost an administrative decision over which teachers have little or no control.

The issue that needs to be clarified more is what number of students make a large group and what should constitute a small group. Eicher (1994) described a small group as that having few teachers with small pools of talent, often limited range of subjects and characteristically finding it hard to justify costly

investment on libraries; their pupils lack competition and interact with relatively few peers as they get hooked with same teacher for an entire school career. Large class size, on the other hand are often impersonal, having broader curricula with teachers being given wider support, while students may suffer discipline problems as teachers cannot get to know their students very easily.

In large class, Eicher (1994) continued, teachers may find it easy to stream students according to ability, while commitment to work may stand a test of time. In terms of numerical strength, the National Policy on Education (1977 revised in 1981 and 2004) specified 20 in pre-primary, 20 in primary and maximum of 40 in secondary school. These specifications, however are unrealistic in some areas as a result of dense population and shortage of classrooms. Kolo (1991) from his studies put the size of a large class as ranging from 30-33 and small class from 8-45. Indiana's Prime Time and Star (2003) viewed the average class, size as ranging 21-31. We have learnt much about instructional practices and how students learn. Yet, the controversial issue of classes and its effect on educational practices and student achievement continue to be confusing and often contradictory. Over the past 20 years, there have been many summaries of research on the relationship of class size to academic achievement. The most cited review of class size is the classic meta analysis of research on the relationship of class size and achievement (Glass and Smith, 1979). The researchers collected and summarized nearly 80 studies of the

relationship of class size with academic performance that yielded over 700 class size comparisons on data from nearly 900,000 pupils. The two primary conclusions drawn from this material are:

- Reduced class size can be expected to produce increased academic achievement
- The major benefits from reduced class size are obtained as the size is reduced <20 pupils

In a compilation of studies examined by Educational Research Service, Robinson (1990) concluded that research does not support the expectation that class size will of themselves result in greater academic gains for students. He observed that the effects of class size on students learning vary by grade level, pupil characteristics, subject areas, teaching methods and other learning interventions. In particular, review of the studies concludes that small classes are most beneficial in reading and mathematics in the early primary grades and that the research rather consistently finds that students who are economically disadvantaged or from some ethnic minorities perform better academically in smaller classes. Slavin (1989) submits that substantial reductions in class size have small positive effect on students and the effect was not cumulative and even disappears in later years. He further asserted that large effects of class size reduction are not likely to be seen until the class size is reduced to one (that is one-on-one tutoring). Bennett (1987) in a review of research, found broad agreement among researchers on the following general conclusions:

- Smaller classes result in increased student-teacher contact
- Reductions in class size to less than twenty students without changes in instructional methods cannot guarantee improved academic achievement
- No single class size is optimal for all grade level
- Smaller classes appear to result in greater achievement gains for students with lower academic ability and for those who are economically or socially disadvantaged
- Classroom management improves in smaller classes (fewer discipline problems)
- Smaller classes result in higher teacher moral and reduced stress
- Individualization is more likely to occur in smaller classes
- Class size reductions alone do not necessarily lead to adoption of dramatically different instructional methods

- Class size appears to have more influence on student attitudes, attention, interest and motivation than on academic achievement
- Very small classes of five or fewer students produce considerable higher achievement

Researchers (NCTE, 1986) have identified the following encouraging results from reducing class size and improving instructional methods:

- Smaller classes result in increased teacher-student contact
- Students in smaller classes show more appreciation for one another and more desire to participate in classroom activities
- In smaller classes, more learning activities take place
- Smaller classes foster greater interaction among students, helping them understand one another and increasing their desire to assist one another
- Smaller classes allow for potential disciplinary problems to be identified and resolved more quickly
- Smaller classes result in higher teacher morale and reduced stress.
- Less retention, fewer referrals to special education and fewer dropouts are the ultimate rewards of class size reduction

The NEA report (1986) also includes among others that there is typically little to be gained from reductions in class size that do not bring class size <30. Muller *et al.* (1988) indicated that in a reduced class size, students received more individual attention, received more immediate feedback that both below average and above average students achieved more that a greater variety of instructional materials were used that the instructional atmosphere were less hectic that teachers assigned more homework and that teachers were happier and more enthusiastic about their teaching. In a statewide class studies, Prime Time and Star (2003) came out with the following results:

- Positive outcomes were found for small classes on such factors as time on task, individualized instruction, well-behaved classes and teacher satisfaction
- The results for academic achievement were mixed at times, small classes were found to have superior outcomes and at times, the large classes performed better

Further study (Folger ang Cox, 1991) showed that even after the small-class intervention was disbanded,

students who had been in smaller classes had higher achievement in all academic areas compared to students in regular or teacher-aide classes. The study also revealed that pupils who had been in small classes were rated as expending more effort in the classroom, taking greater initiative with regard to learning activities and displaying less disruptive or inattentive behaviour compared to their peers who had been in regular-size classes.

In a previous study of teacher mobility, Wisconsin and Helming (1991) found that large class sizes and excessive responsibilities contribute to high stress levels of job dissatisfaction among teachers. This research offers new insights into the complexities of teacher workload and by implication suggests avenues by which students' achievement may be enhanced. They further found that teacher in-service opportunities (professional development programmes) must accompany reduced class sizes so that appropriate teaching can be developed and reinforced to boost student achievement. The Encyclopaedia research on class size have this view thus: whether the benefits of reducing class size are regarded as worth their cost or a second choice in improving education depends almost entirely on how the outcomes of pupils achievement, pupils attitude and teacher satisfaction are weighed in arriving at a general measure of utility.

Clearly different groups of individuals weigh these factors differently. Most taxpayers are likely to minimize considerations of teacher satisfaction and argue that class size reductions are not worth the price.

Teachers are likely to disagree that smaller classes produce more learning and provide the environment in which teachers can become more creative and not burn out so early in their careers.

Kolawole (1982) observed that the relationship between class size and student achievement is negative, such that the larger the class, the lower the student achievement will be. Ajayi and Ogunyemi (1990) in their study of the relationship between instructional resources and students academic achievement in Ogun State found no significant relationship between class size and student academic achievement.

Adeyela (2000) found in her study that large class size is not conducive for serious academic work. Afolabi (2002) found no significant relationship among class size and students learning outcomes. The foregoing differing findings, opinions and observations call for further investigation into the relationship between class size and student academic achievement particularly in Mathematics, which this present study was out to do.

## **MATERIALS AND METHODS**

**Research questions:** The following questions were answered:

- Will there be differences in the performance of students (male and female) taught by teachers having large classes?
- Will there be differences in the performance of students (male and female) taught by teachers having smaller classes?

**Participants:** The participants for the study comprised of 1750 senior secondary school students and 123 mathematics teachers from 36 senior secondary schools drawn from the six states in the Southwestern part of Nigeria.

**Instruments:** Two instruments were used for data collection. These instruments are Questionnaire for Mathematics Teachers (QMT) and Mathematics Achievement Test (MAT).

**Questionnaire for Mathematics Teachers (QMT):** The QMT was developed by the researcher by adapting the Third International Mathematics and Science Study (TIMSS) questionnaire. It consists of Section A, which is made up of 10 questions dealing with the name of the school, age, gender, qualification, years of experience, number of students in the mathematics class of teachers, number of periods of teaching mathematics in a week, number of hours spent on other activities outside the formal school day like keeping students' records up to date and administrative tasks including staff meetings which has the options "None", "<1", "1-2", "3-4" and ">4 h". Section B consists of 14 items which deal with the attitude of teachers towards the teaching of mathematics and has the options "Strongly Agree (SA) (4)", "Agree (A) (3)", "Disagree (D) (2)" and "Strongly Disagree (SD) (1)"; Section C has 7 items, which deal with the participation in professional development activities of the teacher like the number of hours spent attending workshops, seminars, conferences which the teacher will respond to by writing the number of hours in figure and how this professional development activities has helped to develop the teachers' capacity to teach some topics like mensuration, indices and logarithms, equations, inequalities, algebraic expressions, statistics and probability in mathematics which has the options "None", "little", "quite a lot" and "A great deal". QMT was given to some mathematics teachers in secondary schools and mathematics educators for scrutiny. The QMT was administered on 40 senior secondary 2 mathematics teachers in eight different

schools in Ibadan metropolis. The Cronbach alpha was used to determine the reliability coefficient. The value obtained was 0.67.

**Mathematics Achievement Test (MAT):** This test was developed by the researcher in order to assess the level of acquisition of mathematical concepts of the students. It covers the main topics of mathematics taught in SS2 up to the third term of the school year. It consists of 40-item multiple choice questions with 4 options A-D and was based on three cognitive levels “knowledge”, “understanding” and “application”. The test items were scored manually. Each correct answer attracted one mark, while a wrong answer was scored zero.

The level of achievement of a student was taken to be the student’s total test score. MAT was trial tested on 50 SS II students in three different schools in Ibadan metropolis. Kuder- Richardson formula KR-20 was used to determine the reliability coefficient. The value obtained was 0.74. The average difficulty index obtained was 0.45, which shows that the instrument was neither too difficult nor too simple.

## RESULTS AND DISCUSSION

The results are presented according to how the questions are raised. As regards the question of whether there will be differences in the performance of students taught by teachers having large classes, results showed that students’ performance in the Mathematics Achievement Test was as low as 23% for boys and 22% for girls in classes of student with a population of 80-120. Apart from this, the number of periods mathematics teachers have to teach mathematics in a week was in the range of 9-20 periods. Other activities performed by the mathematics teachers which take most of their time include student supervision (41%, 1-2 periods), student counseling (45%, 1-2 periods) and other administrative duties (48%, 1-2 periods).

This results are in agreement with the findings of Kolawole (1982), who observed that the relationship between class size and student achievement was negative, such that the larger the class, the lower the student achievement will be. Adeyela (2000) also gave credence to this fact in her study that large class size is not conducive for serious academic work.

Also the research of Wisconsin and Helming (1991) greatly supported these results in that large class sizes and excessive responsibilities contribute to high stress levels of job dissatisfaction among teachers. Results also showed that the performance of students taught by teachers in smaller classes was good because the performance of students in the Mathematics Achievement

Test was as high as 64% on the whole. The performance of boys was 68%, while that of the girls was 60%. The total number of students in these classes ranges from 20-40. These results are in conformity with the findings of Muller *et al.* (1988), which indicated that in a reduced class size, students received more individual attention and more immediate feedback that both below average and above average students achieved more that a greater variety of instructional materials were used that the instructional atmosphere were less hectic that teachers assigned more homework and that teachers were happier and more enthusiastic about their teaching.

These findings are also in agreement with the findings of Bennett (1987), who agreed with the results of researchers that smaller classes result in increased student-teacher contact, greater achievement gains for students with lower academic ability and for those who are economically or socially disadvantaged, improvement in classroom management, higher teacher moral and reduced stress, produce considerable higher achievement.

## CONCLUSION

From the results, it can be seen that the larger the class size of students being taught the less the performance of the students. There is therefore, the need to make the number of students to be taught in the mathematics classes to be moderate so that the teacher can be able to manage the class effectively and be able to give individual attention to students who may have problem of assimilating the concepts of what has been taught.

The issue of class size has been addressed in some states of Nigeria like in Oyo State during the regime of the Governor senator Rasheed Oladoja who made an educational policy that the maximum number of students in a class should be 20. This policy was rubbished after his exit from government.

## RECOMMENDATION

It is recommended that the educational policy makers should formulate policies that will ensure that the number of students in a class should not exceed 30 students. This in turn will make the government to provide enough classrooms for the schools.

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