

# Impact of Class Size on Students' Academic Performance in Biology in Idemili North Local Government Area of Anambra State

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## **Abstract**

*The paper investigated the impact of class size on students' academic performance across selected public senior secondary schools in Idemili North Local Government Area of Anambra State. In this study, the effect of class size directly on students' performance; psychological effect of class size on students' performance and social effect of class size on students' academic performance were analyzed. Self-administered questionnaire was used as instrument for data collection in the study. A sample of one hundred and fifty (150) students in three selected public senior secondary schools was used. Senior secondary two (SS2) and three (SS3) students were used for the study. The students were selected randomly and one hundred and forty (140) questionnaires was correctly filled and collected, ten (10) questionnaires was either not collected or wrongly filled, thereby rendered invalid by the respondent. The analysis was done using descriptive statistics, percentage and frequencies. It was found that large class size had negative effect on students' academic performance in biology. It was also observed that class size has psychological and social effect on students' academic performance. Where the class size cannot be reduced in a given time due to challenges beyond the control of the school authorities, it is recommended that teachers and management of the school should employ rotational students' group formation and study. These groups could identify common challenges and present it to teachers for support. As a long term measure, Government should increase budget allocation to improve schools infrastructural facilities.*

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**Keywords:** *Class size, Academic performance and Biology.*

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## **1. Introduction**

As the world population continues to increase, the class sizes are also affected. Class size is often mentioned by experts in the educational literature as having effect on student's feelings and performance, quality of school budgets and on administration as well (Owoeye and Yara, 2011). It is considered as one of the important determinants of academic performance over which teachers in schools have little or no control. Class size may be defined as the number of students per teacher in a given class or the population of a class (Ajayi *et al.*, 2017). Mokobia and Okoye (2011) explained that educators universally have identified class size as important and desirable attribute of effective educational system. Consequently, debate has continued in the educational literature stakeholders such as academics, policy makers and parents over the educational consequences of class size. Some researchers have maintained that class size is a tool which can be adopted in measuring performance of educational system (Kedney, 2013). According to Imoke (2006) optimum class size implies rational coordination of educational infrastructures, subject to available number of students in order to attain high level of productivity.

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

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

In a related study, Evans and Popova. (2015) established that there is a negative non-linear relationship between class size and student evaluations stronger than the relationship to student achievement, and with less concavity. This supports findings including an analysis of studies which revealed a similar negative relationship between class size and student evaluation, particularly in regards to instructor interactions with students as demonstrated by Altinok and Kingdon (2012). Besides, the literature has argued that pedagogies specifically designed for teaching smaller classes sometimes overlap with pedagogies employed when teaching larger classes but have distinct characteristics that differentiate them from those employed when teaching larger class (Aturupane *et al.*, 2013; Azigwe *et al.*, 2016). Small class pedagogies can include project work where students are individually monitored and provided with continuous feedback on investigative tasks designed to develop higher order thinking skills (Altinok and Kingdon, 2012; Bosworth, 2014). Additionally, these studies suggested that

advantage should be taken of having fewer students in a class to provide learning experiences that facilitate increased collaboration and communication among students, provide helpful learning opportunities and foster student metacognitive skills through the development of information discovering and help-seeking behaviours. According to Amadahe (2016), one of the most essential parts of the teaching and learning process is assessment and evaluation of students. Large classes call for large volumes of marking to be done and feedback given to students. This is a major challenge, especially in Nigeria public senior secondary schools. In the face of large classes, instructors are upset with the workload and resort to traditional teaching and assessment methods. Teachers are unable to finish marking assignments, exercises and examinations on time, and this delays the feedback given to students.

From the social perspective, studies on large class size exist in developing countries but the results are often questionable. Aturupane *et al.* (2013) reviewed 96 studies that tried to link various educational inputs to student performance in developing countries and found out that nearly a third (31) of the reviewed studies specifically considered the effect of pupil-teacher ratio. Out of the investigation, only eight found reduction in class size to significantly explain improved academic achievement. This study is consistent with Stephens *et al.* (2014) study on learning competencies in five francophone sub-Saharan African countries (Burkina Faso, Cameroon, Cote d'Ivoire, Mali and Senegal) which demonstrated that an inverse relationship existed between class sizes and learning outcomes. That is, student learning decreased as class sizes increased. This means that the higher the total number of students in a class, the lower the level of concentration which leads to poor performance of the students. Azigwe *et al.* (2016) revealed that students' engagement, behaviour, and retention are affected in so many ways by the size of the class. This conclusion was drawn when reviewing studies on the link between student engagement and class size conceptualized student engagement in two forms, namely, social engagement (how a student interacts socially with other students and teachers in either pro-social or anti-social ways) and academic engagement (students' attitude towards schooling and the learning process). The study indicated that when students are placed in smaller classes, they become more engaged, both academically and socially, and argue that with strong social academic engagement, academic achievement improves.

In spite of all these benefits, large class size may generate a lot of controversy due to the difficulty of teachers to work with large class size. These controversies may serve as thorns that crumble the performance of students in biology at the senior secondary school level. Some of these problems may be; teachers may find it difficult to use varied teaching methodology in teaching, students may find it difficult to concentrate in the class, teachers may find it difficult to control the students in class and there may be insufficient teaching and learning resources. Hence the quality of teaching, assessment of students and quality of learning may be affected. Basically, earlier one of the subjects in the Nigerian public senior secondary schools which requires demonstrations and much student attention is biology. Therefore, the present study seeks to use biology as baseline to revisit the issue of class size implications on quality of teaching and learning. Findings from this study would not only contribute to the educational literature but also educational planning and policy towards school infrastructure. The study focuses on three effects of class size: instructional impact of class size on students' performance; psychological impact of class size on students' performance and social impact of class size on students' performance in biology at public senior secondary schools in Idemili North Local Government Area of Anambra state.

## 2. Methodology

Descriptive survey design was used in this study. The descriptive survey was used because it aims at primarily describing, observing and documenting a situation as they occur rather than explaining them. The design has the advantage of producing a good amount of responses from a wide range of people and it involves extracting information from a large number of individual using the same set of questions through personal contact, electronic mails and the phones. The target population was public senior secondary school students in Idemili North Local Government Area of Anambra state. The instrument used in this study was questionnaire. One hundred and fifty (150) questionnaires were distributed to students in three selected public senior secondary schools. Senior secondary two (SS2) and three (SS3) students were used for the study since they have had a year or two respectively of learning experience in secondary school studying biology, they will therefore be in the position to answer the questions accordingly. The schools were purposely selected based on the students population and secondly the accessibility. The students were however selected randomly and one hundred and forty (140) questionnaires was correctly filled and collected, ten (10) questionnaires was either not collected or wrongly filled and thereby rendered invalid by the respondent. The questionnaire was developed based on the concerns, issues and arguments raised in previous literatures about the topic. The questionnaire was structured into four parts with close-ended questions. Part one was centered on direct impact of class size on students' academic performance, part two contains questions on the impact of class size on instructional strategies, part three captures questions on the psychological impact of class size on students' performance and part four involves questions about the social impact of class size on students' performance. The questions required the respondents to answer thus; strongly agree (SA), Agree (A), undecided (U), disagree (D), and strongly disagree (SD) respectively. The questionnaires were administered personally. Subsequent to the data collection, the data were analyzed using frequency and percentage. Statistical Package and Service Selection (SPSS) was used to analyze the data.

## 3. Results and Discussions

The tables below report the results from the study and discuss the findings in line with the focus of the study.

**Table 1: Impact of Class Size on Students' Academic performance**

| Questions  | SA       | A        | UD     | D        | SD       |
|--|----------|----------|--------|----------|----------|
| Students hardly see writings on the board when seated at the back in a large class?                      | 29 (21%) | 38 (27%) | 8 (5%) | 33 (24%) | 32 (23%) |
| Students have the opportunity to cheat during class exercises, test and examination in large class size? | 57 (40%) | 29 (21%) | 2 (2%) | 32 (23%) | 20 (14%) |
| Students can do other things like copying notes in large class when                                      | 33 (23%) | 20 (14%) | 5 (4%) | 42 (30%) | 40 (29%) |

biology lesson is going on without the teacher noticing?

Smaller class sizes allow more time for teachers to help students with practical in biology and develop their skills which can increase student's achievement?

Students are very active in large class size than in small class?

|          |          |        |         |          |
|----------|----------|--------|---------|----------|
| 50 (36%) | 58 (41%) | 5 (4%) | 10 (7%) | 17 (12%) |
|----------|----------|--------|---------|----------|

|        |          |          |          |          |
|--------|----------|----------|----------|----------|
| 9 (6%) | 28 (20%) | 15 (11%) | 36 (26%) | 52 (37%) |
|--------|----------|----------|----------|----------|

Table 1 presents detailed results on how class size affects the academic performance of the students in biology. The result above shows that a good number of the students agree that there is a high possibility of cheating during examination in a large class; this was confirmed by 61 percent of the respondents. This means that the true performance of the students cannot be ascertained since poor students stand to benefit from the act of cheating. Also, 48 percent of the students indicated that they can hardly see the writings on the board in a large class. However, this figure was contradicted by 47% of them who indicate that they can clearly see writings on the board in a large class. Additionally, it can be observed that large class makes it difficult to be active in class. This was revealed from 63 percent of the students. Furthermore, 77 percent of the total respondents agreed that smaller class sizes allow more time for teachers to help students develop appropriate practical skills which can increase student's performance. This means that in large classes it would be difficult for teachers to help students to develop skills to increase their performance. The findings have largely demonstrated that large class size has negative effect on students' performance in biology. Surprisingly, 59 percent of the respondents disagreed that they can do other things like copying notes in large class when biology lesson is going on without the teacher noticing them. This may be attributed to the fear of being punished when caught and the desire to pay attention in biology class due to its perceived ambiguity of the subject. There is a strong reason to conclude that large class size could negatively affect students' performance. Students are likely to lose concentration, focus and even attention from teachers. This confirms the assertion that some small class pedagogies which could include project work where students are individually monitored and provided with continuous feedback on investigative tasks are designed to develop higher order thinking skills (Altinok and Kingdon 2012; Bosworth 2014). Consistent with some earlier studies, it has been established in this study that small class size provides learning experiences that facilitate increased collaboration and communication among students, provide helpful learning opportunities and foster student metacognitive skills through the development of information discovering and help-seeking behaviors, Altinok and Kingdon (2012); Bosworth (2014), through practical orientation and class participation. The results further confirmed the study by Azigwe *et al* (2016) which indicated that in a large class teacher find it difficult to teach effectively and efficiently leading to students not being able to also learn effectively since low participation in class activities were possible.

**Table 2: Impact of Class Size on Instructional Strategies**

| Questions   | SA       | A        | UD       | D        | SD       |
|---|----------|----------|----------|----------|----------|
| The teaching of practical biology skills is neglected in large class size?                                | 21 (15%) | 34 (24%) | 10 (7%)  | 47 (34%) | 28 (20%) |
| Teachers are likely to give more class exercise to students in smaller class size than larger class size? | 60 (43%) | 40 (29%) | 4 (2%)   | 14 (10%) | 22 (16%) |
| The use of audio-visual aids in large class would make lessons more interesting?                          | 11 (13%) | 37 (26%) | 5 (4%)   | 19 (13%) | 60 (43%) |
| The atmosphere in large class size is always teacher-centered with passive students?                      | 47 (34%) | 36 (25%) | 21 (15%) | 25 (20%) | 11 (8%)  |

From Table 2, it could be observed that class size has some relationship with instructional strategy be it positively related or negatively related. The result above shows that teachers do not neglect the practical aspect of biology due to large class size. 54 percent of the students disagreed that the teaching of practical skills is neglected in large class size. This is consistent with the findings by Aturupane *et al.* (2013) which revealed that teachers are able to use teaching strategies that fit the large class size such as group work and working on projects rather than employing pedagogies like collaborative learning and the systems and structures needed for working effectively within the context of collaborative learning are embedded in the careful sequencing of activities that follow a specific design to promote learning. This means that in terms of instructional practicability and ways of teaching, class size has no significant relationship with respect to instructional strategy. The students revealed further that the use of audio-visual aids in large class size would not be appropriate and could not make lessons interesting and 56 percent of the students held this view. The findings further showed that 72 percent of respondents held the opinion that teachers are more likely to teach with very little or no class exercise in a large class size. Regular exercise is an important instructional strategy which helps increase academic performance of students (Hattie, 2009). Also, 59 percent of the total respondents accepted that in large classes, the atmosphere is teacher-centered with passive students. This is evidence that class size has implications on instructional strategy and students' academic performance but Stephens *et al.* (2014) stated that there is no guarantee that smaller classes will automatically lead to more productive works. Similar to the evidences found in this study, Amedahe (2016) noted that discussion time becomes scrappy among students in large classes and instructors may rely on passive lecturing, assign less written homework or fewer problem sets, and may not require written papers.

**Table 3: Impact of Class Size on Students' Psychological Readiness**

| Questions   | SA       | A        | U        | D        | SD       |
|---|----------|----------|----------|----------|----------|
| Students feel more relaxed in large class size since it's difficult to know themselves by name?               | 23 (16%) | 51 (37%) | 19 (13%) | 31 (22%) | 16 (23%) |
| Most students feel shy to speak in large class size?  | 25 (19%) | 55 (39%) | 6 (4%)   | 27 (19%) | 27 (19%) |
| Students seldom have the opportunity to express their self in large class size?                               | 30 (21%) | 46 (33%) | 19 (13%) | 32 (23%) | 13 (9%)  |
| Students like sitting at the back of the class to hide from the attention of the teacher in large class size? | 16 (12%) | 43 (30%) | 2 (1%)   | 47 (34%) | 32 (23%) |
| Students have the challenge to study hard and prove themselves in large class size?                           | 30 (20%) | 42 (30%) | 16 (12%) | 29 (19%) | 26 (17%) |
| Students find it difficult to concentrate due to the noisy and stressful atmosphere in large class size?      | 41 (29%) | 44 (32%) | 9 (6%)   | 16 (12%) | 30 (21%) |
| Students tend to be lousy in larger class size than in smaller class size?                                    | 45 (32%) | 46 (33%) | 13 (9%)  | 6 (4%)   | 30 (21%) |
| Students tend to feel anxious and uncomfortable due to the crowd in large class size?                         | 21 (15%) | 70 (50%) | 16 (12%) | 20 (14%) | 13 (9%)  |
| Students don't get cautioned when they sleep during   | 16 (12%) | 24 (17%) | 3 (2%)   | 38 (27%) | 59 (42%) |

lessons in a large class?

|  |          |          |        |          |          |
|--|----------|----------|--------|----------|----------|
| Students go unnoticed by teachers when they miss lessons in large class? | 34 (24%) | 43 (31%) | 8 (5%) | 28 (20%) | 27 (19%) |
|--|----------|----------|--------|----------|----------|

The results reported in Table 3 provide evidence to show that there are psychological impacts of class size on the performance of the students. 58 percent of the respondents indicated that most students feel shy to talk in the classroom. This seems to affirm the conclusion reached by Rubin (2012) which revealed that most of the students in large class may not understand the concept of what is taught as the size deters them from voicing out to ask questions. This could negatively affect their participation and performance in the class. 54 percent of the respondents indicated that students seldom have the opportunity to express themselves in large class size and 53 percent agreed that students feel more relaxed in large class size since it is difficult to know them by name. On the other hand, 57 percent of the respondents disagreed that students like sitting at the back of the class to hide from the attention of the teacher in large class size. Similarly, 50 percent of the respondents indicate that students have the desire to study hard and prove myself even in large class size. These evidences seem to support the findings of Hattie (2009) that it is not the size of the class that enhances student academic achievement, but the quality of the teaching that takes place. Hattie (2009) also noted that when teachers continue to use large class teaching strategies, even when teaching small classes, there is little approval that learning is enhanced. To further buttress the point of Hattie (2009), 50 percent of the respondents said that students feel challenged to study hard to prove themselves in large class size, this simply implies the willingness and encouragement to learn even in extreme conditions. However, one important psychological impact of class size that was observed in this study is that 55 percent of the total respondents agreed that students go unnoticed by teachers when they miss lessons in large class. Under this circumstance students could perform poorly since teachers are not able to monitor their presence in class. This support the finding of Bosworth (2014) and Evans and Popova, (2015) which revealed that there is an impact of class size upon student performance since its (performance) decreases as the class size increases. In another development, 61 percent of the students indicate that students find it difficult to concentrate due to the noisy and stressful atmosphere in large class size hence this adversely affect their academic progress. Lastly 69 percent of respondents disagree that students don't get cautioned when they sleep during lessons in a large class. This means that notwithstanding the size of class students cannot just sleep without incurring punishment from the teacher. Some test items showed no significant impact while others have revealed negative impacts. However, it is evidential that the overall impact of all the test items revealed that large class size has significant negative impact on students' psychological readiness. Even where the evidence seems to favour large size, the differential impact was quite negligible. Thus, it is reasonable to conclude that large class size has significant negative impact on students' psychological readiness to achieve academic excellence.

**Table 4: Social Impact of Class Size on Students' Academic Performance**

| Questions  | SA       | A        | U        | D        | SD       |
|--|----------|----------|----------|----------|----------|
| Student-Student interaction is mostly neglected in large class size? | 18 (13%) | 24 (17%) | 17 (12%) | 26 (19%) | 55 (39%) |



|   |          |            |          |          |          |
|---|----------|------------|----------|----------|----------|
| Teacher-Student interaction is mostly neglected in large class size?  | 42 (30%) | 45 (32%)   | 15 (11%) | 24 (17%) | 14 (10%) |
| Teachers easily identify students who need extra tuition and attention during lesson period in small class size than in large class size? | 46 (32%) | 53 (37.0%) | 15 (11%) | 15 (11%) | 11 (7%)  |
| Teachers find it difficult to remember students by name in larger class size?   | 25 (18%) | 67 (47%)   | 15 (11%) | 25 (18%) | 8 (5%)   |
| Teachers are unable to notice students who are not serious with jottings and note copying?  | 25 (18%) | 67 (47%)   | 15 (11%) | 25 (18%) | 8 (5%)   |

Table 4 above shows the result of the responses on the social impacts of large class size on students' performance. 58 percent of the respondents indicated that student-student interaction is very high in large class size. This means that in a large class size, student – student interaction which enhances inter-student relationship and creates good social bond is achieved. This contradicts the findings by Finn *et al.* (2003) which suggested that when students are placed in smaller classes, they become more engaged both academically and socially and further argued that with strong social academic engagement, academic achievement improves. The differences in the results may be attributed to differences in social settings of where Finn *et al.* (2013) conducted their study and the current study setting. Nigerian culture embraces large social settings and people feel good with others around. Moreover, majority of the students, 62 percent reported that teacher-student interaction is mostly neglected in large class size. This supports the earlier study by Altinok and Kingdon (2012). Altinok and Kingdon (2012) also found that it is difficult for teachers to spot problems during lessons and give corrections, identify specific needs of the students and gear teaching to meet them, set individual targets for students, and be flexible in the use of different approaches in teaching. 69 percent of students agreed that teachers easily identify students who need extra tuition and attention during lesson period in small class size than in large class size. Additionally, 65 percent of the students believe that teachers find it difficult to remember students by name in larger class size while another 65 percent indicate that teachers are unable to notice students who are not serious with jottings and note copying and this invariably has an adverse effect on the progress of the students' academic performance.

#### 4. Conclusion and Recommendations

This study was carried out to investigate the impact of class size on students' academic performance in biology in public senior secondary schools in Idemili North LGA of Anambra state. Three areas of possible impacts were investigated: impact of class size on students' performance; psychological impact of class size on students' performance and social impact of class size on students' academic performance. The study revealed that there is the opportunity for students to cheat during class exercises, test and examination in large class size. This translates that the actual performance of the students could not be seen or reflected in their class score and this could subsequently affect them adversely in any external examination. Other impacts of large class size were difficulty in following and seeing what has been written on the class room board; difficult on the side of the teachers to devote time to help students develop appropriate practical skills, hence this can impede students' performance. Large sized classes have negative impact on the academic performance of students. It is also concluded that class size has significant impact on the appropriateness of teachers' instructional strategies. With respect to the psychological impact of class size on students' performance, it was revealed that students' feel shy to speak in large class size and also find it really hard to express themselves in a large class; also, the atmosphere becomes noisy and stressful, thereby breeding the opportunity to miss lessons without the notice of the teacher in large class size. There is therefore enough reason to agree that large class size has psychological impacts on students' academic performance. Lastly, the social impact of class size on students' academic performance revealed that though student-student interaction is enhanced in large class, teacher – student's interaction is mostly neglected in large class size. Furthermore, it was observed that teachers are not able to identify students who need extra tuition and attention during lesson period in large class size.

The study demonstrated that large class size could have adverse impact on students' academic performance. Therefore, where the class size cannot be reduced in a given time due to challenges beyond the control of the school authorities, it is recommended that teachers and management of the school should employ rotational students' group formation and study. These groups could identify common challenges and present it to teachers for support. Furthermore, as seen from the findings that some students who sit at the back of the class find it difficult to see what the teacher writes on the board, the use of technologies such as projectors are encouraged to address the issue. As a long term measure, Government should increase budget allocation to improve schools infrastructural facilities. The Ministry of Education, policy makers, parent - teachers association, old boys/students association and other non-governmental organizations, corporate bodies and religious organizations should contribute respectively to renovate dilapidated classrooms, build more classrooms to contain the growing enrolments in the schools and provide schools with the facilities they need to make teaching and learning easier and effective.

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