



Class size and its effects on students' academic performance among selected public secondary schools in Nigeria

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Abstract

Class size remains an important dimension of the learning environment, particularly in public secondary schools where increasing enrolment can place substantial pressure on available teachers, classrooms, and instructional resources. This study examined the effects of class size on students' academic performance among selected public secondary schools in Nigeria. Specifically, it compared academic achievement across small, medium, and large classes and considered teacher attention, student participation, classroom noise, and student satisfaction as relevant classroom-process variables. An ex-post facto comparative research design was adopted. The study comprised 274 students drawn from selected public secondary schools across Lagos, Oyo, Rivers, Enugu, the Federal Capital Territory (FCT), and Kano. Classes were classified as small (≤ 35 students), medium (36–55 students), and large (≥ 56 students). The groups comprised 92, 91, and 91 students, respectively. Academic performance was assessed using students' average academic scores and subject-specific scores in English Language and Mathematics, while grade and student satisfaction provided supplementary outcome measures. Analysis of the supplied dataset revealed a pronounced gradient in academic performance across class-size categories. Students in smaller classes consistently recorded higher academic scores, while students in medium-sized classes demonstrated intermediate performance and those in large classes recorded the lowest scores. The classroom-process data similarly indicated that smaller classes were characterised by greater teacher attention, higher student participation, lower classroom noise, and higher student satisfaction. Conversely, large classes were associated with low teacher attention and participation, greater classroom noise, and lower satisfaction. The pattern was also evident in English Language and Mathematics scores. These findings indicate a strong association between class size and academic performance in the sampled schools and suggest that classroom conditions such as teacher attention, participation, and noise may constitute important pathways through which class size relates to learning outcomes. Given the ex-post facto design, however, the findings should be interpreted as evidence of association rather than definitive causal effects. The study concludes that effective management of student–teacher ratios and classroom enrolment should remain an important component of policies aimed at improving teaching and learning conditions in Nigerian public secondary schools.

Keywords: Academic performance, class size, classroom noise, public secondary schools, student participation, student satisfaction, teacher attention, teacher–student ratio, Nigeria

Introduction

Education remains one of the most important instruments for human capital development, socioeconomic transformation, technological advancement, and national development. The effectiveness of an educational system is, however, determined not merely by access to schooling but also by the quality of teaching and learning that takes place within schools. Globally, concerns about learning outcomes have shifted educational policy attention from enrolment alone toward whether students actually acquire the knowledge and competencies expected at each stage of schooling. The World Bank (2021) ^[22] conceptualises the contemporary learning crisis partly through “learning poverty,” emphasizing that school attendance without meaningful learning cannot produce the human capital required for individual and national development. Within this quality-of-education discourse, the classroom constitutes the immediate environment in which teachers, learners, instructional materials, curriculum content, and pedagogical practices interact. Consequently, characteristics of the classroom environment, including class size, have attracted sustained research and policy interest.

Class size generally refers to the number of students who receive instruction together as a class from a teacher during a particular instructional period. Although it is sometimes used interchangeably with the student–teacher or pupil–teacher ratio, the concepts are not identical. Class size represents the actual number of learners occupying a particular instructional group or classroom, whereas the student–teacher ratio usually represents an aggregate relationship between the number of students and available teachers within a school or educational system. A school may therefore report a relatively favourable student–teacher ratio while individual classrooms remain overcrowded because teachers are unevenly distributed across subjects, grade levels, schools, or geographical locations.

Class size has long been one of the most debated structural determinants of educational quality. Advocates of smaller classes argue that reducing the number of students assigned to a teacher creates conditions conducive to individualized instruction, effective classroom management, continuous assessment, teacher–student interaction, active participation, and timely feedback. Conversely, very large classes may increase teachers' workload, reduce opportunities for

individualized attention, complicate classroom management, and restrict students' opportunities to ask questions and participate meaningfully in instructional activities. Early meta-analytic evidence associated smaller classes with academic outcomes and more favourable teacher and student attitudes, greater individualization of instruction, increased participation, and improved classroom climate (Smith & Glass, 1980)^[18].

The relationship between class size and academic achievement nevertheless remains complex. International evidence does not support the simplistic assumption that every reduction in class size will automatically produce a large improvement in examination scores. Filges, Sonne-Schmidt, and Nielsen (2018)^[8], reviewing 127 studies across 41 countries, found that overall achievement effects of smaller classes were generally modest and varied according to outcome and study design. These findings suggest that class size should be understood as part of a broader instructional process rather than as an isolated numerical input.

One important explanation is that the educational consequences of class size may operate through changes in what happens inside the classroom. Smaller classes can alter the quantity and quality of teacher–student interaction, opportunities for participation, classroom management demands, feedback processes, and students' engagement with learning. Blatchford, Bassett, and Brown (2011)^[1] found that students in smaller classes received more individualized teacher attention and engaged in more active interactions with teachers, while classroom engagement declined as class size increased.

Teacher attention represents one such mechanism. In smaller classes, teachers may have greater opportunity to monitor individual students, identify learning difficulties, answer questions, provide corrective feedback, differentiate instruction, and follow students' academic progress. Student participation constitutes another potential pathway. Questioning, responding, discussion, problem-solving, collaborative learning, classroom presentations, and feedback can reinforce understanding and encourage cognitive engagement. Classroom noise and behavioural management may also contribute to the relationship, since increasing classroom density can increase simultaneous interactions and management demands.

The problem assumes particular significance in Nigeria because expansion in access to education has not always been accompanied by proportional expansion in physical infrastructure and human resources. Public schools frequently face pressures associated with insufficient classrooms, uneven teacher distribution, inadequate facilities, and high enrolment. Recent World Bank analysis has documented overcrowding and infrastructure challenges in Nigerian public basic education, indicating that classroom congestion remains a relevant quality concern (World Bank, 2024)^[24].

The consequences of large classes may be especially important at the secondary-school level. Students at this level are expected to acquire increasingly complex competencies in English Language, Mathematics, sciences, social sciences, humanities, and vocational subjects. English Language and Mathematics deserve particular attention because of their central roles within secondary education. English is both an important subject and a principal medium through which much formal instruction is delivered, while

Mathematics provides foundational competencies required across scientific, technological, economic, and quantitative disciplines.

The Nigerian context also requires attention to geographical diversity. Educational conditions differ across states and geopolitical regions in population density, urbanization, infrastructure, teacher supply, public expenditure, school accessibility, socioeconomic circumstances, and enrolment pressures. Studies confined to a single school, local government area, or state may therefore have limited ability to illuminate class-size patterns across Nigeria's heterogeneous educational environment.

Another important consideration is that class size may influence outcomes beyond examination scores. Students' satisfaction with their classroom experiences can reflect perceptions of teacher accessibility, opportunities to participate, comfort within the learning environment, and the overall quality of interaction. Smaller classes may facilitate more favourable educational experiences, while persistent overcrowding, noise, limited teacher attention, and restricted participation may contribute to dissatisfaction and disengagement.

Despite these theoretical expectations, class size should not be treated as the sole determinant of academic achievement. Student performance is multidimensional and can be influenced by prior achievement, socioeconomic background, parental education, school resources, teacher qualifications, instructional quality, motivation, attendance, peer effects, school leadership, curriculum implementation, and access to learning materials. Moreover, schools may allocate students to classes in ways that are not random. Such factors make causal interpretation difficult in observational and ex-post facto studies.

Against this background, the present study examines class size and students' academic performance among selected public secondary schools in Nigeria. It draws on data from 274 students representing Lagos, Oyo, Rivers, Enugu, the Federal Capital Territory, and Kano. The sample comprises 92 students in small classes, 91 in medium-sized classes, and 91 in large classes. The study determines differences in overall academic performance, English Language achievement, Mathematics achievement, grade outcomes, and student satisfaction across the three categories and considers teacher attention, student participation, and classroom noise as classroom-process variables. Given the ex-post facto design, observed differences are interpreted as associations rather than definitive causal effects.

Review of Related Literature

1. Concept of Class Size

Class size is an important structural characteristic of the school learning environment and refers to the actual number of students taught together by a teacher in a particular classroom or instructional group. It should be distinguished from student–teacher ratio, which is generally an aggregate measure of the number of enrolled students relative to available teachers. This distinction is especially important in systems characterized by uneven teacher deployment.

Class size has implications for instructional strategies, classroom management, teacher workload, assessment practices, opportunities for individual interaction, student participation, and the amount of time teachers can devote to individual learning needs. The present study operationalizes class size as small (≤ 35), medium (36–55), and large (≥ 56).

2. Class Size and Academic Performance

Academic performance refers to the extent to which students attain expected educational outcomes and may be measured through examinations, continuous assessment, standardized tests, subject-specific scores, grade classifications, or composite averages. The relationship between class size and achievement remains debated. Smaller classes may permit greater individualization and feedback, but learning outcomes also depend on teacher quality, instructional methodology, leadership, motivation, socioeconomic circumstances, parental support, curriculum quality, and educational resources.

Systematic evidence supports a qualified interpretation. Filges *et al.* (2018) ^[8] found that effects of smaller classes were generally modest and heterogeneous. Thus, the present study investigates whether performance differs among students exposed to small, medium, and large classroom environments without presuming a causal effect.

3. Theoretical Framework

The study is situated within an Input–Process–Output perspective of educational effectiveness and a social-pedagogical conception of classroom learning. Class size and teacher–student ratio constitute structural inputs; teacher attention, student participation, and classroom conditions represent processes; while academic scores, subject performance, grades, and satisfaction represent outcomes.

The framework proposes that class size may relate to achievement through classroom processes: class size may affect teacher attention, student participation, and classroom noise, which in turn may be associated with academic performance. Observational evidence showing more frequent personalized teacher–student contacts in smaller classes provides conceptual support for this pathway (Blatchford *et al.*, 2011) ^[1].

4. Class Size and Teacher Attention

Teacher attention concerns the extent to which teachers can monitor, interact with, guide, assess, and respond to individual students. Smaller classrooms potentially allow greater opportunities to answer questions, inspect work, diagnose misconceptions, provide individualized explanations, and monitor engagement. Blatchford *et al.* (2011) ^[1] reported that students in smaller classes received more individualized teacher attention and active interaction. Brühwiler and Blatchford (2011) ^[1, 4] likewise found that smaller classes were associated with favourable classroom processes while adaptive teaching competence remained consequential.

5. Class Size and Student Participation

Student participation includes asking and answering questions, contributing to discussions, undertaking classroom exercises, participating in group activities, and interacting constructively with teachers and peers. As class size increases, a fixed instructional period must accommodate more learners, potentially reducing individual opportunities to participate. Blatchford *et al.* (2011) ^[1] found that classroom engagement declined with increasing class size, with important implications for lower-achieving secondary students.

6. Class Size, Classroom Noise and Management

Classroom management refers to the strategies through which teachers organize behaviour, instructional activities, time, movement, and interactions. As classroom numbers increase, management can become more demanding, potentially increasing noise, off-task behaviour, and the proportion of instructional time devoted to restoring order. Nevertheless, teacher competence can moderate these effects, and a large class is not inherently disorderly.

7. Teacher–Student Ratio and Academic Performance

Teacher–student ratio reflects the number of students relative to available teaching personnel. High ratios can increase lesson preparation, marking, assessment, record keeping, behavioural management, and student-support demands. Aggregate ratios, however, may conceal differences between actual classrooms; for this reason, the present study emphasizes actual class size while also describing teacher–student-ratio categories.

8. Class Size and English Language Performance

English Language occupies a strategic position in Nigerian secondary education as both an academic subject and a major language of formal instruction. Effective English teaching frequently requires reading, writing, oral communication, correction, and feedback. Large classes can constrain these processes, while smaller classes may permit more interaction and personalized feedback. English achievement nevertheless also depends on prior literacy, language environment, instructional resources, reading habits, teacher competence, and socioeconomic factors.

9. Class Size and Mathematics Performance

Mathematics requires cumulative conceptual understanding, procedural competence, practice, feedback, and problem-solving. Smaller classes may facilitate the identification of misconceptions and targeted explanations. However, African evidence has not uniformly shown an independent class-size effect. Lockheed and Komenan (1989) ^[14] found that teaching processes were important in analyses of mathematics achievement in Nigeria and Swaziland, illustrating the need to examine classroom mechanisms rather than class size alone.

10. Class Size and Student Satisfaction

Student satisfaction reflects students' affective evaluation of classroom experiences, including teacher accessibility, classroom comfort, participation opportunities, peer relationships, and instructional support. Manageable classes may strengthen students' sense of belonging and access to teachers, whereas overcrowded classrooms may be associated with anonymity, noise, competition for resources, and fewer opportunities for participation.

11. Empirical Evidence and Nigerian Context

International class-size research has produced heterogeneous findings. Experimental and observational studies have sometimes identified benefits of smaller classes, but systematic reviews show that average achievement effects are often modest and context dependent (Filges *et al.*, 2018) ^[8]. Evidence concerning classroom processes is more consistent, with smaller classes frequently

associated with more individualized interaction and engagement.

The Nigerian context makes the issue especially relevant because public education operates under demographic and resource pressures. Historical and more recent sector analyses have documented overcrowding, uneven infrastructure, and teacher-supply challenges. These conditions suggest that class size should be examined alongside physical infrastructure, teacher deployment, instructional resources, and teaching quality.

12. Methodological Issues and Gap in the Literature

Class-size research faces selection bias, confounding, measurement differences, and non-random allocation of students. Socioeconomic background, school resources, teacher competence, prior achievement, parental education, and location may influence both class placement and achievement. Studies also differ in whether they measure actual class enrolment or aggregate student–teacher ratios.

Much of the strongest evidence originates from high-income systems, while many Nigerian studies are geographically restricted. The present study addresses part of this gap by comparing 274 students across six Nigerian locations and examining academic outcomes alongside teacher attention, participation, noise, and satisfaction. Because the study is ex-post facto, however, associations are not interpreted as definitive causal effects.

Methodology

1. Research Design

The study adopted an ex-post facto comparative research design. The design was appropriate because class size had already occurred naturally within the participating schools and was not manipulated by the researchers. Students were compared according to their existing classroom-size conditions rather than being experimentally assigned.

2. Study Area

The study was conducted among selected public secondary schools in Lagos, Oyo, Rivers, Enugu, the Federal Capital Territory (FCT), and Kano. These locations represent different geographical, demographic, and educational contexts within Nigeria.

3. Population and Sample

The target population comprised students attending public secondary schools in the selected locations. Students from JSS3, SS1, and SS2 were represented. The analytical sample consisted of 274 students: 92 in small classes (≤ 35 students), 91 in medium classes (36–55), and 91 in large classes (≥ 56).

4. Sampling Procedure

A multistage sampling approach was adopted. Public secondary schools and eligible classes were identified across the selected locations, classrooms were classified using actual enrolment, and eligible students from JSS3, SS1, and SS2 were selected until the required sample distribution was achieved. Because the study was ex-post facto, no student or teacher was reassigned for research purposes.

5. Study Variables and Operational Definitions

The principal independent variable was class size, analysed as actual classroom enrolment and categorically as small (≤ 35), medium (36–55), and large (≥ 56). Teacher attention, student participation, and classroom noise were coded on three-level ordinal scales. The principal dependent variable was academic performance measured as average percentage score, with English Language score, Mathematics score, grade classification, and student satisfaction as additional outcomes. State, age, sex, and class level served as control variables.

6. Data Quality and Coding

The dataset was checked for completeness, consistency, valid coding, and logical relationships among variables. Class-size values were cross-checked against the classification rules, categorical variables against the codebook, and academic scores against expected ranges.

7. Statistical Analysis

Frequencies and percentages summarized categorical variables, while means and standard deviations summarized continuous variables. One-way ANOVA was specified to compare mean academic, English Language, and Mathematics scores across class-size categories, with robust alternatives where assumptions were violated. Correlation analysis assessed the relationship between actual class size and academic performance, while multiple linear regression was specified to examine class size after adjustment for selected covariates. Categorical outcomes were assessed using cross-tabulations and appropriate association tests. Statistical significance was evaluated at $p < .05$, with 95% confidence intervals and effect sizes where applicable.

8. Statistical Assumptions

Relevant assumptions for ANOVA and regression were to be assessed, including variance homogeneity, residual distributions, linearity, homoscedasticity, influential observations, and multicollinearity. Because CLASS_SIZE, SIZE_CATEGORY, and TEACHER_STUDENT_RATIO encode closely overlapping information, they were not to be entered simultaneously as interchangeable predictors without diagnostic justification.

9. Ethical Considerations

Students' identifying information was excluded from analytical presentation, and identification numbers were used solely for data organization. Academic records and classroom information were treated confidentially and reported in aggregate form. Applicable institutional and school-level ethical requirements, including appropriate consent or assent procedures for research involving minors, were to be observed.

10. Methodological Limitations

The ex-post facto design does not provide the same degree of causal identification as randomized research. Unmeasured factors such as prior academic ability, socioeconomic background, parental education, teacher qualifications, school resources, and attendance may partly account for observed differences. The strong

correspondence among class size, teacher–student ratio, teacher attention, participation, and noise also require caution in interpreting these variables as statistically independent determinants.

Results and Discussion

The study examined 274 students across three class-size categories: small ($n = 92$), medium ($n = 91$), and large ($n = 91$). The analysis revealed a clear descriptive gradient in which academic performance was highest among students in small classes, intermediate among those in medium classes, and lowest among those in large classes. The same general pattern was evident in English Language, Mathematics, grade classification, and student satisfaction.

1. Distribution of Students by Class-Size Category

Class-size category	Definition	Frequency	Percentage
Small	≤ 35 students	92	33.6
Medium	36–55 students	91	33.2
Large	≥ 56 students	91	33.2
Total		274	100.0

The sample was almost equally distributed across the three class-size groups, providing a balanced basis for comparative analysis.

2. Class Size and Academic Performance

Class-size category	n	General pattern of academic scores	Performance level
Small (≤ 35)	92	Predominantly about 79–92%	High
Medium (36–55)	91	Predominantly about 58–74%	Moderate
Large (≥ 56)	91	Predominantly about 34–46%	Low

Students in small classes recorded substantially higher academic scores than their counterparts in medium and large classes. Students in medium-sized classes occupied an intermediate position, while those in large classes consistently recorded the lowest scores. The supplied Batch 1 check reported approximate means of 82.7%, 64.0%, and 40.2% for small, medium, and large classes respectively; these figures are retained as a preliminary check rather than represented as full-sample estimates.

3. English Language and Mathematics Performance

Outcome	Small classes	Medium classes	Large classes
English Language	High	Moderate	Low
Mathematics	High	Moderate	Low

Both subject-specific outcomes reproduced the same gradient as overall academic performance. Inspection of the supplied data indicates that English scores are generally approximately two percentage points above overall academic score, while Mathematics scores are approximately two points below it. The three continuous achievement measures are therefore highly dependent and should not be interpreted as statistically independent confirmations of the same finding.

4. Grade, Teacher Attention, Participation, Noise and Satisfaction

Variable	Small (≤ 35)	Medium (36–55)	Large (≥ 56)
Predominant grade	Distinction	Credit	Pass/Fail
Teacher attention	High	Moderate	Low
Student participation	High	Moderate	Low
Classroom noise	Quiet	Moderate	Noisy
Student satisfaction	High	Moderate	Low

The classroom-process indicators displayed an exceptionally consistent gradient. Small classes corresponded with greater teacher attention, participation, quieter conditions, stronger grades, and higher satisfaction. Large classes showed the reverse pattern. These results are directionally consistent with observational evidence that smaller classes permit more individualized interaction and engagement (Blatchford *et al.*, 2011)^[1].

However, teacher attention, participation, classroom noise, teacher–student ratio, grade, and satisfaction are unusually tightly aligned with class-size category in the supplied dataset. Consequently, conventional mediation or multivariable models could overstate independent effects. These variables are best interpreted as strongly associated classroom conditions rather than independently established causal mechanisms.

5. Discussion of Major Findings

The principal finding is that class size was strongly associated with academic performance in the sampled students. Smaller classes coincided with stronger overall, English Language, and Mathematics performance, while larger classes coincided with weaker outcomes. The result is consistent with the proposition that manageable classroom numbers can support teacher–student interaction, feedback, participation, and classroom management.

The magnitude and regularity of the differences in the present dataset are substantially stronger than the average effects reported in international systematic evidence. Filges *et al.* (2018)^[8] found that class-size effects were generally modest and heterogeneous. This contrast requires caution: the present results should not be interpreted to mean that reducing every Nigerian secondary-school class to 35 students or fewer would automatically generate the large achievement gains observed in this dataset.

The findings nonetheless have practical relevance. They indicate that students represented in the dataset experienced markedly different academic and classroom conditions across the three class-size categories. Class-size management should therefore be considered alongside teacher recruitment and deployment, infrastructure, instructional resources, professional development, and effective classroom management.

Conclusion and Recommendations

1. Conclusion

This study examined class size and its relationship with students' academic performance among selected public secondary schools in Nigeria using an ex-post facto comparative design. The findings revealed a clear and consistent class-size gradient. Students in small classes

recorded the strongest academic performance, students in medium-sized classes demonstrated intermediate performance, and students in large classes recorded the lowest performance. Similar patterns were observed in English Language and Mathematics scores and grade classifications.

The findings further demonstrated systematic differences in classroom conditions. Small classes were characterized by high teacher attention, high student participation, relatively quiet classroom conditions, and high student satisfaction. Medium-sized classes generally displayed moderate levels of these indicators, whereas large classes were associated with low teacher attention, low participation, greater classroom noise, and low satisfaction.

Because the study was ex-post facto, the findings establish strong associations within the study sample but cannot demonstrate that class size alone caused the observed differences. Unmeasured factors such as prior achievement, teacher quality, socioeconomic background, parental support, school resources, attendance, and instructional practices may also have contributed.

Overall, the study concludes that class size is an important correlate of academic performance and classroom learning conditions among the sampled Nigerian public secondary-school students. Effective class-size management should form part of a broader strategy incorporating teacher quality, infrastructure, instructional resources, and classroom management.

2. Recommendations

Federal and state education authorities should progressively reduce severe classroom overcrowding in public secondary schools, giving priority to schools substantially exceeding manageable enrolment levels.

Expansion of access to secondary education should be accompanied by corresponding investment in classrooms, furniture, instructional facilities, sanitation, and rehabilitation of deteriorated infrastructure.

Education authorities should recruit sufficient qualified teachers and address uneven deployment across schools, subjects, grade levels, and geographical areas.

Where immediate class-size reduction is impracticable, teachers should receive professional development in large-class pedagogy, including structured group work, peer-assisted learning, formative assessment, differentiated instruction, and classroom-management techniques.

School administrators should protect teacher attention and student participation through regular questioning, small-group activities, targeted academic support, continuous feedback, and opportunities for active learning.

Ministries of Education and school-management agencies should routinely monitor actual classroom enrolment rather than relying exclusively on aggregate student–teacher ratios. Schools experiencing both severe overcrowding and weak academic outcomes should receive priority in teacher deployment, classroom construction, instructional materials, and other educational interventions.

Future studies should use longitudinal, multilevel, natural-experimental, or credible quasi-experimental designs and incorporate prior achievement, socioeconomic background, parental education, teacher qualifications, school resources, and attendance.

Future research should measure teacher attention, student participation, classroom noise, engagement, and satisfaction

independently so that potential mediating mechanisms can be evaluated more credibly.

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