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Senior Secondary School Students' Perception of Class Size Influence on Chemistry Learning in Etche Local Government Area, Rivers State

***[1]Nduudee, J.N., & [2]Shedrack, T.**
[1]Department of Chemistry, Ignatius Ajuru University of Education Port Harcourt, Nigeria
[2]Department of Physics, Ignatius Ajuru University of Education, Port Harcourt, Nigeria

Corresponding author email:* joywereneeduu@gmail.com

Abstract
This research explores students' perception of how class size influences the learning of chemistry at the senior secondary school level in Etche LGA, Rivers State, Nigeria. Employing a descriptive survey design, the study surveyed 250 students from 10 secondary schools out of a total population of 1,950 students across thirteen schools in Etche LGA. Data collection was conducted using the "Influence of Class Size on Chemistry Students' Learning (ICSCSL)" questionnaire, which demonstrated high reliability with a Cronbach Alpha coefficient of 0.85. Mean and standard deviation were utilized to address research questions. Findings revealed that respondents generally concurred on the influence of class size on teachers' ability to supervise student notes, guide experiments, and support students with learning disabilities. Large class sizes were associated with challenges such as tedious lessons, student anxiety, limited teacher accessibility, and difficulties in managing student behaviour. The study underscores the importance of class size in shaping the quality of chemistry education delivery, advocating for strategies to tackle challenges posed by large class sizes and leverage the benefits of smaller class settings for an enhanced learning experience. The findings support the recommendation in the National Policy on Education to reduce the number of pupils accepted to each class.

Keywords: Class Size, Effective, Teaching, Learning, Chemistry

Introduction

Every nation requires a substantial level of scientific literacy among its citizens to fully capitalize on the abundant opportunities presented by science (Amoke, 2020). Science is characterized as a distinct and compelling discipline that employs a systematic approach to discover and formulate new knowledge. According to Nnorom (2019), teaching and training, emphasizing inquiry and inherent attitude traits, constitute science. Given its impact on our lives and careers, science plays a significant role in society. Science education, a subset of general education, imparts knowledge about the scientific method and its outcomes to students. Recognizing the importance of science to society, the federal government's Ministry of Education has mandated its inclusion in secondary school curricula. Amoke (2020) lists chemistry as one of the newly-introduced subjects. Chemistry occupies a unique position among the various scientific courses offered to students in their final year of high school. It focuses on substances and the changes they undergo due to alterations in their molecular composition, as defined by the Dictionary (2000). Students who take chemistry classes often develop scientific habits that benefit them in many other aspects of their lives. These practices include self-reliance, scepticism toward superstitions, critical thinking, and respect for others' opinions (Ali, 2012). The majority of required scientific courses begin with chemistry. Most educational studies and programs have concentrated on enhancing students' academic success in Chemistry. As a branch of science, chemistry is indispensable to any country's efforts to advance its knowledge and technology.

Udofia and Udo (2016) highlighted the crucial role of chemistry in national and technological advancement. Chemistry classes provide students with opportunities to build upon their existing knowledge about the world, better

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preparing them for future challenges. The use of effective teaching strategies by educators significantly impacts the class size and serves as the rationale for many educational programs and research endeavours. Various factors, including home environment, school conditions, and teacher attributes, can influence children's academic performance, both positively and negatively. The size classification of a class, whether considered large or small, is determined by factors such as the instructor's approach, school climate, and pedagogical philosophies and theories (Sparks, 2015).

Class sizes are on the rise due to a variety of factors, including inadequate school facilities, population growth, and a shortage of subject teachers. While many educators believe that smaller class sizes result in higher student achievement and facilitate more meaningful feedback from teachers, the correlation between class size and test scores remains uncertain (Amoke, 2020). Advocates for smaller class sizes argue that children benefit academically and experience less frustration when they receive more individual attention from teachers. Research conducted by Kedney (2013) suggests that students who were part of smaller classrooms during their early education tend to perform better academically as they progress to larger courses in middle and high school. Causes of subpar academic achievement include:

1. Lack of Funds.
2. School Structure and Organization.
3. Teachers Qualification.
4. Curriculum and Teaching Philosophies.
5. Economic background of the learner.
6. Poor attitude toward Chemistry concept
7. Increase in class size.

The term "class size" refers to the total number of students that a single educator may teach during an instructional session. Eboatu and Ehiri (2018) define class size as the number of students and teachers present in a classroom at any given time. According to Adeyenni cited in Adolphus and Godsgift (2022), class size is a measure of the typical number of students in a school's classroom. Effective management of class size requires careful coordination of educational resources to ensure a high level of productivity (Imoke et al., 2006). In the field of education, class sizes are typically categorized as large or small. Aliu (2015) defines a small class size as consisting of 15–40 students per instructor, while a large class size includes 41 students or more.

As class size decreases, the likelihood of a teacher spending more time with each student increases. In smaller classes, teachers may find it easier to monitor student progress, provide targeted feedback, identify specific needs, and establish individualized goals. Additionally, teachers often report stronger relationships with students when class sizes are smaller. Ajayi et al. (2017) proposed raising the average class size as a possible solution to the problem of increasing educational capital costs. However, Johnson (2017) highlighted concerns that rising class sizes could be a direct consequence of growing enrollment at many schools, posing challenges for students. Public and mudroom secondary schools often cram a large number of students into inadequate, rundown learning facilities, exacerbated by constant strikes and low teacher salaries, which hinder the implementation of effective learning programs and contribute to overcrowded classrooms. Various factors contribute to the increase in class sizes, including overcrowding in classrooms, population growth, and a shortage of qualified teachers in some subjects. Eboatu and Ehirim (2018) noted that in classrooms with too many pupils, children become disengaged, and teachers struggle to provide the individual attention needed, resulting in diminished academic performance. According to the Federal Republic of Nigeria recommended student-teacher ratios for pre-primary, primary, and secondary schools are 1:25, 1:35, and 1:40, respectively. Some researchers have suggested class size as a metric for evaluating school effectiveness. Educators and academics concur that larger classes adversely affect student performance. Reduced class sizes enhance teaching quality and student learning, enabling more individualized attention. In his 2013 article, Abdullahi defined poor academic performance as any level of performance below what is considered desirable.

Statement of the problem

Due to inadequate financing and infrastructural issues (i.e., large classrooms), the educational program has devolved into a fight for survival for both instructors and pupils. Many children were squeezed inside the old, crumbling school buildings for lessons. There has never been an appropriate focus on teaching and learning programming due to the pitiful remuneration of teachers and the constant strike activities. Only in a comfortable setting, free from distractions, can students and instructors work together to foster learning and instruction. The researchers intend to

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determine the influence of class size on effective teaching and learning of chemistry in Rivers State senior secondary schools in light of the aforementioned difficulties.

Aim and Objectives of the Study

The primary goal of this research was to examine students' opinions regarding how class size affects the learning of chemistry at the senior secondary school level in Etche LGA, Rivers State, Nigeria. The objectives of the study are to:

1. Determine the effects of class size on student-teacher interactions in the context of chemistry education in secondary schools
2. Find out the impact of class size on the effectiveness of chemistry teaching and learning in senior secondary schools in Etche Local Government Area, Rivers State
3. Identify how class size influences the quality of chemistry education delivery in secondary schools, specifically in terms of teacher accessibility, student comfort, and instructional effectiveness

Research Questions

The study addressed the following questions

1. What are the effects of class size on student-teacher interactions in the context of chemistry education in secondary schools?
2. What is the impact of class size on the effectiveness of chemistry teaching and learning in senior secondary schools in Etche Local Government Area, Rivers State?
3. How does class size influence the quality of chemistry education delivery in secondary schools, specifically in terms of teacher accessibility, student comfort, and instructional effectiveness?

Methodology

This study used a descriptive survey approach for its investigation. Etche Local Government Area in Rivers State was the site of the research. One thousand nine hundred fifty (1,950) students from thirteen different secondary schools in the Etche Local Government Area of Rivers State made up the study's population. Using a random sampling approach, a sample of 250 students drawn from 10 public secondary schools made up the sample size. The research used a questionnaire with twenty items as its data collection tool. Influence of Class Size on Chemistry Students' Learning (ICSCSL) was the title of the questionnaire. This instrument made use of a modified 4-point Likert scale. Two specialists assessed the instrument's face and content validity. The reliability coefficient of the instrument was 0.85 using the Cronbach Alpha formula. To make a decision, a mean of 2.50 was considered sufficient, while a mean of less than 2.50 was considered inadequate. The research questions were analysed using mean and standard deviation

Results

Research question 1: What are the effects of class size on student-teacher interactions in the context of chemistry education in secondary schools?

Table 1: Descriptive statistic on the influence of class size on student-teacher interactions in the context of chemistry education in secondary schools

S/N	ITEMS	Mean	SD	Remark
1	High rate of negative peer group influence in large classes.	2.76	1.11	Agree
2	There is effective student-teacher interaction in large class	2.36	1.13	Disagree
3	During the lesson session, teachers in small classes are better able to pinpoint which pupils need further help than in larger classes.	2.22	1.08	Disagree
4	The inability of teachers to effectively follow up students' progress after assessment (e.g test/assignment)	3.28	0.96	Agree
5	Discipline is not effectively enforced in large classes.	3.64	0.63	Agree
6	In smaller classes, teachers are more likely to assign more homework than in larger ones.	3.68	0.74	Agree
	Grand Mean	**2.99**		**Agree**

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The results from Table 1 indicate that the majority of respondents agreed with several statements regarding the effects of class size on student-teacher interactions in the context of chemistry education in secondary schools. Specifically, participants agreed that there is a high rate of negative peer group influence in large classes, teachers are unable to effectively follow up on students' progress after assessment, discipline is not effectively enforced in large classes, and teachers are more likely to assign more homework in smaller classes compared to larger ones. However, respondents disagreed with the statement that there is effective student-teacher interaction in large classes and that teachers in small classes are better able to pinpoint which pupils need further help than in larger classes. The grand mean suggests that participants generally agreed that class size has an impact on student-teacher interactions in chemistry education in secondary schools.

Research Question 2: What is the impact of class size on the effectiveness of chemistry teaching and learning in senior secondary schools in Etche Local Government Area, Rivers State?

Table 2: Descriptive statistics on the impact of class size on the effectiveness of chemistry teaching and learning in senior secondary schools in Etche Local Government Area, Rivers State

S/N	ITEMS	Mean	SD	Remark
1	Teachers have little or no access to supervise student's chemistry note during lesson	3.28	0.91	Agree
2	Teachers provide optimum support for students with learning disability in small classes rather than large classes.	3.54	0.57	Agree
3	The inability of teachers to effectively guide students during chemistry experiments in large class size	3.72	0.45	Agree
4	The objective for a student's presentation cannot be achieved in a large class size	3.28	0.94	Agree
5	Deviant conduct is prevalent in big classes.	3.66	0.79	Agree
6	Punishment for deviant behaviour encroaches into lesson periods in large class	3.64	0.48	Agree
7	Effective and adequate guidance and instruction of students carrying out chemistry practice in small class	3.84	0.37	Agree
	Grand Mean	**3.57**		**Agree**

The results from Table 2 suggest that participants generally agreed on several aspects regarding the impact of class size on the effectiveness of chemistry teaching and learning in senior secondary schools in Etche Local Government Area, Rivers State. Specifically, respondents agreed that teachers have limited access to supervise students' chemistry notes during lessons, teachers provide optimal support for students with learning disabilities in smaller classes compared to larger ones, and there is an inability of teachers to effectively guide students during chemistry experiments in large class sizes. Also, participants agreed that the objectives for student presentations cannot be achieved in large class sizes, deviant conduct is prevalent in big classes, and punishment for deviant behaviour encroaches into lesson periods in large classes. Furthermore, respondents agreed that effective and adequate guidance and instruction of students carrying out chemistry practice occurs more frequently in smaller classes. The grand mean suggests that participants strongly agreed with the impact of class size on the effectiveness of chemistry teaching and learning in senior secondary schools in Etche Local Government Area, Rivers State.

Research Question 3: How does class size influence the quality of chemistry education delivery in secondary schools, specifically in terms of teacher accessibility, student comfort, and instructional effectiveness?

Table 3: Descriptive statistics on how class size influences the quality of chemistry education delivery in secondary schools, specifically in terms of teacher accessibility, student comfort, and instructional effectiveness

S/N	ITEMS	Mean	SD	Remark
1	Chemistry lessons in large classes are tedious and time-consuming.	3.08	0.89	Agree
2	Because there are so many people in a big classroom, some students may experience anxiety and discomfort.	2.28	1.06	Disagree
3	From their seats in the rear of a big classroom, students can scarcely make out the words on the board.	3.28	0.78	Agree
4	Teachers in small class sizes are more accessible to students than in large class sizes	2.98	1.01	Agree
5	Teachers are unable to effectively access students' test and exam scripts in a large class.	3.54	0.76	Agree
6	There is inadequate chemistry field trip planning and organization in large classes.	1.82	1.82	Disagree
7	Teachers are unable to effectively manage students in large classes.	**3.50**	0.92	Agree
	Grand Mean	**2.93**		**Agree**

The results indicate that participants generally agreed on several aspects regarding how class size influences the quality of chemistry education delivery in secondary schools, specifically in terms of teacher accessibility, student comfort, and instructional effectiveness. Specifically, respondents agreed that chemistry lessons in large classes are tedious and time-consuming, students may experience anxiety and discomfort due to the large class size, and students seated at the rear of a big classroom may have difficulty seeing the board. Moreover, participants agreed that teachers in small class sizes are more accessible to students than in large class sizes and that teachers are unable to effectively access students' test and exam scripts in large classes. Additionally, respondents agreed that there is inadequate planning and organization for chemistry field trips in large classes and that teachers struggle to effectively manage students in large classes. The grand mean suggests that participants agreed with the influence of class size on the quality of chemistry education delivery, particularly in terms of teacher accessibility, student comfort, and instructional effectiveness in secondary schools.

Discussion

While there were mixed perceptions on the effectiveness of student-teacher interactions in large classes, respondents generally agreed that class size affects teachers' ability to supervise student notes, guide students during experiments, and provide optimal support for students with learning disabilities. These findings on the importance of considering class size in shaping the quality of chemistry education delivery are supported by some earlier studies (Darling-Hammond, 2000; Blatchford & Mortimore, 1994; Chingos & Whitehurst, 2012). The study found that large class sizes contribute to challenges such as tedious and time-consuming lessons, student anxiety and discomfort, difficulty in viewing the board, and limited accessibility for teachers to access students' test and exam scripts. Moreover, large class sizes were associated with inadequate planning for field trips and difficulties in managing student behaviour. The findings on the challenges faced by teachers in large classes, earlier findings by Hattie (2003), McIntyre et al. (2010) and Osborne and Collins (2001) are examples. The study suggests that class size influences the quality of chemistry education delivery in terms of teacher accessibility, student comfort, and instructional effectiveness. Smaller class sizes appear to offer advantages in terms of facilitating better student-teacher interactions, enhancing teaching and learning effectiveness, and providing a more conducive learning environment. Regarding the finding on the impact of class size on teacher-student interaction and instructional effectiveness, some earlier studies are in support of it (Johnson, & The Project on the Next Generation of Teachers, 1990; Blazar &Kraft, 2017; Pietsch et al., 2003).

Conclusion

The study highlights the crucial role of class size in shaping the quality of chemistry education in secondary schools. It suggests that policymakers and educators should explore strategies to address the challenges associated with large class sizes and consider the potential benefits of smaller class sizes in improving the overall learning experience for

students. The findings indicate that teachers face numerous challenges in large classes, including increased time spent on class management and discipline, which negatively impact content delivery and students' learning of chemistry. These challenges include large classroom size, inadequate infrastructure, difficulty in maintaining control due to large class sizes, and limited capacity to provide timely feedback and individualized support to students. Addressing these challenges is essential for teachers to better understand and support their students, ultimately enhancing the quality of chemistry education delivery in secondary schools.

Recommendations

1. One recommendation from the National Policy on Education is to reduce the number of pupils allowed in each classroom. This will promote increased collaboration and communication among students and teachers to increase experiences that could facilitate effective learning.
2. To guarantee effective evaluation and feedback in teaching and learning, educational policymakers, administrators, and government agencies must adhere to the recommended class size as outlined in the National Policy on Education.
3. Teachers should employ positive reinforcement to encourage good behaviours and discourage deviant behaviours generally during lesson periods.

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