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### **Influence of Large Class Size on the Effective Teaching and Learning of Chemistry in Secondary Schools in Onitsha North Local Government Area of Anambra State.**

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#### **Abstract:**

The study investigated the influence of large class size on the effective teaching and learning of chemistry in secondary schools in Onitsha North Local Government Area, Anambra state. The study adopted a descriptive survey research design. Four research questions guided the study.. Simple random sampling technique was used. One hundred and eighty (180) senior secondary two (SS 2) Chemistry students and twenty (20) Chemistry teachers were sampled and used for the study. The instrument for data collection was structured questionnaire developed by the researchers. Also, the instrument was validated by three experts and the reliability of the instrument was obtained using Cronbach alpha reliability which gave a reliability index of 0.85. Data collected were analyzed using mean and standard deviation to answer the research questions. The findings of the study revealed the followings: It was revealed that large class size negatively influence the teaching of Chemistry in secondary school. It was revealed that large class size negatively influence the learning of Chemistry in secondary school. It was revealed that large class size have ineffective classroom interaction during Chemistry lesson. It was revealed that teachers do not provide optimum support for students in large class size during Chemistry lesson.

**Keywords:** Influence, Large Class Size, Effective Teaching, Learning of Chemistry, Secondary Schools

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#### **Introduction**

Scientific knowledge serves as a fundamental force driving global progress and acts as a cornerstone for national development. It represents a distinct field of study characterized by its methodical approach to acquiring and organizing knowledge through systematic investigation. Nations can maximize the vast benefits that scientific advancement offers only when their populations possess adequate scientific understanding and literacy.

According to Pember and Humbe (2009), science encompasses educational processes, particularly within academic institutions, aimed at enhancing environmental awareness and cultivating systematic research abilities alongside

natural behavioral traits. The significance of scientific knowledge in society stems from its direct connection to everyday experiences and professional development. Both scientific methodologies and discoveries are transmitted through specialized educational frameworks, particularly science education programs.

Recognizing science's vital role in society, Nigeria's Federal Government, working through the Federal Ministry of Education, integrated scientific subjects into the national secondary education curriculum, with Chemistry being among these essential subjects.

Among the various scientific disciplines taught at the senior secondary level, Chemistry holds a distinctive place. Studying Chemistry involves the pursuit of knowledge and truth, fostering qualities such as perseverance, patience, and objectivity in students (Opara & Waswa, 2013). Chemical education nurtures scientific thinking patterns that students can apply across different life domains, including critical reasoning skills, rejection of superstitious beliefs, and appreciation for diverse perspectives (Yunus & Ali, 2012). As a scientific discipline, Chemistry serves as a prerequisite for numerous science-oriented academic programs (Oloyede, 2010).

Enhancing student performance in Chemistry remains a primary focus driving educational research initiatives and program development. Beyond individual student characteristics, various factors including family background, institutional conditions, and instructor qualifications significantly influence academic outcomes, either beneficially or detrimentally. The number of students in a classroom represents one institutional factor that affects learning effectiveness, highlighting the importance of implementing efficient pedagogical approaches that promote improved comprehension and knowledge retention.

The term "class size" refers to the total number of students assigned to a single teacher throughout an academic year, which can range from small to large groups. This concept parallels the management principle of "span of control," describing how many individuals a supervisor can effectively oversee (Micheal, 2010). It represents an administrative metric indicating student-to-teacher ratios during the academic period. Adeyemi (2008) characterized class size as an educational indicator reflecting the typical number of students per classroom within an institution.

Educators, functioning as classroom coordinators, must manage, monitor, and instruct their assigned students effectively during instructional periods. Common perception suggests that smaller class groups experience fewer behavioral interruptions, leading to enhanced teacher-student interaction and superior learning outcomes compared to larger classes. Increasing student numbers typically results in more disruptions and reduced actual learning time, as instructors must address behavioral issues rather than focus on teaching. However, Hattie (2009) emphasized that mere student-teacher interaction doesn't guarantee improved learning outcomes; rather, the quality and effectiveness of these interactions determine educational

success. Sparks (2010) noted that class can be said to be large when the student number is more than 25. 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 & Yara, 2011). It is considered as one of the important determinants of academic achievement over which teachers in schools have little or no control. Mokobia and Okoye (2011) explained that educators universally have identified class size as important and desirable attribute of effective educational system. According to Doyle (2014), the focus is on the needs, interest and comfort of the students. 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. 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, Glewwe & Wisniewski, 2013). The increase of the intake of senior secondary school students in a large class has numerous benefits for the schools and the country as a whole. One of the benefit is 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. The question of optimal classroom enrollment remains a contentious topic, particularly during the current era marked by rapidly expanding student populations, economic constraints, educator shortages, and declining academic performance. Educational professionals hold divergent views regarding what defines small, large, or appropriate class sizes. The perception of whether a classroom is considered overcrowded or adequately sized depends on various elements including instructor-related factors, institutional conditions, and underlying educational principles and approaches. Multiple circumstances contribute to oversized classrooms, including insufficient educational facilities, demographic growth, and inadequate numbers of specialized subject instructors. Within typical classroom settings, educators must address the challenges of working with students who possess diverse personalities, backgrounds, perspectives, interests, attitudes, and capabilities (Eboatu & Ehirim, 2018).

Within Onitsha North Local Government Area in Anambra State, the problem of limited classroom facilities is compounded by a shortage of chemistry instructors, as retiring teachers are not promptly replaced annually. This situation results in elevated student-to-teacher ratios across schools and creates gaps in specialized subject instruction. Frequently, multiple classes must be merged for chemistry lessons due to these shortcomings, creating oversized learning groups that may impede students' academic progress in chemistry. The researcher noted that several secondary

schools in Onitsha South Local Government Area experience large class sizes specifically due to insufficient numbers of qualified chemistry teachers. Some of the problems that are associated with large chemistry classes are congestion, noisy classes, little or no interpersonal relationships between teacher and students, etc. In a chemistry class of 50:1 students-teacher ratio, some of the students will not be able to hear the teacher audibly while teaching and learning process are ongoing. Consequently, this situation results in inadequate delivery of instructional content from chemistry educators to their students, ultimately leading to minimal comprehension and retention of the subject matter being taught. As a result, this research aims to examine how oversized classroom enrollments affect the quality of chemistry instruction and student learning outcomes in secondary educational institutions within Onitsha North Local Government Area of Anambra State.

### Methodology

The study adopted a descriptive survey research design. The population of the study comprised all the secondary school two chemistry (S.S. II) students and chemistry teachers in all the sixteen (16) public secondary schools in Onitsha North Local Government Area of Anambra State. Simple random sampling technique was used to select ten (10) Secondary Schools out of Sixteen (16) Public Secondary Schools in Onitsha North Local Government Area of Anambra State. Eighteen (18) Chemistry Students and Four (2) Chemistry Teachers were sampled each from the Ten (10) Public Secondary Schools using the same sampling technique, hence One Hundred and Eighty (180) Senior Secondary Two (SS 2) Chemistry Students and Twenty (20) Chemistry Teachers were sampled and used for the study. The sample size were Two Hundred (200), comprising SS2 Chemistry Students and Teachers. The instrument for data collection was a structured questionnaire developed by the researchers.

The method of data analysis for answering research questions was mean and standard deviation. Interpretation is based on real limit of numbers, mean of 3.50 - 4.50 implies Strongly Agreed (SA), 2.50 - 3.49 implies Agreed (A), 1.50 - 2.49 implies Disagreed (D) and 0.50 -1.49 implies Strongly Disagreed (SD). The researchers considered any variable with 2.50 or above was accepted while any item that has a mean below 2.50 was rejected.

### Result and Discussion

#### Results

**Research Question One:** What is the influence of large class size on the teaching of Chemistry in Secondary Schools?

**Table 1:**

Means and Standard Deviation on the influence of large class size on the teaching of Chemistry in Secondary School.

S/N	Statement	$\bar{X}$	SD	DECISION
1	Oversized classroom enrollment impacts the speed at which instructional content is delivered during lessons	2.24	1.09	Disagreed
2	Educators can recognize learners who struggle with comprehending the core concepts of a lesson.	2.52	1.11	Agreed
3	Excessive student numbers extend the duration instructors dedicate to managing administrative duties rather than teaching.	2.23	0.837	Disagreed
4	Educators invest considerable time in classroom management and discipline instead of focusing on instruction.	1.99	0.713	Disagreed
5	Instructors can evaluate the learning requirements of their students.	2.53	1.12	Agreed
6	Teachers can identify and address the psychological and social needs of their pupils.	2.52	1.11	Agreed
<b>Cluster Mean</b>		<b>2.33</b>	<b>0.997</b>	

The analysis of the result in table 1 on mean and standard deviation on the influence of large class size on the teaching of Chemistry school shows that items 1, 3, 4, and 6 has mean score of 1.5 - 2.49 set as the criterion for disagreed. However, item 2, 5 and 6 has mean score of 2.50 - 3.49 set as the criterion for agreed. The cluster mean of 2.33 and standard deviation of .0997 indicate that the influence of large class size on the teaching of Chemistry in secondary school is disagreed.

**Research Question Two:** What is the influence of large class size on the learning of Chemistry in Secondary Schools?

**Table 2:**

Mean and Standard Deviation of the influence of large class size on the leaning of Chemistry in Secondary Schools?

S/N	The implication of large class size on learning	$\bar{X}$	SD	Decision
1	Oversized classrooms hinder students' ability to absorb and comprehend information.	3.48	0.98	Agreed
2	The environment becomes a platform for socialization rather than focused learning.	3.08	0.83	Agreed

3	Knowledge transfer from educators to learners becomes inadequate and incomplete.	3.48	0.92	Agreed
4	Elevated rates of academic failure occur in overcrowded learning environments.	3.32	0.91	Agreed
5	Disruptions caused by disengaged students impede the learning process in oversized classes.	3.40	1.07	Agreed
6	Students lack incentive to participate in classroom activities.	3.36	0.90	Agreed
7	Overcrowded conditions provide chances for students to display disruptive conduct as teachers struggle to maintain order.	3.24	0.95	Agreed
8	Educational resources and tools necessary for effective learning are insufficient in large classroom settings.	3.40	0.88	Agreed
9	Frequent tardiness to instructional sessions becomes common.	3.00	0.84	Agreed
10	Learners demonstrate reduced focus and concentration in oversized classroom environments.	3.44	0.83	Agreed
<b>Cluster Mean</b>		<b>3.32</b>	<b>0.91</b>	

The analysis of the result in table 2 on mean and standard deviation on the influence of large class size on the learning of Chemistry school shows that items 1,2,3,4,5,6,7,8,9, and 10 has mean score of 2.50 - 3.49 set as the criterion for agreed. The cluster mean of 3.32 and standard deviation of 0.91 indicate that the influence of large class size on the learning of Chemistry in secondary school is agreed. This implies that there are negative influence of large class size on effective learning of Chemistry.

**Research Question Three:** What influence does large class size have on classroom interaction during Chemistry lesson in secondary schools?

**Table 3:**

Mean and standard deviation on the influence of large class size on classroom interaction during Chemistry lesson in secondary school.

S/N	Items	$\bar{X}$	SD	Decision
1	Increased incidence of harmful peer influence occurs in overcrowded classroom settings.	3.18	0.57	Agreed
2	Beneficial peer influence emerges within large classroom environments.	1.82	1.06	Disagreed
3	Meaningful interaction between students and instructors takes place in oversized classes.	1.90	0.89	Disagreed

4	Excessive classroom enrollment makes Chemistry instruction tedious and unengaging.	3.12	0.88	Agreed
5	Learners experience stress and discomfort due to overcrowded learning conditions.	2.80	1.16	Agreed
6	Oversized classrooms provide opportunities for productive outcomes.	1.70	0.45	Disagreed
7	Students positioned in rear seats struggle to see blackboard content clearly in crowded classrooms.	3.66	0.35	Agreed
8	Learners in large classes maintain adequate visibility of the instructional board.	2.30	0.46	Disagreed
9	Instructors can readily recognize students requiring additional support and focus during lessons in oversized classroom settings.	1.92	0.26	Disagreed
<b>Cluster Mean</b>		<b>2.48</b>	<b>0.67</b>	

The analysis of the result in table 3 on mean and standard deviation on the influence of large class size on the classroom interaction during chemistry lesson shows that items 2, 3, 6, 8, and 9 has mean score of 1.5 - 2.49 set as the criterion for disagreed. However, item 1, 4, and 5 has mean score of 2.50 - 3.49 set as the criterion for agreed. Item 7 has mean score of 3.66 that is for strongly agreed. The cluster mean of 2.48 and standard deviation of .67 indicate that the influence of large class size on the classroom interaction during Chemistry lesson is disagreed. This implies that large class size have ineffective classroom interaction during Chemistry lesson.

**Research Question Four:** What influence does class size have on teachers support during chemistry lesson?

**Table 4:**

Mean and standard deviation on the influence large class size have on teachers support during Chemistry lesson.

S/N	Item	X	S D	Decision
1	Oversized classrooms provide educators with additional opportunities to assist learners during Chemistry laboratory work and skill development, potentially enhancing individual student understanding.	1.73	0.85	Disagreed
2	Instructors deliver maximum assistance to students with learning challenges in overcrowded classroom environments.	1.96	0.17	Disagreed
3	Sufficient planning and coordination of educational excursions occur in large classroom settings.	3.10	0.87	Agreed
4	Teachers face challenges in providing proper supervision and direction during Chemistry laboratory activities in oversized classes.	3.95	0.22	Agreed

5	Student presentation goals remain unattainable in overcrowded learning environments.	3.88	0.28	Agreed
	<b>Cluster Mean</b>	<b>2.92</b>	<b>0.48</b>	

The analysis of the result in table 4 on mean and standard deviation on the influence of large class size have on teachers support during Chemistry lesson shows that items 1, and 2 has mean score of 1.5 - 2.49 set as the criterion for disagreed. However, item 3 has mean score of 3.10 set as the criterion for agreed. Items 4, and 5 has mean score of 3.50 - 4.50 set as the criterion for strongly agreed. The cluster mean of 2.92 and standard deviation of .48 indicate that teachers do not provide optimum support for students in large class size during Chemistry lesson.

### Discussions of the Findings

The finding of this study revealed that large class size negatively influence the teaching of Chemistry in secondary school. The findings are consistent with the findings of Olowe, (2021) who pointed out that large class size negatively influence teaching. Kobina (2021) asserted that large class size influences negatively the way and manner a teacher will be able to deal with the psychological needs of students. Because with larger class the teacher will be not be able to concentrate on the needs of students that is; personal, emotional and social aspect of the students. In support of this statement, Agyemeng (2009) believed that a large class size cannot help students to perform well academically because arrangement in class causes distress to them. A qualitative study by Owusu-Ansah (2014) suggested that teachers struggle as class sizes escalate which affect student academic performance in classroom.

The research findings demonstrate that oversized classroom enrollment adversely impacts Chemistry education in secondary schools. The investigation confirmed a correlation between classroom capacity and academic achievement. The study further established that meaningful learning becomes challenging within overcrowded educational environments. Excessive student numbers impair learners' comprehension abilities in Chemistry and compromise the quality of knowledge transmission from educators. This situation contributes to elevated academic failure rates. Disruptions caused by uncommitted students negatively affect the learning process in oversized classrooms.

Additional findings indicated diminished student motivation to participate in classes within large learning environments. Such conditions create opportunities for disruptive conduct as instructors struggle to maintain adequate classroom management. The research also highlighted insufficient educational resources to support effective learning in overcrowded settings. Oversized classes promote chronic tardiness and reduced student engagement during instruction, suggesting that large classroom environments do not facilitate optimal Chemistry learning outcomes.

These results align with Glass and Smith's (2019) research indicating that excessive student enrollment correlates with declining academic achievement. However, the findings contradict Barcca and Fredua's (2008) conclusions that evidence linking larger classes to diminished learning outcomes remains inconclusive. Furthermore, the study revealed that educators encounter difficulties conducting thorough assessments during group presentations, individual projects, research assignments, and oral evaluations, resulting in reduced student learning effectiveness due to limited participation in lessons and activities. These observations support the work of Altinok and Kingdon (2012) and Bosworth (2014), who reported that pedagogical approaches involving project-based learning with individual monitoring and continuous feedback for developing critical thinking skills prove ineffective in oversized classroom settings.

The research established that excessive classroom enrollment results in poor interactive communication during Chemistry instruction. The study confirmed the relationship between class capacity and instructional quality. Research outcomes revealed widespread negative peer influence in large classes and demonstrated that teachers cannot readily identify students requiring additional support during lessons. These findings support Miller and Cunningham's (2011) research indicating that educators who maintain respectful classroom environments earn greater student respect and are perceived as having higher academic expectations. Teachers are advised to prioritize learning processes over final grades, though this becomes more challenging when educational systems emphasize accountability and standardized testing.

The investigation revealed inadequate teacher support for students in oversized Chemistry classes. Students in large learning environments experience reduced involvement and receive insufficient instructor assistance during laboratory sessions. The study observed that educators cannot effectively identify learners requiring extra guidance during instruction in overcrowded settings. Rubin (2012) supports these findings, noting that teachers cannot dedicate adequate individual attention to ensure each student grasps Chemistry concepts in large classes. Similarly, Halbech, Ehrle, Zahorik, and Molnar (2011) discovered that oversized classes prevent educators from delivering comprehensive Chemistry content due to instructional time lost managing behavioral issues.

### Conclusion

Based on the findings of the study, the following conclusions were drawn:

1. It was revealed that that large class size negatively influence the teaching of Chemistry in secondary school
2. It was revealed that that large class size negatively influence the learning of Chemistry in secondary school

3. The findings of this study revealed that large class size have ineffective classroom interaction during Chemistry lesson

The findings of this study revealed that that teachers do not provide optimum support for students in large class size during Chemistry lesson.

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