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Article

Assessing the Impact of Instructional Materials on Students' Academic Performance in Chemistry: A Study of Secondary Schools in Apa LGA, Benue State

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Abstract: The quality and availability of learning materials can make a big difference in how well students perform, especially in subjects like Chemistry. This study looks at how access to instructional resources affects students' academic success in Chemistry across selected secondary schools in Apa Local Government Area, Benue State. Using a mix of surveys and interviews, data were gathered from both students and teachers to assess whether materials like textbooks, laboratory equipment, and Learning materials were sufficient and accessible. The findings suggest that students tend to perform better when they have the right resources, highlighting the need for better-equipped labs, more textbooks, and improved instructional materials. Based on these insights, the study suggests increased investment in educational resources to support better learning and academic achievement in Chemistry.

Keywords: Learning Materials, Student Performance, Chemistry Education, Secondary Schools

1. Introduction

Teaching Chemistry is not just about memorizing facts; it is about understanding the composition, structure, properties, and uses of matter. However, without the right instructional materials, it can be difficult for students to grasp these complex ideas. Chemistry, with its abstract concepts and scientific principles, requires tangible tools such as models and visual aids to help students connect theory to real-world applications. Research has shown that when instructional materials are lacking, students often struggle to understand these concepts—especially in secondary school, where they are building the foundation for more advanced science education.

In Nigeria, where English is the primary language of instruction, this challenge is even more pronounced. Studies indicate that students may lose up to 20% of their cognitive capacity for reasoning due to language barriers [1]. This limitation makes it even harder for them to grasp abstract Chemistry concepts and relate them to everyday life. To address this issue, instructional materials such as diagrams, models, and hands-on demonstrations can help bridge the gap. As noted in [2], such materials bring Chemistry to life, making it more engaging for students.

The ultimate goal of teaching Chemistry, and science in general, is to spark curiosity, enhance critical thinking, and prepare students to solve real-world problems. However, overreliance on verbal explanations can hinder effective learning. Studies suggest that traditional teaching styles often make it difficult for students to visualize and understand abstract ideas [2]. Chemistry, in particular, demands practical examples and hands-on

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experience to fully grasp concepts like the behavior and structure of matter. Without appropriate instructional materials, students may struggle to develop a deeper understanding of the subject.

That is why it is essential to incorporate models, charts, and hands-on demonstrations into Chemistry instruction. These tools not only help students visualize complex ideas but also encourage active participation, problem-solving, and critical thinking. Such instructional materials transform Chemistry from a subject filled with abstract theories into one that students can actively engage with and understand.

Science, unlike many other subjects, engages multiple senses. Students are not just reading about the world; they are seeing, touching, and interacting with it. UNESCO emphasized this concept in 1973, stating, *"If science is to be learned effectively, it must be experienced"* [3]. A hands-on approach is critical for students to truly comprehend Chemistry rather than merely learning theories in isolation. Empirical evidence suggests that when students experience the subject firsthand—through experiments, models, and visual aids—they retain information better and perform at higher academic levels [2].

This study aims to assess the impact of instructional materials on students' academic performance in Chemistry in secondary schools within Apa Local Government Area (LGA), Benue State. By examining the extent to which schools are equipped with teaching resources, this research seeks to emphasize the significance of instructional materials in improving learning outcomes. Additionally, it highlights the need for enhanced accessibility to these materials and for adequate teacher training in their effective utilization.

More specifically, this research will investigate the availability, adequacy, and usage of instructional materials in Chemistry classrooms and evaluate how these resources affect students' comprehension of the subject, engagement in learning, and overall academic achievement. By analyzing the correlation between instructional resources and student performance, the study aims to underscore the importance of educational materials in fostering effective Chemistry instruction while providing recommendations for improving their provision and utilization.

2. Materials and Methods

This section outlines the research methodology used in the study, detailing the procedures followed to investigate the impact of instructional materials on students' academic performance in Chemistry in secondary schools within Apa Local Government Area (LGA) of Benue State.

The study was conducted in all government-approved secondary schools, both public and private, within Apa LGA. The selected schools were chosen to represent a diverse set of educational institutions, including government, private, mission, and community secondary schools. These schools were distributed across various wards such as Ugbokpo, Edikwu I, Edikwu II, Ojope, Ojantelle/Akpete, Ikobi, Oiji, Auke, Igoro, Iga-Okpaya, and Oba. This selection ensured a broad and representative sample of secondary schools within the LGA for administering the questionnaire.

A **descriptive survey design** was adopted for this research. This approach was chosen because the focus of the study was to examine the current situation—specifically the relationship between the availability and use of instructional materials and students' academic performance in Chemistry. A descriptive survey enables researchers to collect quantitative data on this relationship without delving into the underlying causes or motivations behind existing practices [4].

The population for the study included all secondary schools approved by the Benue State Ministry of Education within Apa LGA. This encompassed a total of **twenty (20) secondary schools**, including government, private, mission, and community schools. Additionally, the study focused on **twenty-three (23) Chemistry teachers** currently

teaching in these schools, as they play a critical role in the implementation and use of instructional materials in Chemistry education.

For the **sampling process**, six (6) secondary schools were selected, along with eight (8) Chemistry teachers. A **simple random sampling technique** was employed to select both the schools and the teachers. This method ensured that the sample was representative and minimized any potential sampling errors. The randomness of selection helped to eliminate biases, ensuring a fair distribution of responses across different school types and teachers within the LGA [5].

The data collection instrument used was a self-constructed Teacher's Questionnaire titled: *Use of Instructional Materials and Students' Academic Performance Questionnaire (UIMSAPQ)*. The questionnaire was designed using a five-point Likert scale, allowing teachers to express their views on the use of instructional materials and their impact on students' performance. The scale consisted of five options: Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), and Strongly Disagree (SD). To simplify the data analysis, the responses were collapsed into a three-point scale for analysis: Agree (A) for both Strongly Agree (SA) and Agree (A), Disagree (D) for both Undecided (U) and Disagree (D), and Strongly Disagree (SD).

The questionnaire was divided into two sections. Section A gathered the biographical data (biodata) of the respondents, i.e., the Chemistry teachers. Section B contained twenty (20) items aimed at assessing the teachers' views on the use of instructional materials and how they perceived their impact on students' academic performance in Chemistry.

The researchers, together with research assistants, personally visited the selected schools to administer the questionnaires to the Chemistry teachers. This approach ensured a high response rate and increased the reliability and validity of the data collected. By directly interacting with the teachers, the researchers were able to clarify any doubts regarding the questionnaire and ensure that all items were fully understood by the respondents.

The validity of the questionnaire was ensured through expert review. The instrument was validated by experts in Science Education from three different institutions. Feedback from these experts was used to refine the instrument, ensuring that the items were accurate in measuring the intended constructs related to instructional materials and academic performance. The validation process addressed face validity, content validity, and construct validity, ensuring that the instrument was well-suited to the research objectives.

For data analysis, descriptive statistics were used. The collected data were organized and presented in tables, with the results expressed as simple percentages. Descriptive statistics enabled the researchers to make generalizations about the use of instructional materials in Chemistry education and their impact on student performance, providing meaningful insights into the current state of education within the study area.

3. Results and Discussion

Table 1. Sample Population of Secondary Schools and Their Respective Chemistry Teachers in Apa LGA.

S/No	Name of School	Teachers Population	Questionnaires Administered	Questionnaires Returned	Percentage Returned
1	Government Secondary School, Ugbokpo	1	1	1	100%
2	Christ the King Academy, Ugbokpo	1	1	1	100%

S/No	Name of School	Teachers Population	Questionnaires Administered	Questionnaires Returned	Percentage Returned
3	El-shadai Secondary School, Ugbokpo	1	1	1	100%
4	St. John's Secondary School, Amoke	2	2	2	100%
5	Odugbo Community Secondary School, Odugbo	2	2	2	100%
6	Achema Community Secondary School, Iga Okpaya	1	1	1	100%
TOTAL		8	8	8	100%

Source: Field Survey, 2024.

Table 1 provides an overview of the sample population used for the study, which includes eight (8) Chemistry teachers from six (6) secondary schools in Apa LGA. The data indicate that all eight (8) questionnaires administered were returned, resulting in a **100% response rate**. This high response rate is essential in ensuring that the findings accurately reflect the entire sample population, thereby reducing potential biases and increasing the validity of the results.

High response rates in educational research are crucial, as they provide a more precise representation of the target population. As noted in [6], comprehensive data collection is necessary for producing reliable conclusions. A 100% response rate in this study strengthens the validity of the findings, ensuring that the perspectives of Chemistry teachers across different school types in Apa LGA are well represented.

Table 2. Teacher's Qualification.

Qualification	No. of Respondents	Percentage
NCE	1	12%
B.Sc (Ed)	3	38%
B.Sc	4	50%
M.Ed	0	0%
M.Sc	0	0%
Ph.D	0	0%
Others	0	0%
TOTAL	8	100%

Source: Field Survey, 2024.

Table 2 presents the qualifications of the Chemistry teachers involved in the study. Out of the eight (8) respondents, one (12%) holds a Nigeria Certificate in Education (NCE), three (38%) have a Bachelor of Science in Education (B.Sc Ed.), and four (50%) possess a Bachelor of Science (B.Sc.) degree. Notably, none of the teachers hold advanced degrees such as a Master of Education (M.Ed.), Master of Science (M.Sc.), or Doctor of Philosophy (Ph.D.).

These findings suggest that while the teachers possess basic and intermediate qualifications, there is a gap in higher academic qualifications, which could potentially affect the effectiveness of Chemistry instruction. Research has shown that teacher qualifications significantly impact the quality of instruction, with more qualified teachers typically demonstrating better teaching outcomes [7]. The absence of higher-degree

holders could, therefore, be a limiting factor in the effective utilization of advanced instructional materials and innovative teaching strategies.

Table 3. Availability of Instructional Materials.

Item No. & Statement	Agree (A)	Undecided (U)	Disagree (D)	Total	Remark
1. Instructional materials are available for Chemistry teaching and learning.	7 (88%)	0	1 (12%)	8	Agreed
2. The school has inadequate instructional materials for use.	4 (50%)	0	4 (50%)	8	Mixed

Source: Field Survey, 2024.

Table 3 addresses the availability of instructional materials for teaching Chemistry. According to the data, seven (88%) out of eight (8) respondents agreed that instructional materials are available for Chemistry teaching and learning, while one (12%) respondent disagreed. This suggests that, in general, instructional materials are available but may be lacking in certain schools. However, when respondents were asked about the adequacy of these materials, 50% agreed that there are insufficient instructional materials, while the other 50% disagreed. This finding aligns with previous research [8], which highlights that while some schools may have instructional materials, their quantity and quality.

Table 4. Impact of Instructional Materials on Students' Academic Performance

Item No. & Statement	Agree (A)	Undecided (U)	Disagree (D)	Total	Remark
3. Students assimilate better and faster when instructional materials are used.	8 (100%)	0	0	8	Agreed
4. Concepts learned by students through the use of instructional materials have better retention capability.	7 (88%)	0	1 (12%)	8	Agreed
5. The more instructional materials used, the better the assimilation and retention of concepts.	7 (88%)	1 (12%)	0	8	Agreed
6. Students learn slowly when instructional materials are used.	0	0	8 (100%)	8	Disagreed
7. Students forget easily when instructional materials are used.	0	0	8 (100%)	8	Disagreed
12. The use of instructional materials improves students' performance in Chemistry exams.	8 (100%)	0	0	8	Agreed
14. Students actively participate in Chemistry lessons when instructional materials are used.	7 (88%)	0	1 (12%)	8	Agreed
19. Instructional materials help in breaking down complex Chemistry concepts for better understanding.	8 (100%)	0	0	8	Agreed

Source: Field Survey, 2024.

Table 4 presents the impact of instructional materials on students' academic performance in Chemistry. The results indicate strong support for the positive impact of instructional materials on learning outcomes. Specifically, 100% of respondents agreed that students assimilate better and faster when instructional materials are used. Additionally, all respondents agreed that the use of instructional materials improves students' performance in Chemistry exams.

Similarly, 88% of respondents agreed that instructional materials contribute to better retention of concepts and facilitate active student participation. These findings align with previous research, which emphasizes that science education should engage multiple

senses to promote a deeper understanding of complex concepts [9]. The overwhelming agreement on the benefits of instructional materials in this study echoes prior research [10], which found that instructional materials significantly enhance student comprehension and retention in science subjects. These materials help bridge the gap between abstract theories and real-world applications, making Chemistry more accessible and engaging for students.

Table 5. Usage of Instructional Materials by Teachers.

Item No. & Statement	Agree (A)	Undecided (U)	Disagree (D)	Total	Remark
8. Teachers use instructional materials in their lessons.	8 (100%)	0	0	8	Agreed
9. Teachers use out-dated instructional materials in their lessons.	1 (12%)	3 (38%)	4 (50%)	8	Mixed
10. Teachers use a variety of instructional materials in their lessons.	7 (88%)	0	1 (12%)	8	Agreed
11. Teachers use instructional materials that are relevant to the lessons they teach.	8 (100%)	0	0	8	Agreed

Source: Field Survey, 2024.

Table 5 examines the usage of instructional materials by Chemistry teachers. The data indicate that 100% of respondents agree that they use instructional materials in their lessons, while 88% agree that they employ a variety of materials. However, the table also highlights a concern: 12% of teachers reported using outdated materials, suggesting that some schools rely on resources that may not reflect current advancements in Chemistry education.

This finding aligns with previous research [11], which emphasizes that the effectiveness of instructional materials is significantly influenced by their relevance and up-to-date nature. Outdated materials may hinder effective learning, particularly in Chemistry, where technological advancements and modern instructional resources play a crucial role in enhancing students' understanding. Ensuring that teaching materials remain current is essential for maximizing their impact on student learning and academic performance.

4. Conclusion

This study explored how instructional materials impact students' academic performance in Chemistry in secondary schools in Apa LGA, Benue State. The findings indicate that students learn better, retain concepts longer, and perform well in exams when appropriate instructional materials such as textbooks, laboratory equipment, and Learning materials are available and effectively used. However, challenges such as outdated or insufficient materials were identified. To improve Chemistry education, the study recommends increased investment in modern teaching resources and ongoing teacher training. Enhancing both material availability and instructional strategies will create a more effective learning environment, leading to better student outcomes.

Recommendation

1. Both the government and private educational institutions in Apa LGA ensure the adequate provision of diverse and modern instructional materials.
2. Schools should establish a system for regularly monitoring and evaluating the effectiveness of instructional materials used in Chemistry teaching.

All key stakeholders, including teachers, school administrators, parents, and local government authorities, collaborate in the planning and decision-making process regarding the provision of instructional materials.

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