



Assessment of Instructional Material Relevance and Availability for Biology Education

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ABSTRACT

This study assessed the relevance and availability of instructional materials for biology education in Awka South Local Government Area of Anambra State, Nigeria. Adopting a descriptive survey design, data were collected from 38 biology teachers selected from 19 public secondary schools using a self-structured 4-point rating questionnaire. The study revealed a diverse range of instructional materials, including posters, organ tissue specimens, maps, plasma specimens, and others, catering to various learning styles and objectives. The study highlighted the importance of considering local context and resources in enhancing biology education. Findings have implications for policymakers, curriculum developers, and educators, suggesting avenues for improving resource provision and enhancing learning outcomes.

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1. INTRODUCTION

Instructional materials serve as indispensable tools in education, particularly in subjects like biology, where complex concepts often necessitate visual aids and hands-on activities for effective comprehension and retention (Junco & Nabua, 2023). In the realm of biology education, instructional materials encompass an extensive array of resources, ranging from traditional textbooks to cutting-edge multimedia presentations, from laboratory equipment to intricate models, charts, and specimens (Amos *et al.*, 2022). These materials are strategically employed to captivate students' interest, solidify foundational concepts, and foster dynamic, participatory learning environments. By leveraging instructional materials, educators can stimulate curiosity, encourage exploration, and facilitate deeper engagement with the subject matter (Abubakar *et al.*, 2024).

Through interactive experiences facilitated by these resources, students are empowered to construct meaningful connections between theoretical knowledge and real-world phenomena, thereby enhancing their overall understanding and mastery of biological principles (Trust *et al.*, 2023; Konopka *et al.*, 2015). Thus, the judicious utilization of instructional materials not only enriches the educational experience but also cultivates a fertile ground for lifelong learning and scientific inquiry. In a study by Savasci (2014), it was found that the use of instructional materials in biology classrooms positively correlates with student motivation and understanding of complex biological concepts.

Furthermore, instructional materials tailored to local contexts can enhance relevance and cultural sensitivity in biology education. For instance, incorporating examples of indigenous flora and fauna in instructional materials can foster a deeper connection between students and their environment (Burns, 2015; Ruado & Cortez, 2024). Therefore, assessing the relevance of instructional materials involves evaluating their alignment with curriculum objectives, student demographics, and local ecological contexts.

Despite the importance of instructional materials, their availability can vary widely across different educational settings. Factors such as budget constraints, inadequate infrastructure, and limited access to technology can pose significant barriers to acquiring and utilizing instructional materials effectively (Menberu, 2024; Joshi *et al.*, 2021). In Awka South Local Government Area, disparities in resource allocation and infrastructure may affect the availability of instructional materials for biology education.

A study conducted by Wood (2009) revealed that many schools in underserved areas struggle to provide basic laboratory equipment and supplementary resources for biology classes. This shortage not only impedes teachers' ability to deliver quality instruction but also limits students' opportunities for hands-on learning experiences (Msimango *et al.*, 2024; Lawrence & Tar, 2018). Therefore, assessing the availability of instructional materials involves examining both the physical presence of resources and the accessibility of technology-enabled learning tools.

The utilization of instructional materials in biology education can have a significant impact on students' academic achievement. Research has shown that interactive and multisensory learning experiences facilitated by instructional materials can improve student comprehension and retention of biological concepts (Idris *et al.*, 2018). Moreover, instructional materials that cater to diverse learning styles and abilities can promote inclusive education practices and equitable learning outcomes (Bakare, 2024).

In a meta-analysis conducted by Arum (2015), it was found that students exposed to a variety of instructional materials in biology classrooms consistently outperformed their peers who relied solely on traditional lecture-based instruction. Furthermore, the effective

integration of instructional materials can enhance critical thinking skills, problem-solving abilities, and scientific inquiry among students (Irhasyuarna *et al.*, 2022). Therefore, assessing the impact of instructional materials on students' academic achievement involves measuring their effectiveness in facilitating conceptual understanding, skill development, and knowledge application in biology. The study is essential for several reasons. Firstly, it aims to identify the extent to which current instructional materials align with the specific needs and requirements of biology education in the local context. This is crucial as instructional materials tailored to local contexts have been shown to enhance relevance and cultural sensitivity in education (Saro *et al.*, 2023).

Secondly, the study seeks to uncover any gaps in the availability of instructional materials, which could significantly hinder effective teaching and learning experiences. Research conducted by Saro *et al.* (2023) has highlighted how underserved areas often struggle to provide basic laboratory equipment and supplementary resources for biology classes, indicating potential disparities that need to be addressed urgently. Furthermore, by assessing both relevance and availability, the study aims to provide actionable insights for educators and policymakers to improve the quality of biology education in Awka South Local Government Area. Identifying these gaps and discrepancies can inform targeted interventions and resource allocation strategies to ensure equitable access to high-quality instructional materials for all students. Thus, the study holds immense significance in fostering educational equity and enhancing the overall learning experience in biology education within the local community.

The following research questions were formulated to guide the study:

- (i) What is the relevance of instructional materials in teaching biology in the Awka South Local Government area?
- (ii) What is the availability of instructional materials for teaching biology in Awka South Local Government Area?

2. METHODS

The research design employed in this study is a descriptive survey type, aiming to collect data at a specific point in time to describe existing conditions or establish standards for comparison. The area of study is Awka South Local Government Area in Anambra State, Nigeria, which consists of nine towns with a predominantly artisan, trading, farming, and civil servant population. Geographically surrounded by Awka North, Dunukofia, and Aniocha Local Government Area, Awka South has witnessed deforestation due to agricultural expansion and human settlement.

The sample consisted of 38 biology teachers selected through simple random sampling, ensuring a fair representation of teachers from various schools. Data collection utilized a self-structured 4-point rating questionnaire with two sections: personal data and items related to research questions. The instrument underwent validation by two teachers within Awka South Local Government Area to ensure content adequacy, coverage, and data yield. Reliability testing involved distributing questionnaires to ten teachers outside the study area and conducting a test-retest method, resulting in a high internal reliability score of 0.75.

The researcher administered 38 questionnaires personally to the selected respondents and collected them promptly. Data analysis employed weighted mean scores and standard deviation, with an acceptance criterion set at 2.50. The mean score calculation followed a formula involving the sum of the frequency of each questionnaire item and deviations from

the mean, divided by the total number of respondents. Any item scoring 2.50 and above was accepted, while those below 2.50 were rejected.

3. RESULTS AND DISCUSSION

3.1. Research Question 1

Research question 1 is “what is the relevance of instructional materials in teaching biology in Awka South Local Government Area?”. **Figure 1** illustrates the mean and standard deviation scores for various aspects related to the relevance of instructional materials in teaching biology in Awka South Local Government Area. The findings suggest that instructional materials are viewed positively in terms of their relevance to biology education in the region. Specifically, respondents strongly agreed that instructional materials enhance students' attention and interest, with a mean score of 4.00, indicating unanimous agreement among participants. This implies that instructional materials successfully captivate students' attention and engage them in the learning process effectively. Moreover, instructional materials were also perceived to save teachers' preparation time and efforts, albeit with slightly lower agreement (mean = 3.50, standard dev = 0.5). Similarly, respondents acknowledged the role of instructional materials in keeping learners busy and active, elucidating verbal concepts, and facilitating effective retention of concepts and skills in biology, as evidenced by mean scores ranging from 3.50 to 3.64, with moderate levels of variability (std dev = 0.48 to 0.58).

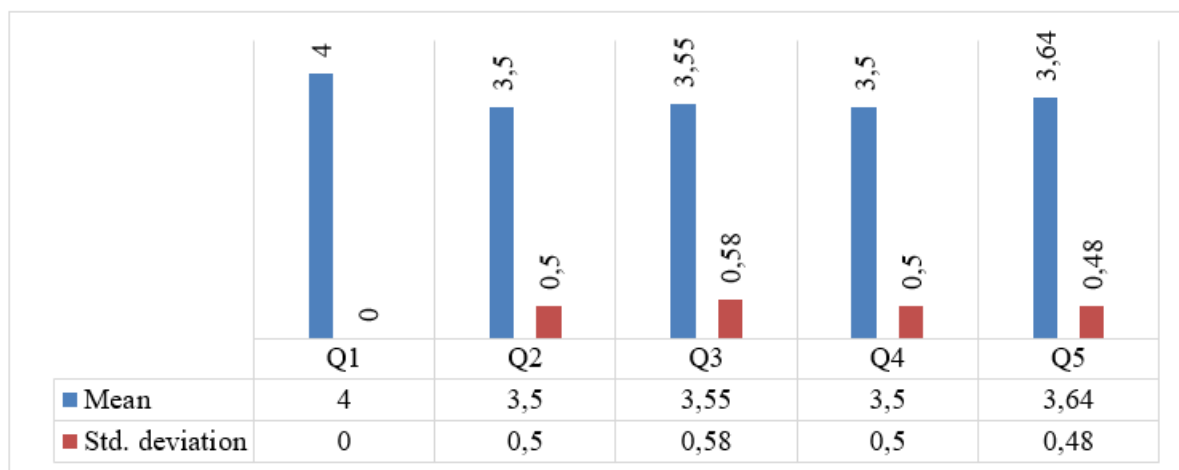


Figure 1. Mean and standard deviation on the relevance of instructional materials in teaching biology in Awka South Local Government Area. Note: Q1: Instructional material enhances the attention and interest of students; Q2: Instructional materials save teachers preparation time and efforts; Q3: Instructional material keep learners busy and active; Q4: Instructional material elucidate verbal concepts in teaching education biology; Q5: Instructional materials help in effective retention of concept and skills in biology.

3.2. Research Question 2

Research question 2 is “what is the availability of instructional materials for teaching biology in Awka South Local Government Area?”. **Figure 2** provided represents mean scores and standard deviations for various instructional materials used in teaching biology, it is evident that items like posters (mean=2.77), organ tissue specimens (mean=3.14), cheek tissue specimens and maps (mean=3.05), dissected lizard (mean=3.09), plasma specimen and charts (mean=3.09), and mammalian skeleton (mean=3.77) are generally accepted as effective instructional materials for teaching biology, as their mean scores are above the

midpoint of the scale. However, audio and video recorders (mean=2.05) and projectors (mean=1.86) received lower mean scores, indicating that they are not perceived as highly effective for teaching biology compared to the other items. Additionally, the standard deviations provide insight into the variability of responses for each item. Higher standard deviations suggest more variability in opinions among respondents.

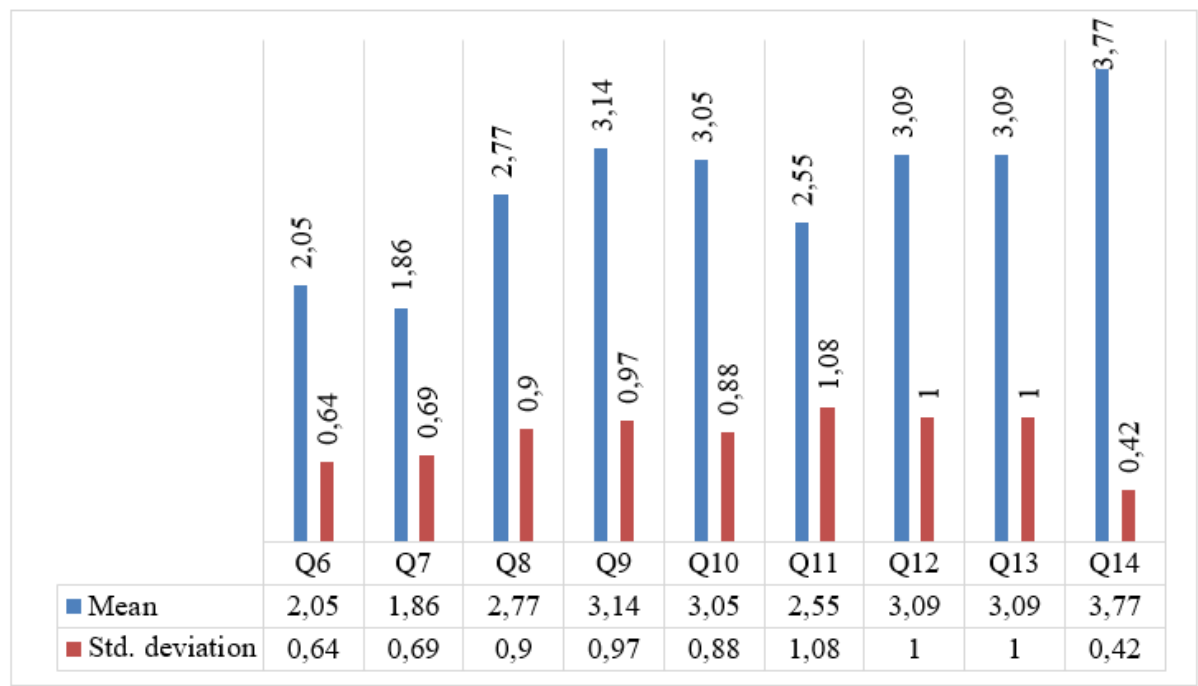


Figure 2. Mean and standard deviation on the availability of instructional materials for teaching biology in Awka South Local Government Area. Note: Q6: Audio and Video recorders are available instructional materials for teaching biology; Q7: Projectors are available instructional materials for teaching biology; Q8: Posters are available instructional materials for teaching biology; Q9: Organ tissue specimen are available instructional material for teaching biology; Q10: Cheek tissue specimen and maps are available instructional materials for teaching biology; Q11: Whole blood specimen is an available instructional materials for teaching biology; Q12: Dissected lizard is an available instructional materials for teaching biology; Q13: Plasma specimen and charts are available instructional materials for teaching biology; Q14: Mammalian Skeleton is an available instructional materials for teaching biology.

3.3. Discussion

Research question 1 sought to find out the relevance of instructional materials in the teaching of biology in Awka South Local Government Area. The study found that instructional materials serve to enhance student attention and interest in biology. This aligns with other study (Ruado & Cortez, 2024), which emphasized the positive impact of instructional materials on student engagement and motivation in biology education. In contrast, without such aids, teaching solely through verbal instruction may struggle to capture students' interest and maintain their attention. Moreover, instructional materials contribute to active learning by keeping students engaged and participative in the learning process. This finding resonates with Konopka et al., (2015) research, which highlighted the role of instructional materials in promoting interactive and dynamic learning experiences. Conversely, a lack of diverse instructional materials may result in passive learning, hindering students' exploration

and understanding of biological concepts. Furthermore, instructional materials aid in elucidating complex verbal concepts in biology. Coleman *et al.* (2018) demonstrated that visual aids such as charts and diagrams help students comprehend abstract ideas more effectively. Similarly, the use of specimens and models allows students to visualize and understand biological structures, as supported by other research (Kazoka *et al.*, 2021). Without such aids, students may struggle to grasp intricate biological concepts presented solely through verbal instruction.

Research question 2 dealt with the availability of instructional materials for teaching biology in Awka South Local Government Area. The results of this study show that posters are one such resource, offering visual aids to enhance understanding. These posters may depict biological processes, anatomical diagrams, or ecological concepts, aiding in comprehensive learning. In contrast, organ tissue specimens provide hands-on learning opportunities, allowing students to explore the structure and function of organs firsthand. Cheek tissue specimens and maps further enrich the learning environment, enabling students to examine cellular structures and geographical contexts simultaneously (Martinez-Sanz *et al.*, 2023). Whole blood specimens offer insight into hematological processes and can be utilized for various practical demonstrations, aligning with the practical-oriented nature of biology education (Abunimye *et al.*, 2024). Similarly, dissected lizard specimens provide a unique opportunity for comparative anatomy studies, allowing students to observe vertebrate anatomy up close. Plasma specimens and charts complement these resources, facilitating discussions on biochemical processes and data analysis (Fischinger *et al.*, 2019). Furthermore, the availability of mammalian skeletons enhances the understanding of vertebrate anatomy and evolutionary relationships (Karten, 2015). Together, these instructional materials cater to diverse learning styles and foster a holistic understanding of biology within Awka South Local Government Area.

4. CONCLUSION

The assessment of instructional material relevance and availability for biology education in Awka South Local Government Area provides valuable insights into the current state of resources supporting biology teaching in the region. Through a descriptive survey design and rigorous data collection methods, this study has shed light on the status of instructional materials and their suitability for facilitating effective biology education. The findings reveal a varied landscape of instructional materials, ranging from posters and organ tissue specimens to maps and plasma specimens. These resources offer diverse opportunities for hands-on learning, visual aids, and practical demonstrations, aligning with the multifaceted nature of biology education. Additionally, the study underscores the importance of considering local context and resources, given the predominantly artisan, trading, farming, and civil servant population in Awka South Local Government Area.

The implications of this study extend beyond academia, offering valuable insights for policymakers, curriculum developers, and educators alike. Addressing gaps in instructional material availability and relevance can enhance the quality of biology education, foster student engagement, and ultimately contribute to improved learning outcomes. However, it's essential to recognize the limitations of this study, including its focus on a specific geographic area and the potential for response bias in questionnaire-based data collection. Future research could explore longitudinal trends in instructional material usage, investigate the impact of resource availability on student performance, and examine strategies for enhancing collaboration between educators and stakeholders to improve resource provision.

Overall, this study serves as a foundation for further exploration and action to enhance instructional material relevance and availability for biology education in Awka South Local Government Area, ultimately contributing to the advancement of science education in the region.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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