



Research Article

Assessing the Relevance and Availability of Instructional Materials for Biology Education in Awka South Local Government Area

Tochukwu Ebuka Umeohana 

Department of Biochemistry, Chukwuemeka Odumegwu Ojukwu University, Uli, Anambra State, Nigeria
E-mail: umeohanatoo@gmail.com

Received: 24 April 2024; **Revised:** 26 July 2024; **Accepted:** 30 July 2024

Abstract: This study aims to assess the relevance and availability of instructional materials for biology education in Awka South Local Government Area (LGA) 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. Rigorous sampling techniques and reliability testing were employed to ensure the credibility of the findings. Analysis techniques such as weighted mean scores and standard deviation were utilized to provide systematic evaluations of instructional material relevance and availability. The study reveals 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 highlights the critical role of local context and resources in enhancing biology education. It discusses implications for policymakers, curriculum developers, and educators, offering strategies for improving resource provision and boosting learning outcomes. Despite limitations such as geographic focus and potential response bias, this research lays a foundation for further studies and actions aimed at advancing biology education in Awka South LGA and beyond.

Keywords: availability, biology, education, instructional materials, relevance

1. Introduction

Biology curriculum encompasses structured educational content, learning objectives, essential topics, and competencies related to biological sciences. The biology curriculum requirements for the secondary school educational level in Awka South Local Government Area are contained in a comprehensive official curriculum document provided by the Ministry of Education. These documents specify the learning objectives, topics, and competencies students are expected to achieve. Key elements of the curriculum include the scope and sequence of topics, which outline the progression and depth of subject matter. For instance, the curriculum covers foundational concepts such as cell biology, genetics, ecology, and human physiology, ensuring students gain a thorough understanding of essential biological principles (Aniekwu et al., 2022).

Additionally, the curriculum identifies specific skills that students should develop, such as critical thinking, scientific inquiry, and practical laboratory skills. These competencies are crucial for fostering a deep understanding of biological processes and their applications (Ogbuze & Okoli, 2020). The curriculum also prescribes instructional materials, including textbooks, laboratory equipment, and supplementary resources, ensuring that educators have

the necessary tools to effectively teach the subject. Recommended teaching methodologies and assessment strategies are also highlighted, offering guidance on the most effective approaches to deliver the content and evaluate student understanding (Chukwuma & Abba, 2020).

The literature on instructional materials for biology education underscores their vital role in shaping effective teaching and learning. Textbooks are central to biology instruction, providing structured and curriculum-aligned content, though their quality and currency can vary significantly (Smith et al., 2017). Laboratory equipment is also crucial, enabling hands-on learning and practical application of biological concepts. However, many schools, particularly those in low-income areas, face shortages of essential laboratory supplies, impacting the quality of experiential learning (Postigo & López-Manjón, 2019). Digital resources, such as online simulations and educational videos, have emerged as valuable supplements to traditional materials, offering interactive and dynamic learning experiences. Despite their potential, the use of digital tools is often constrained by limited technological infrastructure and varying levels of teacher proficiency (Wahlberg & Gericke, 2018). Additionally, comprehensive teacher support materials, including lesson plans and assessment tools, are important for enhancing instructional quality.

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 (Lightfoot & Schwager, 2013). 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).

Current research highlights that while textbooks and laboratory equipment are fundamental, their relevance is contingent upon how well they align with the curriculum objectives. According to Saro et al. (2023), textbooks must be up-to-date and aligned with the latest biological concepts to effectively support the curriculum. In Awka South, there may be discrepancies between curriculum requirements and the content of available textbooks, potentially leading to gaps in students' learning experiences. Laboratory equipment is equally critical for experiential learning. Ruado and Cortez (2024) note that adequate and modern lab resources enhance practical understanding, which is crucial for grasping complex biological processes. However, shortages or outdated equipment in Awka South schools could hinder hands-on learning opportunities, impacting students' ability to apply theoretical knowledge practically. Digital resources offer additional value by providing interactive and engaging learning experiences. Patton et al. (2022) emphasize that while these tools can significantly enrich biology education, their integration is often limited by technological constraints and varying teacher expertise. Ensuring that instructional materials are both relevant and accessible is essential for meeting the curriculum's demands and addressing students' learning needs effectively (Rapanta et al., 2020; Ruado & Cortez, 2024).

Synthesis of the literature on the quality of instructional materials reveals several critical factors: accuracy, clarity, depth of coverage, and appropriateness for the target audience. Accuracy is essential, as it ensures that the content

is scientifically correct and free from errors. According to Abunimye et al. (2024), instructional materials with high accuracy provide a solid foundation for student learning and prevent the dissemination of misinformation. Clarity is another key aspect, as materials must present concepts in a way that is easily understandable for students. Bello et al. (2023) argue that clear explanations and well-organized content enhance student comprehension and retention. Depth of coverage involves the extent to which materials address the necessary curriculum topics. Irhasyuarna et al. (2022) emphasize that comprehensive coverage is crucial for meeting educational standards and preparing students for further studies.

Many schools in underserved areas struggle to provide basic laboratory equipment and supplementary resources for biology classes, as revealed by Jacob et al. (2020). This shortage not only impedes teachers' ability to deliver quality instruction but also limits students' opportunities for hands-on learning experiences (Rapanta et al., 2020; 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 is crucial for enhancing students' academic achievement. Research indicates that interactive and multisensory learning experiences facilitated by instructional materials can significantly improve student comprehension and retention of biological concepts (Idris et al., 2018). Moreover, instructional materials that cater to diverse learning styles and abilities promote inclusive education practices and equitable learning outcomes (Bakare, 2024).

A meta-analysis conducted by Arum (2015) 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. Additionally, the effective integration of instructional materials enhances 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. Synthesizing the literature on national educational curriculum reveals a consensus on the critical role of instructional materials in achieving educational goals. The national curriculum emphasizes the need for high-quality, relevant, and accessible instructional materials to support effective teaching and learning processes (Amos et al., 2022). These materials include textbooks, laboratory equipment, digital resources, and supplementary aids designed to align with curriculum standards and learning objectives.

Instructional materials are highlighted as essential tools for facilitating student engagement, enhancing understanding of complex concepts, and providing hands-on learning experiences (Bakare, 2024). The literature underscores the importance of regularly updating these resources to reflect current scientific knowledge and pedagogical practices, ensuring that they remain relevant and effective (Fischinger et al., 2019). Furthermore, the national curriculum advocates for the equitable distribution of instructional materials across all schools, emphasizing the need to address disparities between urban and rural educational institutions (Jacob et al., 2020). This equitable approach aims to provide all students with the necessary resources to achieve academic success, regardless of their geographic location or socio-economic background.

Identifying gaps and deficiencies in the availability of instructional materials for biology education reveals several critical issues. Firstly, many schools use outdated textbooks and resources, which do not reflect current scientific knowledge and pedagogical practices, hindering students' understanding (Irhasyuarna et al., 2022). Secondly, there is an insufficiency of basic laboratory equipment and supplementary resources, particularly in underserved areas, limiting hands-on learning experiences crucial for grasping biological concepts (Saro et al., 2023). Moreover, available materials often misalign with national curriculum goals, failing to cover required topics adequately and meet educational standards (Junco & Nabua, 2023). Additionally, a lack of cultural sensitivity in instructional materials creates a disconnect between students and the subject matter, reducing teaching effectiveness (Abubakar et al., 2024). Technological gaps also exist, as many schools lack access to digital tools and online resources that can enhance traditional teaching methods and provide interactive learning experiences, contributing to disparities in educational quality (Abunimye et al., 2024).

Addressing these issues requires updating materials regularly, ensuring sufficiency, aligning with curriculum goals, incorporating cultural sensitivity, and integrating technology. These targeted interventions can significantly improve the quality of biology education, promote educational equity, and enhance student learning outcomes. This study is crucial for several reasons. Firstly, it aims to determine the extent to which current instructional materials meet the specific needs and requirements of biology education in the local context. Tailoring instructional materials to local contexts

enhances educational relevance and cultural sensitivity (Bello et al., 2023). Secondly, the study seeks to uncover gaps in the availability of instructional materials, which could significantly hinder effective teaching and learning. Research by Saro et al. (2023) highlights that underserved areas often lack basic laboratory equipment and supplementary resources for biology classes, indicating disparities that urgently need addressing. By assessing both the relevance and availability of these materials, the study aims to provide actionable insights for educators and policymakers, improving the quality of biology education in Awka South Local Government Area. Identifying these gaps and discrepancies can inform targeted interventions and resource allocation strategies, ensuring equitable access to high-quality instructional materials for all students. Thus, the study is essential for fostering educational equity and enhancing the overall learning experience in biology education within the local community.

1.1 Objectives

1. To assess the relevance of instructional materials in the teaching of biology in Awka South Local Government Area.
2. To evaluate the availability of instructional materials for teaching biology in Awka South Local Government Area.

1.2 Research questions

The following research questions were formulated to guide the study:

1. What is the relevance of instructional materials in the teaching of biology in Awka South Local Government area?
2. What is the availability of instructional materials for teaching biology in Awka South Local Government area?

2. Methodology

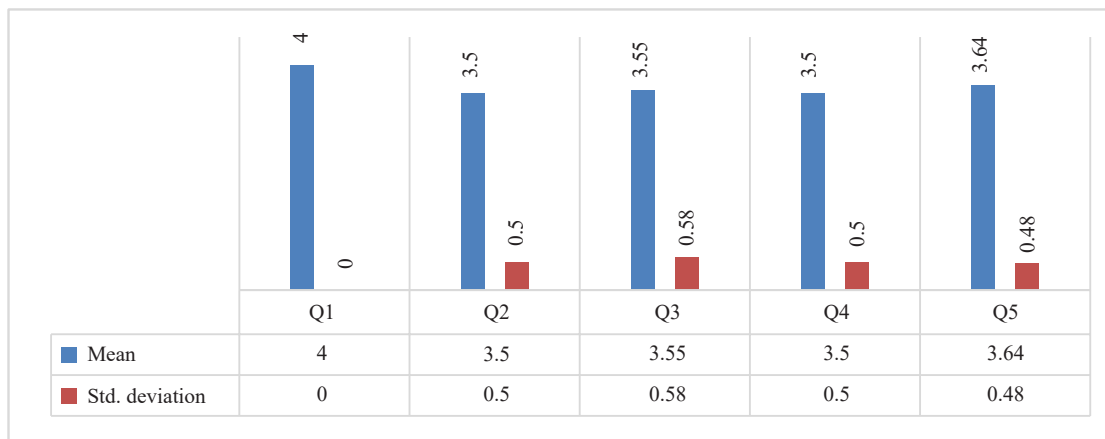
This study employs a descriptive survey design to capture a snapshot of current conditions and establish benchmarks for comparison within Awka South Local Government Area (LGA) in Anambra State, Nigeria. The research focuses on this area, which comprises nine towns and is characterized by a diverse population engaged in artisanal work, trading, farming, and civil service. Geographically, Awka South is bordered by Awka North, Dunukofia, and Aniocha LGAs. Notably, the region has experienced deforestation due to expanding agricultural activities and increased human settlement.

The study examines secondary schools in Awka South, which include Igwebuikwe Grammar Secondary School, St. John of God School, Girls Secondary School, Community Secondary School (Umuokpu), Capital City Secondary School, Kenneth Dike Memorial Secondary School, Ezi-Awka Community Secondary School, Community Secondary School (Okpuno), Nneoma Community Secondary School, Community Secondary School (Mbaukwu), Emeka Aghasili High School, Community Secondary School (Agulu-Awka), Community Secondary School (Amawbia), Union Secondary School (Umuawulu), Union Secondary School (Amawbia), Ezike High School, Holy Cross High School, Community Secondary School (Isiagu), and Krosa Model Schools.

The study's sample consisted of 38 biology teachers from all 19 public secondary schools in the area. Given the manageable size of this population, no additional sampling was necessary. Data were gathered using a self-structured 4-point rating questionnaire, divided into two sections: personal data and research-related items. To ensure the questionnaire's validity, it was reviewed and validated by two teachers from Awka South LGA, confirming its relevance and completeness. Reliability of the instrument was tested by administering the questionnaire to ten teachers outside the study area and applying a test-retest method, which resulted in a reliability score of 0.75. The researcher personally distributed and collected all 38 questionnaires to ensure accuracy and completeness. For data analysis, weighted mean scores and standard deviations were calculated. The acceptance criterion was set at a mean score of 2.50. The calculation involved summing the frequencies of responses for each item, adjusting for deviations from the mean, and dividing by the total number of respondents. Items with a mean score of 2.50 or higher were accepted, while those below this threshold were rejected.

3. Result and discussion

Research question 1: What is the relevance of instructional materials in teaching of biology in Awka South LGA?



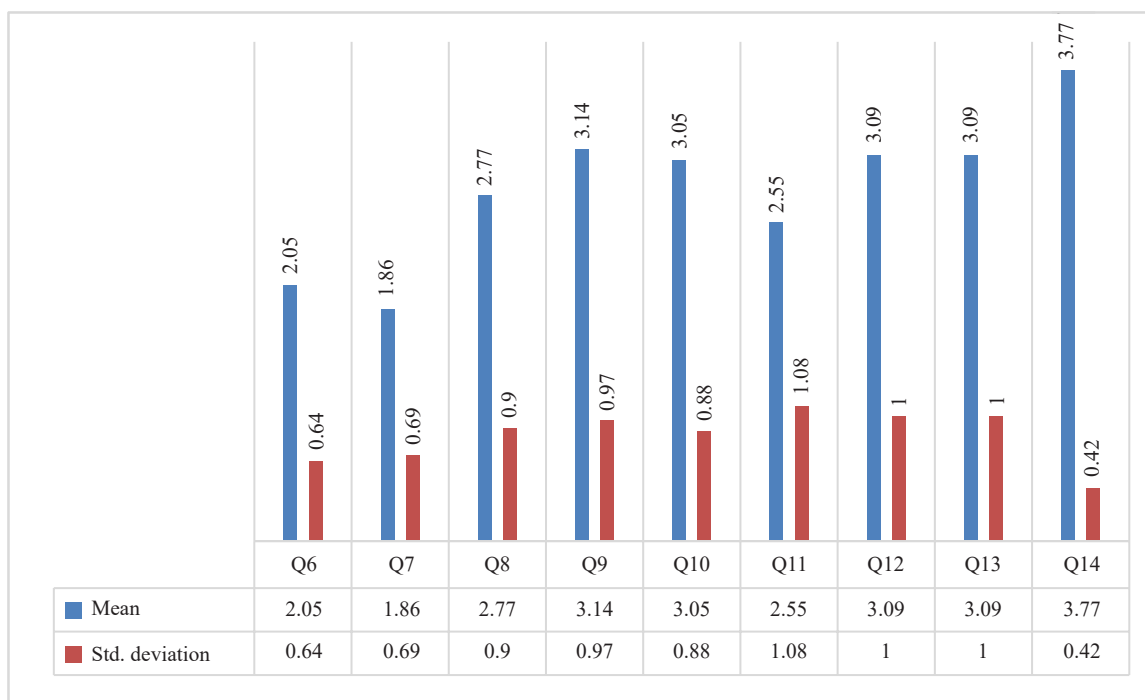
Q1: Instructional material enhances the attention and interest of students;
 Q2: Instructional materials save teachers preparation time and efforts;
 Q3: Instructional material keeps learners busy and active;
 Q4: Instructional material elucidates verbal concepts in teaching education biology;
 Q5: Instructional materials help in effective retention of concept and skills in biology

Figure 1. Mean and standard deviation on the relevance of instructional materials in teaching of biology in Awka South LGA

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 (LGA). 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, std 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).

Research question 1 sought to find out the relevance of instructional materials in teaching of biology in Awka South LGA. The study found that instructional materials serve to enhance student attention and interest in biology. This aligns with Ruado and Cortez (2024) study, 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 Kazoka et al. (2021) research. Without such aids, students may struggle to grasp intricate biological concepts presented solely through verbal instruction.

Research question 2: What is the availability of instructional materials for teaching biology in Awka South LGA?



- 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 material for teaching biology

Figure 2. Mean and standard deviation on the availability of instructional materials for teaching biology in Awka South LGA

Figure 2 represents mean scores and standard deviations for various instructional materials used in teaching biology, it's 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.

Research question 2 dealt with the availability of instructional materials for teaching biology in Awka South LGA. 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 (Patton et al., 2022). 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 LGA.

4. Conclusion

In 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 LGA.

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 LGA, ultimately contributing to the advancement of science education in the region. Based on the findings, several recommendations are proposed to improve biology education in Awka South Local Government Area. Firstly, it is essential for the government and educational authorities to increase investment in acquiring and updating instructional materials, ensuring that schools are well-equipped with the necessary resources. Additionally, regular professional development workshops should be organized to enhance teachers' skills in utilizing these materials effectively and integrating new resources into their curriculum. Schools are also encouraged to collaborate with educational organizations and local businesses to secure additional support and resources. Lastly, implementing periodic assessments to evaluate the adequacy and relevance of instructional materials will help identify and address any gaps promptly, ensuring that the educational needs of students are consistently met.

Conflict of interest

Author has no conflict of interest to declare.

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