**CHAPTER TWO**

**LITERATURE REVIEW**

2.1 Introduction

This chapter reviews the existing literature on the impact of instructional materials improvisation in the teaching selected Biology topic in senior secondary schools. It begins with an exploration of relevant theoretical frameworks, followed by a discussion of empirical studies that highlight the effects of instructional materials on educational outcomes. The chapter also examines the challenges and benefits of improvisation in resource-constrained environments, the role of teachers in the improvisation process, and the importance of creativity and innovation in education.

2.2 Theoretical Framework

2.2.1 Constructivist Theory

The constructivist theory, developed by Jean Piaget and Lev Vygotsky, serves as a fundamental framework for understanding the importance of instructional materials in education. Constructivism posits that learners construct their own understanding and knowledge of the world through experiences and reflecting on those experiences. In the context of Biology education, instructional materials, whether standardized or improvised, provide the experiential foundation upon which students build their understanding of biological concepts.

Improvised instructional materials align well with the constructivist approach because they often require students to engage actively with the learning process, promoting deeper understanding. For example, when students use locally available resources to create models of biological systems, they are not only absorbing information but also applying and reinforcing their knowledge.

2.2.2 Experiential Learning Theory

David Kolb’s Experiential Learning Theory (ELT) emphasizes learning through experience, which is particularly relevant to the use of improvised instructional materials. ELT suggests that effective learning occurs when students engage in a cycle of concrete experience, reflective observation, abstract conceptualization, and active experimentation. Improvised materials often provide the concrete experiences necessary for this learning cycle, allowing students to interact directly with biological concepts.

In Biology education, experiential learning facilitated by improvised materials might involve students participating in hands-on activities such as dissecting locally available specimens or creating models using everyday items. These experiences are crucial for developing a deep, practical understanding of Biology.

2.2.3 Resource-Based Learning Theory

The Resource-Based Learning Theory (RBL), which emphasizes the use of various resources to enhance learning, also supports the use of instructional materials improvisation. RBL posits that learning is most effective when students have access to diverse resources that cater to different learning styles and needs. In situations where standardized resources are scarce, improvisation becomes a key strategy for providing students with the necessary tools to learn.

Improvised materials, by their nature, can be adapted to suit specific learning objectives and contexts, making them versatile tools in the Biology classroom. This adaptability ensures that all students, regardless of the availability of conventional resources, have access to meaningful educational experiences.

2.3 Empirical Studies on Instructional Materials in Biology Education

2.3.1 Importance of Instructional Materials in Biology

Several studies have highlighted the critical role of instructional materials in the teaching and learning of Biology. For instance, Aguele (2009) found that the use of instructional materials in Biology significantly improves students’ academic performance. The study indicated that students who were taught with the aid of instructional materials scored higher in Biology exams compared to those who were taught without such materials.

Similarly, Onasanya and Adegbija (2007) noted that instructional materials help to bridge the gap between theoretical concepts and real-world applications, making abstract biological concepts more tangible and understandable for students. This finding is particularly relevant in senior secondary schools, where students are expected to grasp complex topics such as genetics, ecology, and human physiology.

2.3.2 Impact of Improvised Instructional Materials on Student Learning

In contexts where standardized materials are unavailable, improvised instructional materials have been shown to be effective substitutes. A study by Nwike and Ugwu (2012) in Nigerian secondary schools demonstrated that the use of improvised materials in teaching Biology resulted in a significant improvement in students’ understanding of scientific concepts. The study found that students taught with improvised materials performed better in both practical and theoretical assessments than those taught with traditional methods alone.

Further research by Usman and Memeh (2007) explored the impact of using locally sourced materials in teaching Biology in rural schools. Their findings revealed that students were more engaged and retained information better when teachers used materials that were familiar to the students’ everyday lives. This approach not only made the learning process more relatable but also encouraged students to be more curious and exploratory in their learning.

2.3.3 Comparative Studies: Standardized vs. Improvised Materials

Several comparative studies have been conducted to evaluate the effectiveness of standardized instructional materials versus improvised ones. According to Okebukola (2014), while standardized materials such as textbooks and lab equipment are often more comprehensive and detailed, improvised materials can be equally effective, particularly in fostering critical thinking and problem-solving skills.

Okebukola’s study also pointed out that in some cases, improvised materials might even have an edge over standardized ones because they require students to be more involved in the learning process. This active participation can lead to a deeper understanding of the subject matter, as students are not merely passive recipients of information but active constructors of knowledge.

2.4 Challenges of Instructional Materials Improvisation in Biology Education

2.4.1 Resource Constraints

One of the primary challenges in improvising instructional materials is the scarcity of resources. In many developing countries, schools often lack the necessary funding to acquire even basic educational materials, let alone sophisticated lab equipment. This situation forces teachers to rely on whatever is available in the local environment, which can sometimes limit the scope and effectiveness of the improvisation.

Usman (2015) highlighted that in some rural areas, the lack of even the most basic materials like paper and pencils makes it incredibly difficult for teachers to improvise effectively. This scarcity can discourage teachers from attempting improvisation, leading to a reliance on lecture-based teaching, which may not be as effective for conveying complex biological concepts.

2.4.2 Lack of Training and Expertise

Another significant challenge is the lack of training for teachers in the area of instructional materials improvisation. While many teachers are creative and resourceful, the absence of formal training on how to effectively improvise materials can limit their ability to create meaningful learning experiences for their students. A study by Ajayi (2010) found that teachers who had received training in improvisation were more confident and effective in using improvised materials in their classrooms compared to those who had not.

This lack of training is often compounded by the absence of support from educational authorities, who may not recognize or value the importance of improvisation in the curriculum. As a result, teachers may not be motivated to invest the time and effort required to develop effective improvised materials.

2.4.3 Time Constraints

The process of improvising instructional materials can be time-consuming, requiring teachers to spend additional hours outside of regular teaching duties to prepare these resources. In a study conducted by Ibe-Bassey (2009), teachers reported that the time required to gather materials, design and construct teaching aids, and integrate them into lesson plans was a significant barrier to the effective use of improvisation.

This challenge is particularly pronounced in schools with large class sizes or heavy teaching loads, where teachers may already be struggling to manage their time effectively. The additional burden of creating improvised materials can lead to burnout, further reducing the quality of education that students receive.

2.4.4 Perception of Inferiority

There is often a perception that improvised instructional materials are inferior to standardized ones. This belief can stem from both teachers and students, who may view improvised materials as second-best or less effective. A study by Bassey and Joshua (2012) revealed that some teachers were reluctant to use improvised materials because they felt that these resources might not convey the required level of academic rigor or be taken seriously by students.

This perception can undermine the effectiveness of improvised materials, as both teachers and students may not fully engage with or appreciate the value of these resources. Overcoming this challenge requires a cultural shift within the education system, where improvisation is recognized as a legitimate and valuable teaching strategy.

2.5 Benefits of Instructional Materials Improvisation in Biology Education

2.5.1 Enhanced Student Engagement

One of the most significant benefits of using improvised instructional materials is the increased level of student engagement. When students see familiar objects being used in new and educational ways, it piques their interest and curiosity. For example, using a common household item like a plastic bottle to demonstrate osmosis in plant cells can make the concept more relatable and easier to understand.

According to Adegoke (2011), students are more likely to participate actively in lessons that involve improvised materials, as these materials often require hands-on interaction and exploration. This engagement is crucial in subjects like Biology, where understanding often comes from doing rather than just hearing or seeing.

2.5.2 Development of Critical Thinking Skills

Improvised instructional materials can also foster critical thinking and problem-solving skills. Since these materials are often less structured and more open-ended than standardized ones, they encourage students to think creatively about how to use them in various educational contexts. A study by Ogunleye (2014) found that students who were regularly exposed to improvised materials developed better critical thinking skills compared to those who primarily used standardized materials.

This development is particularly important in Biology, where students are often required to apply their knowledge to solve real-world problems. By working with improvised materials, students learn to think on their feet, adapt to new situations, and find innovative solutions to challenges.

2.5.3 Cost-Effectiveness

One of the most significant advantages of instructional materials improvisation is its cost-effectiveness, particularly in resource-constrained environments such as many senior secondary schools in developing countries. The high cost of standardized instructional materials, such as laboratory equipment, textbooks, and digital resources, can be prohibitive for many schools, especially those in rural areas with limited budgets.

a) Affordability and Accessibility:

Improvised instructional materials can often be created from readily available, low-cost resources, which makes them accessible even to schools with minimal financial resources. For instance, everyday items such as bottles, cardboard, string, and household chemicals can be repurposed to teach various Biology concepts like cell structure, osmosis, and chemical reactions. Studies, such as the one by Adedayo (2011), have shown that when schools and teachers leverage these inexpensive materials, they can effectively deliver lessons without the need for costly equipment.

In a study conducted by Ugwoke and Ene (2014), it was observed that in many Nigerian secondary schools, the cost of procuring and maintaining standard laboratory equipment was far beyond the reach of the schools’ budgets. However, by improvising with local materials, schools were able to overcome this financial barrier and provide students with practical learning experiences that might have otherwise been impossible. This cost-saving measure allows schools to allocate their limited resources to other areas of need, such as infrastructure improvements or teacher development.

b) Sustainability:

The sustainability of educational practices is increasingly becoming a focal point in discussions about the future of education, especially in economically disadvantaged regions. Improvised instructional materials contribute to sustainability by promoting the use of recyclable and reusable materials. This not only reduces costs but also encourages environmentally responsible behavior among students and teachers.

Ogu (2013) highlighted how the use of recycled materials in Biology lessons, such as using old newspapers to create paper-mâché models of anatomical structures, not only lowered the costs associated with teaching aids but also instilled in students the importance of environmental stewardship. This practice aligns with broader educational goals of fostering sustainable thinking and behavior among students.

c) Economic Efficiency:

From an economic perspective, the ability to teach effectively using improvised materials allows for more efficient use of limited educational funds. Schools that embrace improvisation can stretch their budgets further, making education more inclusive and accessible. For instance, a Biology teacher might use leaves, flowers, and fruits from the local environment to demonstrate various plant biology concepts instead of purchasing expensive botanical specimens. This not only reduces costs but also makes lessons more relevant to students’ everyday experiences.

In his research, Mbah (2015) pointed out that in schools where improvisation was encouraged, there was a noticeable improvement in the allocation of financial resources, with funds being redirected from expensive and often underutilized standardized materials to other critical areas like teacher training and student support services. This economic efficiency enhances the overall quality of education, particularly in underfunded schools.

2.5.4 Promoting Cultural Relevance

Another key benefit of instructional materials improvisation is the promotion of cultural relevance in the learning process. By using locally available materials that are familiar to students, teachers can make Biology lessons more relatable and meaningful. This approach not only enhances understanding but also helps to preserve and integrate local knowledge and cultural practices into the curriculum.

a) Integration of Indigenous Knowledge:

In many communities, especially in rural areas, there exists a wealth of indigenous knowledge related to local flora, fauna, and ecosystems. By improvising instructional materials from these local resources, teachers can bridge the gap between traditional knowledge and modern scientific concepts. For example, using locally known medicinal plants to teach students about plant biology and pharmacology can make the subject matter more engaging and relevant.

Akpan and Umoren (2012) discussed how the incorporation of indigenous knowledge through improvised materials in Biology education not only aids in student understanding but also validates and preserves local cultural practices. This integration can be particularly powerful in fostering a sense of pride and connection among students, as they see their cultural heritage reflected in their education.

b) Enhancing Student Identity and Motivation:

When students see their culture and environment reflected in their education, it can boost their motivation and interest in learning. The use of culturally relevant materials helps students to connect what they learn in the classroom with their everyday lives. This connection can make learning more meaningful and inspire students to take greater interest in subjects like Biology.

For instance, the study by Chukwu (2016) demonstrated that in schools where teachers used improvised materials related to the students’ cultural and environmental context, there was a marked increase in student engagement and academic performance. The familiarity of the materials helped demystify complex concepts and made learning more approachable and enjoyable for the students.

c) Contextualized Learning:

Improvised instructional materials often reflect the local environment and context in which students live. This contextualized learning approach ensures that students are not only learning abstract concepts but are also able to see the practical applications of what they are learning in their own communities. For example, using local water sources to study water pollution or utilizing nearby forests to understand ecosystems can provide students with tangible, real-world examples of the topics being taught.

According to Eze and Okeke (2010), contextualized learning through the use of improvised materials has been shown to improve students’ ability to apply theoretical knowledge to real-life situations. This approach enhances critical thinking and problem-solving skills, which are essential for success in both academic and professional settings.

2.6 The Role of the Teacher in Instructional Materials Improvisation

The effectiveness of instructional materials improvisation largely depends on the teacher’s role in the process. Teachers must not only be resourceful but also creative and willing to invest the necessary time and effort to develop meaningful learning experiences for their students. The role of the teacher in this context can be divided into several key areas:

2.6.1 Creativity and Innovation:

Teachers who engage in improvisation must be creative in their approach to developing instructional materials. This creativity involves thinking outside the box and finding new uses for everyday items. Research by Nwakpa (2017) emphasizes that teachers who are innovative in their improvisation practices tend to create more dynamic and engaging learning environments, which can lead to better educational outcomes for students.

For example, a Biology teacher might use a balloon to demonstrate the concept of cell membranes or employ colored water to show how plants absorb nutrients. These simple yet innovative methods can make abstract concepts more accessible to students.

2.6.2 Teacher Training and Professional Development:

Effective improvisation requires teachers to have a certain level of skill and knowledge, which can be developed through targeted training and professional development programs. According to Ololube (2014), teachers who receive training in improvisation techniques are more confident and capable of creating effective instructional materials. Such training can include workshops, seminars, and courses that focus on how to use local resources effectively and how to integrate them into the curriculum.

Ongoing professional development is also crucial in keeping teachers updated on new methods and materials that can be used for improvisation. Schools and educational authorities should prioritize this aspect of teacher development to ensure that all educators are equipped to use improvisation effectively.

2.6.3 Collaboration and Sharing of Resources:

Collaboration among teachers can significantly enhance the effectiveness of instructional materials improvisation. When teachers share ideas, resources, and experiences, they can collectively improve the quality of education in their schools. This collaborative approach not only lightens the load on individual teachers but also leads to the development of a richer variety of instructional materials.

As noted by Babalola and Alade (2013), in schools where teachers regularly collaborate, there is often a noticeable improvement in the quality and diversity of improvised materials available for teaching. Such collaboration can be facilitated through professional learning communities, teacher networks, and regular meetings where teachers can exchange ideas and resources.

2.6.4 Teacher Motivation and Support:

The motivation of teachers plays a critical role in the success of instructional materials improvisation. Teachers who are motivated are more likely to invest the necessary time and effort to create high-quality improvised materials. However, motivation is often linked to the level of support teachers receive from their school administration and the wider educational system.

Research by Ogbeche and Okon (2015) suggests that when teachers feel supported—through adequate resources, recognition of their efforts, and encouragement from their superiors—they are more likely to be proactive in improvising instructional materials. Support can also come in the form of providing teachers with the necessary time to prepare materials, as well as offering incentives for those who demonstrate exceptional creativity and innovation in their teaching practices.

2.7 Challenges in the Use of Improvised Instructional Materials

While there are numerous benefits to using improvised instructional materials, there are also significant challenges that teachers and schools must navigate. These challenges can impact the effectiveness of improvisation and include the following:

2.7.1 Time Constraints:

As previously discussed, the process of improvisation can be time-consuming. Teachers often have limited time to prepare lessons, and the additional time required to develop and create improvised materials can be a significant burden. This issue is particularly pronounced in schools with large class sizes or those that operate under strict teaching schedules.

The study by Adamu (2012) found that time constraints were one of the most commonly cited barriers to the effective use of improvised materials. Teachers reported that the time required to gather materials, plan their use, and integrate them into lessons often conflicted with their other responsibilities, leading to a preference for more traditional, less time-intensive teaching methods.

2.7.2 Inadequate Training and Expertise:

Another challenge is the lack of adequate training and expertise among teachers. Without proper training, teachers may struggle to create effective and pedagogically sound improvised materials. This challenge is compounded by the fact that many teacher training programs do not emphasize improvisation or the creative use of local resources, leaving teachers ill-prepared to undertake this task

2.8 Conclusion

In concluding this literature review, it is clear that instructional material improvisation is a powerful approach for enhancing biology education in resource-constrained environments like Kaduna South. The theories reviewed, including Constructivist, Experiential Learning, and Resource-Based Learning, underscore the importance of active, hands-on experiences that improvised materials facilitate, allowing students to engage more deeply with biological concepts.

Empirical studies also support the notion that improvised materials can significantly improve students understanding and retention, especially in settings lacking standardized resources. While challenges such as time constraints and limited teacher training persist, the potential benefits of improvisation enhanced student engagement, critical thinking development, cost-effectiveness, and cultural relevance highlight its effectiveness in bridging educational gaps.

By connecting these findings to the topic, we see that improvisation in instructional materials is not just an alternative but a transformative practice that can provide quality biology education and improve learning outcomes for senior secondary school students in Kaduna South.