Improvisation in Teaching and Learning Biology in Senior Secondary Schools: Prospects and Challenges

Sallau Ahmad Ibrahim1*, Abdul Ibrahim2, Sani Ya’u3, Sabo Ado Abdullahi4

1,2,3,4Dept. of Biology, School of Science Education, Sa’adatu Rimi College of Education, Kumbotso, PMB 3218, Nigeria
3Child Development Centre, Sa’adatu Rimi College of Education, Kumbotso, PMB 3218, Nigeria

*Corresponding Author: sarikadawa@gmail.com
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Abstract- The teaching of Biology cannot be done effectively without interaction between the teacher, students and the environmental resources. Instructional materials use for teaching and learning by teachers usually stimulate self-activity on the part of the students. Due to the inadequate instructional materials in most of the senior secondary schools, there is needs to bring new innovative ways of providing available materials for effective teaching and learning. These issue bring about the idea of improvisation which is the art of using materials or equipment obtained from local environment or produced by the teacher and with the assistance of the local personnel to enhance instruction. This paper discussed on the conceptual meaning of biology, the importance as well as challenges during teaching and learning biology. It highlight the meaning of instructional materials and improvisation. The significance of improvisation and the factors militating the effective use of improvised materials were mentioned. This paper made some recommendations.

Keywords: Biology, improvisation, improvised materials, teaching and learning

I. INTRODUCTION

Biology remains one of the basic sciences whose teaching and learning is universally known to be efficient and successful, if only undertaken simultaneously with the help of adequate instructional resources and facilities [1]. Biology plays a vital role in the field of biochemistry, medicine, physiology, ecology, genetics, and molecular biology and as such, biology has been made a central focus in most human activities including being a solution to the problem of food scarcity, health, hygiene, family life, poverty eradication, management and conservation of natural resources, biotechnology, ethics, various social vices and as well lack of appropriate instructional materials [1].

The teaching of biology cannot be done effectively without interaction between the teacher, students and the environmental resources. The Biology curriculum is planned to enable the teacher use activity oriented, child-centred approach (guided inquiry) to teach [2]. Studies have also revealed that the achievement of Nigerian students in ordinary level biology was generally and consistently poor over the years [3]. This has been a major source of concern to the school administrators, parents and the government at large. [4] opined that biology is resource intensive, and in an era of poor funding or scarcity of resources, it may be very difficult to find some of the original materials and equipment for the teaching of Biology in schools adequately. Reference [5] reported that there were inadequate resources for teaching biology in secondary schools in Nigeria. Also stated that the available ones are not usually in good conditions in most times. According to [6] some of the factory produced or imported instructional materials have also been discovered to be based on foreign ideas and culture. Reference [7] stated that there were inadequate materials for teaching biology in secondary schools. The aim of this paper is to highlight the need of improvisation in the teaching and learning of biology in secondary schools. Also, to highlight the prospects and challenges of improvisation in teaching and learning biology.

II INSTRUCTIONAL MATERIALS

Reference [1] sees this instructional materials as a wide varieties of equipment and materials use for teaching and learning by teachers to stimulate self-activity on the part of the students. According [2] instructional materials or teaching materials are those equipment and materials that a teacher uses to illustrate, emphasize, and explain a lesson in order to make it clearer to the students. These materials and equipment include simple familiar objects that can be locally obtained. Ahmed [8] opined that instructional materials are also referred to as teaching materials or teaching aids. The
importance of resources for teaching and learning processes is to provide the teacher with the means of expanding the horizon of experience of students, thereby seeking to have a counterpart of firsthand experience [2]. Teaching resources help to provide materials and opportunity for experiment. This ensures students participation in the lesson, which promotes effective learning [2].

The National Policy on Education [9] emphasizes the need for teaching and learning of science processes and principles. The policy recommends practical, exploratory and experimental methods of teaching. Okebukola [10] stated that the basic tools that science uses in the learning of science processes are the instructional materials. The studies of [11,12] have shown that the use of instructional materials have improved achievement. The teaching of biology without instructional materials may certainly result in poor academic achievement. The mastery of biology concepts might not be fully achieved without the use of instructional resources that the students are abreast with. The teaching of biology without instructional materials may certainly result in poor academic achievement. Folorunso [13] observed that there is lack of adequate and appropriate instructional resources for effective teaching of biology in schools.

III. FACTORS INFLUENCING STUDENT ACHIEVEMENT

The study of [14] shown that secondary school students are exhibiting low interest in biology. This low interest of students in biology has been traced to poor achievement in examinations. Umoinyang [15] reported that achievement of students in biology at the end of the secondary school has not improved in the last decade. Folorunso [13] has linked poor achievement trend in biology particularly to the lack of instructional resources in schools due to poor funding of the schools. The poor funding of schools has hindered the principals from providing the teachers with adequate instructional resources as reported by [1]. Also, poor academic achievement in biology could be attributed to many factors such as, low interest of students in biology, inadequate motivation from teacher, poor incentives to biology teachers, lack of adequate supply of instructional material, lack of qualified teachers, and use of teacher centered instructional strategies, inadequate use of instructional materials and use of abstract standardized materials [1]. Among these factors, teacher’s use of abstract standardized instructional strategy is considered as an important factor in this study. Ibitoye and Fape [16] stated that poor achievement in biology was traced to poor usage of instructional resources for biology teaching and learning, poor state of infrastructure facilities, large class size, poor teaching, use of faulty assessment practice, and inadequacy of quality teachers. According to [10] the poor state of laboratory facilities and inadequate use of instructional materials has constituted a cog in the wheel of students’ achievement in biology in the Senior School Examination. Ajagui [17] have shown that biology teachers continue to teach using the lecture method despite the recommended guided discovery or inquiry methods. The inability of biology teachers to apply guided inquiry/discovery approach and other modern methods of science teaching, might be hinged on some problems which include, lack of laboratories, equipped with facilities in schools, large class size, lack of qualified teachers, and incompetency arising from the training of science teachers [1].

II. MEANING OF IMPROVISATION

According to [18] improvisation is the provision of alternatives to real things. Improvisation is the making of substitutes when the real equipment or material is not adequate or available [19]. It is the art of providing and using alternative materials or resources in the absence of the real or factory made one. Oyediran [20] also defines improvisation as the art of using materials or equipment obtained from local environment or produced by the teacher, and with the assistance of the local personnel to enhance instruction. In other to teach by inquiry method or use activity based instructions, improvisation is required since instructional materials seem not to be adequate [19]. Improvisation is the process of making equipment and materials by the students or by engaging the services of others in the absence of real or manufactured ones [4]. Generally, improvisation of instructional materials is an attempt to adapt and make use of local resources in the teaching/learning process when the ready- made materials are not available or are in shortfall or not within the reach of users. The teacher and the students could produce the improvised instructional materials. According to Okebukola [19] improvisation in the context of biology can be seen as the process of using alternative resources for enhancing biology teaching in the absence of the real ones. The teacher initiates the production of the alternative resources, which is constructed by either the teacher or the local artisans e.g. carpenters blacksmiths etc. The teacher may use the students for improvising some of the needed materials or equipments.

According to [1] improvisation is a technique of originating a very new tool, instrument, materials, device or modifying existing ones for serving a particular purpose. Improvisation of instructional materials in secondary schools for teaching/learning purposes cannot be overemphasized. To be able to promote quality instruction in our school system, there is the need to pay attention to improvisation of instructional materials in the teaching/learning process. However [21] noted that improvisation demands adventure, creativity, curiosity and perseverance on the part of the teacher, such skills are only realizable through well-planned training programme on improvisation. Fajola [22] sees improvisation from the creativity involved. These creativity are substitution and construction. Substitution in improvisation simply implies the techniques whereby an already local material is used in place of a piece of equipment that is not available.
whereas construction involves making of a new instrument to serve in place of the unavailable original one, where substitution is not possible [21] opined that improvisation provides connectivity between students abstract and real experience of teaching and learning.

II. IMPORTANCE OF IMPROVISATION
The importance of improvisation cannot be underestimated. Chukwunyeremunwa [1] identified the following:

- Reduces the money spent on the purchase of equipment in educational institutions.
- Ensures the realization of lesson objectives.
- It gives room for a teacher to demonstrate his creative skills and gives room for the use of cheap local materials as alternative to the expensive foreign materials.
- Improvisation encourages students towards the development of creative abilities.
- Provides a frame of reference on which students can key their attention during classroom activities.
- Enables teacher to think of cheaper, better and faster methods of making teaching learning process easier for students.
- Affords students the opportunity of becoming familiar with resources in their environment.
- Helps in solving the problems of lacks of equipment in educational institutions.
- It strengthens enquiry, discovery and investigative methods in sciences.

II. FACTORS MILITATING THE EFFECTIVE USE OF IMPROVISED MATERIALS
Two basic categories of problems or factors associated with improvisation were identified i.e technical and human factors [1]. Some technical factors challenge the degree of accuracy and precision that can be achieved with the improvised materials and equipment. This problem is crucial at both the secondary and tertiary levels where experiments that are more sensitive and observations are carried out. Other technical factors relate to the problems of use. Such questions as whether or not it is easy or difficult, longer or shorter messy or clean and convenient or inconvenient etc, using the improvised materials when compared with the use of standard materials are used. Human factors are problems associated with the teachers’ professional commitments, creative ability, technical skill, ingenuity and competence [1].

Human factors are problems associated with the teachers’ professional commitments, creative ability, technical skill, ingenuity and competence. The problem of commitment is very serious because improvisation requires creative imagination. If a teacher is not committed to improvising his instruction, he will creatively think of substitute for equipment and materials and how to organize them [1,23]. Another aspect of human factor can precipitate when a teacher becomes sensitive to ambience often displayed by government policies and actions. He also observed that the attitudes of heads of schools are not encouraging as they expect science teachers to improvise out of their hard-earned salary without compensating or reimbursing them in return [1,23].

IV. SOLUTION TO THE PROBLEMS

- The teaching of Biology in secondary school should be conducted in a manner that students will effectively understand and learn the concept taught.
- It should be practical as the use of improvised instructional materials has play greater role in students’ achievement.
- Teacher should try to improvise instructional materials and encourage students to do the same. This will give students enough understanding of Biology concepts as the child’s local environment will be used to source for the materials.
- There should be cordial relationship between policy makers and schools for the provision of essential resource materials, like laboratory, glass wares, reagents, microscope, burner.
- It is suggested that regular meaningful workshop on improvisation technique for biology teachers should be conducted to improve and update their competence in teaching.
- At the local education authority level, effort should be made from time to time to organize workshops for biology teachers on improvisation and needs for the use of instructional materials. This is to compliment the efforts of the Millennium Development Goals (MDGs) for re-training of Science teachers.

IV. CONCLUSION
To be able to promote quality instruction in our school system, there is the need to pay attention to improvisation of instructional materials in the teaching and learning process. Students improvised instructional materials play a pivotal role on students’ achievement in Biology. Based on the data consulted, it was found that students taught biology using improvised instructional materials performed better than students taught using conventional material. The process of improvisation gives teachers’ the knowledge of creativity, manipulative skills, and critical thinking. Improvisation helps in saving cost of looking for ready made instructional media which are more costly. It encourages self-reliance and a feeling of confidence during instruction delivery. It provides employment opportunities for youths that are unemployed in the community [24].

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