



Analysis of Educators' Concerns about Paucity of Instructional Aids for the Teaching of Biology in Secondary Schools: The Way Forward

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Abstract: *Biology is a very important science subject and stands as the bedrock upon which are based many other science courses like Medicine, Pharmacy, Nursing, Biochemistry, Genetic, Agriculture etc., that are of great economic importance to a nation. While most students prefer Biology to the other sciences like Physics and Chemistry, their poor performance in the subject has been of immense concern to educators. This paper explored one of the important concerns of educators which is the paucity of instructional aids for effective teaching and learning of Biology in secondary schools. Using documentary sources, the paper explored the concept of instructional aids, highlighted some instructional aids useful for teaching and learning of Biology, reviewed educators concerns on the paucity of instructional aids in spite of their efficacy in teaching and learning Biology. Suggestions on the way forward were also made.*

Key words: *Biology, Instructional aids, Secondary schools*

Introduction

Biology is a branch of natural science that deals with the study of living organisms, including their structures, functioning, evolution, distribution and interrelationships. Biology occupies a unique position in the secondary school education curriculum because of its importance as science of life (Aniaku, 2012). In Nigeria the secondary school Biology curriculum is designed to continue students' investigation into natural phenomena, to deepen students' understanding and interest in biological sciences, and also to encourage students' ability to apply scientific knowledge to everyday life in matters of personal, community, health and agriculture among others (Federal Ministry of Education, 2009).

Biology is a very important science subject and stands as the bedrock upon which are based many other science courses like Medicine, Pharmacy, Nursing, Biochemistry, Genetic, Agriculture etc., that are of great economic importance to a nation. Besides, the importance of Biology to mankind as science of life, it is one of the science subject mostly preferred by many students in the secondary schools because it has less mathematical calculations unlike Physics and Chemistry and deals with non-abstract things (Aniaku, 2012). Because of these reasons, Biology has a very high enrolment of students in the external examination (Senior School Certificate Examination) more than Physics and Chemistry. Ifeobu (2014) agreed that majority of senior secondary school students choose biology in the West African Senior School Certificate Examinations (WASSCE) or National Examination Council's Senior School Certificate Examinations (NECOSSCE). Also, for some senior secondary school students,

biology is a subject of first choice because they find it to be an interesting subject as a subject that is more related to nature.

Despite this interest, students have continued to perform below expectation. In fact, the Chief examiner's reports of the past twenty years have shown that majority of students could not credit the subject (Ifeobu, 2014). One wonders whether this is because of lack of infrastructures and facilities for the teaching of Biology. Indeed, educators have over the years harped on the importance of instructional aids in the teaching and learning of Biology. There also have been concerns about the lack of instructional materials for the teaching and learning of Biology across levels generally and in secondary schools particularly. This paper analyses educators' concern about paucity of instructional aids for the teaching of Biology, and suggests the way forward.

Concept of Instructional Aids

Instructional aids come by different names: instructional materials, teaching aid, instructional media, and so on. Instructional aids are defined by different authors though they convey the same meaning when interpreted. Instructional aids could be explained as devices through which knowledge, skills, attitude, ideas, beliefs and values got transmitted to the learner by the teacher in order to ease teaching-learning process. Akanbi (2018) defined instructional aids as materials designed to enrich the teaching and learning processes and hence contribute to better learning. Similarly, Abdu-Raheem (2016) defines instructional aids as essential and significant tools needed for teaching and learning of school subjects to promote teachers' efficiency and improve students' performance. This definition is in tandem with Isola (2010) which states that instructional aids are objects or devices that assist teachers to present their lessons logically and sequentially to the learners; while Abiodun-Oyebanji and Adu (2007) add that instructional materials or aids are all things that are used to support, facilitate, influence or encourage acquisition of knowledge, competency and skills.

In addition to these definitions one can add that instructional materials are those things that a teacher or the learner uses in the course of learning to make learning simple, easy to understand, retain and recall whenever it is necessary. Instructional aids are vital for the teaching and learning in every discipline. It is particularly useful in the teaching and learning of sciences like Biology where practical activities are demanded.

Instructional Aids for the Teaching of Biology

Practical activities in biology provide opportunities for students to actually do science as opposed to learning about science. Nzewi (2008) asserted that practical activities can be regarded as a strategy that could be adopted to make the task of a teacher (teaching) more real to the students as opposed to abstract or theoretical presentation of facts, principles and concepts of subject matters. Nzewi maintained that practical activities should engage the students in hands-on and mind-on activities, using varieties of instructional materials/equipment to drive the lesson home. Nwagbo and Chukelu (2011) stated that:

The use of practical activities (approach) to the teaching of biological concepts should therefore be a rule rather than an option to biology teachers, if we hope to produce students that would be able to acquire the necessary knowledge, skills and competence needed to meet the scientific and technological demands of the nation.

In Biology, practical activities are not possible outside some instructional aids. Ahmed (2017) enumerated some instructional materials that are necessary for the teaching of Biology practicals which at the same time could be improvised. They include: Tripod stand for supporting during heating, Bunsen burner- Source of heat, Funnel for transferring liquid, Plant press for drawing moisture or water away from plants, D.N.A model for illustration in genetic, Round bottom flask for measuring liquid volume, measuring cylinder for measuring liquid volume, Indicators (after conducting chemical analysis) as indicator for acid and base, Indicator catching net for collecting of insects or catching insects, Test-tube holder for holding test-tube during experiments. Others are Pooter for collecting small insects, Spatula for putting chemicals into test-tube, Watch-glasses for stocking and putting specimens, Aspirator for respiration experiments for diffusion, Diffusion chamber for diffusion experiments and rate of diffusion, Enzymatic reaction chamber for experiments on enzymes, Reptile-hook for studies in biology topics, Ball globe for teaching topics in ecology, Photometer for measuring the rate or speed of plant transpiration, and Clinostat for demonstrating direction of plant growth in response to light.

Educators' Concern About Paucity of Instructional Aids

Biology educators have attributed the poor performance of secondary school students in public examination Biology to, among others, paucity of instructional aids. In recent times, studies have shown that while instructional aids are inevitable in the teaching and learning of Biology, there has not been commensurate effort to ensure that they are available for the teaching and learning of Biology. Ali, Toriman and Gasim (2014) in a study of the status of Biology teaching in Kano made some startling discoveries. The number of laboratories in the selected schools was found to be inadequate because 60% of the students have only one Biology laboratory which will carry the population of the students. Practical is only conducted one to two times in a week despite the fact that 62.7% of the students prefer practical to lecture method of teaching (28%). Furthermore, the laboratory equipment or materials are not adequately available in the selected schools (57.3%). That means the students may not have access to laboratory materials like light microscope and other important materials which are needed in any Biology laboratory. The schools have no adequate charts, models; diagrams talk less of mini zoological garden which is all important for proper understanding of biology.

Ogundiwin, Asaju, Adegoke and Ojo (2015) determined the effect of Group Investigative Laboratory strategies, on secondary school students' achievement in Biology in Oyo State. Data were analyzed using ANCOVA. The study found that there was a significant main effect of Treatment groups on the students' posttest Achievement scores ($F(2,139) = 32.559, P < .05, \eta^2 = .321$). Group investigative strategy was significantly different from the conventional strategy in their achievement scores. The exposure of the learners to Group Investigative Laboratory strategies have been found to positively affect the enhancement of students' achievement in Biology.

A situation in which schools lack functional laboratory for teaching Biology, therefore, is an assurance of failure in Biology public examination. Laboratories serve a number of important functions. They provide opportunities for the application and investigation of content and concepts presented in textbooks and associated lectures and promote a range of 'practical' skills that form the basis for application in upper year level studies and longer term careers. Among other things, the practical skills engendered by laboratory activities include formulating

predictions and hypotheses, setting up experiments, making accurate observations and collecting data, handling biological materials, and developing accuracy and precision in the use of equipment and application of techniques. These sorts of hands-on science experiences have been shown to strengthen students' manipulative and visual-motor skills (Stephens, 2015). Where this is lacking, the students miss out.

In addition to the laboratory, learning is incomplete in this modern world without computer application. But, Ali et al (2014) observed that in secondary schools in Kano, 76% of students have never used computer although equal percentage of the respondents agree that Computer Assisted Learning will help immensely in the study of Biology. Students need computer for simulation and for bringing home live those things that ordinarily may not be brought to the classroom.

Awolaju (2016) investigated instructional materials as correlates of students' academic performance in Senior Secondary Schools in Osun State. The sample used for the study consisted of 40 students who were randomly selected from two different secondary schools in Ilesa East Local Government area in Osun State. 20 Students were used for experimental group while the other 20 students were under the control group. Quantitative method was used to collect data by using the research questions and hypotheses formulated for the study. Research instrument used for the study consisted of Biology Achievement Test (BAT). Data collected were analyzed by using mean score, standard deviation and T-test distribution. Findings revealed that students taught with instructional materials performed better than those taught without instructional materials. That is, the experimental group performed better than the control group (t-calculated value, 3.94 > t-critical value 2.02). The post test scores of male and female students taught with instructional materials showed no significant difference between their scores (t-critical value, 2.10 > t-calculated value, 1.33). Based on these findings appropriate recommendations were made.

Akpan, Okoli and Akpan (2018) investigated challenges to accessibility and utilization of instructional materials in the teaching-learning process. The study area was Ikwuano Local Government Area of Abia State, Nigeria. Multi-stage sampling procedure was used in the selection of the sample sizes of 300 pupils and 120 teachers from populations of primary school teachers and pupils in the area. The instrument for data collection was a structured questionnaire. Data collected were analyzed using mean and simple percentage. The findings were that the disposition of the teachers affects the accessibility and utilization of instructional materials, children who were taught with instructional materials performed better than those who were not. The challenges facing the accessibility and utilization of instructional materials include poor power supply, high cost of instructional materials, insufficient lesson duration, late hour of school dismissal, etc. The study recommended, among others, that private organizations should partner in the provision of some vital instructional materials that are cost intensive; and school time table should be planned to suit the inclusion of the use of instructional materials during lessons.

From the analysis so far, some facts have emerged. It is established that Biology educators believe in the efficacy of the use of instructional aids in teaching Biology. Students who are taught using instructional aids perform better than those taught without. However, there is paucity of instructional aids for the teaching of Biology. Teachers also share the blame of non-

utilization of instructional materials or aids. Teachers have options to improvise in the absence of standard materials.

The Way Forward

In view of the foregoing, it is suggested as follows:

1. Instructional aids should be used in teaching biology lessons in the classroom. The use of instructional aids in teaching and learning biology will enable the students to develop inquiry skills needed for concept and knowledge construction which will help them to appreciate biology better and improve on their achievements and interest.
2. Biology teachers should be trained and retrained on the job to adopt the use improvised instructional aids in the absence of standard aids. Training of these teachers could be done by the Government or relevant professional bodies like Science Teachers Association of Nigeria (STAN) through seminars, workshops and conferences.
3. The curriculum planners should plan the nation's Biology curriculum to accommodate skills in improvisation of instructional aids for the students and should allot more time to biology in the school time table to enable the application of instructional aids.
4. Government should take positive steps to provide instructional aids for the teaching of sciences generally and Biology in particular. Other agencies should also assist in providing these all-important instructional aids for effective learning outcome in Biology.

Conclusion

Biology is a very important science subject and stands as the bedrock upon which are based many other science courses like Medicine, Pharmacy, Nursing, Biochemistry, Genetic, Agriculture etc., that are of great economic importance to a nation. The teaching and learning of Biology over the years, however have suffered setbacks given the achievement of students in the public examinations. Paucity of instructional aids has been blamed for this abysmal performances. Educators therefore are concerned that Biology is a practically-oriented subject that requires extensive use of instructional aids in order to achieve the desired learning outcome. The paper is a call on all stakeholders to address the perennial problem of paucity of instructional aids facing the teaching and learning of Biology.

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