
Pedagogical Approaches and Effective Teaching in Biology Education: A Review of Teacher's Roles and Responsibilities

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ABSTRACT

Effective teaching methodology is one way of ensuring learner's performance as far as content delivery is concern. Therefore Biology education as a course of study which is geared towards promoting understanding of man's relationship with his environment by establishing the interrelationship between living and non-living as they exist within common surrounding. Critical observation of a phenomenon, identifying the problems, communicating and asking questions, formulation of hypothesis, analyzing and making inference as well as making prediction are skills needed by students studying Biology. Therefore, effective content delivery is required by every Biology teacher using relevant pedagogical approaches. In view of this, the present paper tries to review various pedagogical approaches for effective teaching of Biology, describe who an effective Biology teacher is, as well as identifies factors militating against teaching efficiency: the paper offer some key recommendations for teachers' implementation and to government for necessary action.

Keywords: Effective Teaching, Teaching Methodology, Biology Education.

INTRODUCTION

Teaching is one among several other components in education aimed towards achieving all round development of an individual. Effective teaching no doubt leads to the producing quality work force that provides favorable competition among the committee of developed nations. Some teachers lack the methodology to teach and make positive impact in the students, due to several reasons such as: poor attitude, lack of commitment just to mention a few, which disallow them from delivering competent lesson in their classes. This calls for concern, relevant teaching strategies be employed by the teachers in order to make teaching interesting and easy to understand as well as enhancing performance of all students. Teacher preparation is training undertaken by prospective teachers before being employed in the teaching (Gwang, 2005). Teacher preparation is a very vital instrument for the development and transformation of any nation. In his contribution Ibukun (2004) asserted that quality of human resources, often dictates the extent of the effectiveness of educational programmed. Teacher education is and will always be the foundation of a quality educational product.

Biology is a branch of science which studies life. Biology develops scientific technique attitudes and skills such as: observations, communicating, predicting and others. Therefore, Biology education is the act of teaching and learning in order to inculcate or transfer this attitudes, techniques and skills to the students (Okenyi, 2012). This process require quality Biology teachers to lead the crusade. A qualified Biology teacher is assume to have a mastery of employing relevant teaching methodology to suit his lesson delivery to enhanced understanding by all students. Using the appropriate teaching strategy will give rise to quality teacher product in all spheres of teaching life. The Teacher's primary role is to facilitate students' learning as well as the overall comprehension of the materials. Learning is continuously assessed through both formal and informal forms of assessment, which include: group projects, student's portfolios and class participation (Prince and Felder, 2006). The selection of the teaching methods is always affected by the learning objectives. Several good features are emphasized in teaching methods and have implication especially for developing curriculum and teaching for sustainable development, having quality Biology Teachers who have the pedagogical skills will help to produce a quality student who is expected to pass this education the younger generation.

Biology is the science that deals with the study of living organism (plants and animals). It is also studies the way our environment evolved. Medical advancement shows the importance of Biology in our daily lives. The study of diseases, their causative agents, cure as well as the action of drugs are a way of Biological enlightenment. As Oyovwi cited in Nwokonobi (2008) Says that recent advances recorded in the field of Biochemistry, Physiology, ecology, genetics and molecular Biology have made the subject a central focus in most human activities including solutions to the problems of food security, pollution, family life, conservation of natural resources etc. National policy on Education (NPE, 2004) cited in Oyovwi, due to the immense benefit of the subject (Biology) federal government of Nigeria made Biology a core science subject for the senior secondary schools. The basic objectives are to prepare students to acquire the following:

1. To acquire adequate laboratory and field skills in Biology
2. To gain meaningful and relevant knowledge
3. To have reasonable functional scientific attitudes
4. To have the ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture.

All the above mentioned objectives need quality Biology Teachers to deliver the task by employing the effective teaching methods in their classrooms.

WHAT ARE EFFECTIVE PEDAGOGICAL APPROACHES?

Effective pedagogical strategies can be seen as objective-oriented activities and flow of information between teachers and students. Studies of teaching methods influence all types of learning in the cognitive, affective and the psychomotor domains as Eila, Irmeli and Eija cited in (Karami, Pakmehr and Adhili, 2012). The choice of effective teaching methods depends on what kind of teaching approach is preferred. An effective teacher has a wide-ranging repertoire of different teaching and learning models, strategies and techniques and knows how to create the right conditions for learning. In order to effectively teach Biology subject the following pedagogical approaches are paramount:

Lecture Method:

The conventional instructional method in teaching Biology is the lecture which comprises the principles and methods used for instruction to be implemented by teachers to achieve the desired learning for memorization by students. This is a kind of teacher centered approach to learning, teachers are authorities and students primary role is to passive receive the formation through lectures and direct instructions, learning is measured using objectively scored tests and assessment (Prince and Felder, 2006). Lecture method remains one of the popular methods to transmit information and ideas by the teachers, trainers and speakers. While teachers are quite familiar with the approach, lectures can be informative boring and overwhelming depending on the compelling nature of the message and presenter's style and clarity of the message. Conceptual understanding is usually driven by the effectiveness of lecture delivered by a well-trained teacher.

Laboratory Method:

Laboratory work is the hall mark of education in the science and technology based fields. Student's laboratories are a costly resource yet their educational potential is often not fully realized in practice. It is timely that design delivery and the forms of student assessment used be examined critically for their contribution to the quality of learning. Snezana, Ljana and Milena cited in (Winter, Lemons, Bookman and Hoose. 2001). A laboratory setting is a more conducive learning environment than lecture halls, as it provide students with real life situations and a chance to exercise their problem solving skills, because the students are involved with the materials so it makes learning permanent.

Questioning Method:

Questioning technique of teaching enhance student's performance, where the teacher ask formative kind of questions throughout the lesson and allow students' to provide the answers themselves in their own ways, most at times open ended questions are given by the teacher to arouse the interest of the learner's and sometime close ended questions are asked and this form the basis for assessing the students and it carries all the students along (Inclusive teaching).

Project Method:

The Teacher become the mediator and directs the learning process. Students choose topic to write on using the relevant materials related to his/her topic; this is more on students centered approach. These deals with research findings, answers to some questions of interest to the researcher where hypothesis are formulated, and experiments are carried out, problems are solved and conclusions are drawn. This method is very effective if the student knows what he/she is doing otherwise the student will end up doing nothing and achieving no result and the end, supervisors need to strongly advice their student and support then technically.

THE ROLE OF QUALITY BIOLOGY TEACHER

A quality education is one that provides all the learners with capabilities they require to become economically productive, develop sustainable livelihood, contribute to peaceful and democratic societies and enhance individual well-being. The learning outcomes that are required

vary according to context but at the end of Biology education cycle must include threshold levels of literacy, basic science knowledge and life skills including awareness and prevention of disease. Capacity development to improve the quality of teachers and their stakeholders is crucial throughout the process.

For Biology teacher to be effective he/she must have the following qualities:

1. Competency to deliver effective lesson
2. Use relevant and adequate teaching aids
3. Knows different teaching methods: when and how to implement
4. Consider how best the students can learn and would be given the necessary attention.

If teaching means facilitating learning, then the role of the Biology Teacher to provide a clear and accurate presentation of subject matter, may be a necessary but not sufficient basis for effective teaching, thus, the traditional lecture exposition, takes little account of the of the learners existing knowledge and understanding . Effective teaching is not just an issue of “pitching” (another transfer of metaphor) at the right level to make sense to the learners, but rather designing instruction to optimally link with existing thinking. So to shift students understanding towards the target knowledge set out in the curriculum (Taber, 2001). Students can learn practical skills or attitudes (such as: valuing learning) or desiring to make a productive and positive contribution to the society.

BARRIERS TO EFFECTIVE TEACHING OF BIOLOGY

For teaching and learning in Biology to be effective some of this factors listed below are hindering the process:

Teachers Qualification:

Some teachers are not qualified because they don't have the idea of the different teaching methods, some are new and do not have teaching qualification, they usually operate the traditional method (lecture method), which is not student centered. Immediately after their NYSC teaching becomes their last resorts. As Akinfe, Olofinniyi and Fashiku cited in Sander (1988) found that the simple largest factor affecting academic growth of the population of students are differences in effectiveness of individual teachers. He further propounded that the higher a teacher is qualified, the higher his/her level of education in the teaching profession. Teachers are supposed to undergo one year of training i.e. PGDE (Post graduate diploma in education) for them to have the efficiency to perform better in the class and employ the effective teaching methods that will suits their subjects, for improvement in their teaching and learning process.

Laboratory Equipment:

Biology as a science subject is based on practical and experiment. Inappropriate, inadequate and non-utilization of facilities have been identified by some authors as some of the possible causes of student's poor performance, for instead as Ihejimaizu and Ochui cited in Aderonmu (2006) found that students often complain of non-familiarization with biology laboratory

equipment until a few weeks to the external examination, and in most cases, even the teachers of the subject did not know the use of laboratory equipment and chemicals until the practical examination have commenced. It is a must for Biology Teachers to know everything about their laboratory equipment before commencing their practical classes.

Inadequate Teaching Aids:

The Teacher, who is effective in his teaching from the topic and learning outcomes, knows what teaching aids he/she needs to help him/her deliver an effective lesson. But is quiet unfortunate most teachers don't know how to use teaching aids or improvise using low cost or no cost materials around them, some don't even know how to use the chalk board to ensure the learning objective is achieved at the end of the lesson, showing lack of professionalism on the part of the teacher. As Akinfe, Olofinniyi and Fashiku cited in Akinyemi (2006). Posited that "if we want the performance of our students in science to improve", they should be encourage to use appropriate thinking strategies' through innovation intervention by teachers, to help them achieve their goals, of becoming effective Biology teachers.

Large Class Size:

Class size is administrative decision over which teachers have little or no control. Class size refers to an educational tool that can be used to describe the average number of students per class in a school (Adeyemi, 2008). This is an issue of concern in most of our institutions of learn where teaching at times becomes almost impossible with the over populated classrooms we found ourselves today. In this case teachers have no option than to use the traditional method of teaching which is teacher centered. Even if the teacher is competent and has the pedagogical skills, because of the population he/she becomes handicap in employing the effective teaching strategies to enhance his efficiency. Some students are at the expense of losing so much from the content of the lesson because large class size presents more challenge for class management, students' control, planning assessment and marking. To be able to employ the effective teaching methods in our classrooms, we must consider the number of students in the class for easy flow of information, assimilation and retention to be effective in Biology.

Underfunding:

One of the major problems facing Teacher education in Nigeria is inadequate funding of Teacher education. As Garba cited in Akindutire and Ekundayo (2013) who lamented over inadequacy of fund in teacher education. For schools to operate effectively basic materials should be provided for smooth running of the system. Teachers need some materials to discharge their duties e. g. In Biology the teacher need materials like: charts showings different groups of plants and animals, vital textbooks, consumables, chemicals, reagents, slides, but due to lack of funds some are not available or not sufficient, this have negative effect on the learners because there are some materials that are costly and very important to the teacher to teach effectively and impact knowledge to the learner there by promoting quality education. Practical classes are of important to the Biologist as an avenue to experiment.

Teacher Preparation:

This lies strictly on the Teacher, how well is he/she preparation to deliver the task ahead? Does he have the methodology to teach effectively? Teachers need to prepare to make effective and efficient use of different teaching methods to make lessons interesting and arouse the attention of the students. Some teachers are not well prepared or poorly prepared before their lessons and by so doing they end up delivering poor lessons. Teachers in Biology should be well prepared to deliver effective lessons by mastering their subject content taking note of all the materials needed to deliver a competent lesson by employing the effective teaching methods.

CONCLUSION

The key role of a Biology teacher is to teach and make meaningful impact on his students learning achievements by employing different teaching methods. The attainment of the goals of Biology education largely depend on the quality of Biology Teachers, to overcome some of the challenges' mentioned in this paper like Teachers preparation, Teachers qualification, larger class size etc. Therefore, the techniques of what students will be able to achieve at the end of each lesson, using relevant and adequate teaching aids and how to organize learners' in different ways lies on the shoulders of the teachers in order to enhance participation by all students for effective delivery of quality Biology teacher production in Nigeria.

RECOMMENDATIONS

For a Biology teacher to be effective and employs the right teaching methods as far as content delivery is concern the following recommendations have been put forward:

1. Teachers without teaching qualification should go for one year studies i.e. Post graduate diploma in education (PGDE).
2. Biology Teachers should further their studies to have a wider scope of knowledge for the task ahead of them. (Teaching methods).
3. The management of the institution should always employ qualified laboratory technologist/ qualified Biology Teachers for smooth and efficient running of practical's in the Laboratory.
4. Biology Teachers should try and apply all the effective teaching methods practically in their classrooms, to know the most effective teaching method for our students.
5. Government should always place education at the top and provide all the necessary funds needed for schools and institutions to move forward.
6. Authority concerned with training staff should always encourage their staff to go for seminars, workshops and conferences for capacity building.
7. The management of institutions should make the number of students to be taught in classes to be moderate, so that the teacher will manage the class effectively using the appropriate teaching strategy and have class control.

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