EFFECTIVE TEACHING OF PRACTICAL BIOLOGY COURSES AT NCE LEVEL AS A WAY FORWARD IN SOLVING ENVIRONMENTAL AND SECURITY PROBLEMS IN NIGERIA

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Abstract

Biology education is all about teaching and learning the diversity of living organisms and how they relate to one another as well as with other non-living components of the environment. Certainly, it is dealing with any threat that may affect the security and health of the varieties of organisms including man. Against this background, this paper aims to explore the roles played by practical biology as a course at NCE level as related to its teaching/learning in enhancing security and understanding environmental problems from the grassroot based on the slogans of: "if I hear, I forget; if I see, I remember; and if I do, I understand". It is a known fact that practically based lessons are meant to improve students’ understanding, improve skills and prepare the students for the job market. Thus, the authors recommend among others the need of subject (practicals) allocation to the most committed, dedicated and devoted lecturers among others for the course to be effectively taught and the concepts to be effectively learnt.

Keywords: Biology, Biology Education, Teaching, Learning, Environmental and Security problems

Introduction

Biology is the branch of science that study living components of the environment as well as how each relate to one another and the non-living components of the environment. The objectives of teaching Biology Education at NCE level as outlined in the National Commission for Colleges of Education (NCCE, 2008). National Minimum Standards NCE Biology include:

i. Viewing biology as a process of inquiry into the living world
ii. Critically analyzing the activities of living things in their environment
iii. Demonstrating practical skills in handling scientific apparatus
iv. Demonstrating excellent and professional competence in teaching secondary school biology
v. Applying concepts and methods acquired in the course in new areas of study and in everyday situations.

A careful observation of each of the above objective requires the need of practical approaches and activities for concepts and ideas to be effectively learnt and then be inculcated in to the minds of the future generations. Fafunwa, (1981) and Ogumlaye, (1999) identified major areas that if well addressed will ameliorate the problems and enhance efficiencies of science teachers including:

i. Quality of teachers
ii. Approaches to science teaching
iii. Adequacy of laboratory apparatus and equipment and
iv. Class size in science teaching

This implies that teaching is more than just telling and testing but is a guidance to learning activities. Odinaka, (2012) defines teaching as “a complex art of guiding the learners through a variety of selected experiences or learning tasks to bring about worthwhile or relatively permanent change of behaviours”. The teacher is the hub of the educational system because the school cannot be better than the teacher. Similarly, Abdullahi, (1982) argued that science teaching involves various activities including lecture, practical work, demonstration, group discussion, discovery and project. Barness, (1983) averred that the use of well selected instrtuional materials and apparatus contributes immensely towards clarity and understanding of the instruction. Therefore, the teacher constitutes the most vital factor in the educational system because it is based on their number, quality and devotion to duty that the effectiveness of education a system depends.

Effective teaching arouses from the quality and devotion to duty of a teacher. National Teachers’ Institute, (2000) opines that “education unlocks the door to modernisation but
it is the teacher that holds the key”. Therefore, a lecturer responsible for teaching practical courses holds the key of unlocking other courses that are are theoretically learnt. Practical biology courses at the NCE level comprises of BIO 115, 125, 217, 225 and 316 corresponding to Biology practical I to V, which in turn corresponds to teaching a practical course in a semester with the exception of teaching practice semester at 300 level. These courses cover the following environmental and security aspects as outlined in the NCCE (2008) National Minimum standard NCE Biology:

i. Principles and practice of sterilization (Human diseases control and prevention)

ii. Identification and roles of lower plants in the environment (e.g. decomposers and nutrient cycling)

iii. Study of root stem and leaves of monocot and dicots (e.g. Carbon sequestration by leaves)

iv. Experiments on photosynthesis and its role in the production of oxygen and starch

v. Gross and structure of organs e.g. kidneys

vi. Population studies

vii. Identification of plant diseases associated to cash crops

viii. Measurement of heart beat, breathing rate and effect of exercise

ix. Pollution in the stream (eutrophication) and in the air and their effects and roles in the environment

x. Practical identification of variation among individuals’ fingerprint, blood group, height etc

xi. Hybridization

xii. Improvisation in Biology (using locally disposed materials in the environment)

xiii. Safety in the school laboratories (e.g. Fire, fire control equipment and its consequencies)

xiv. Observation of areas of apparent gully erosion
Relationship between the objective of teaching biology at NCE level, Content of practical biology at all NCE levels and environmental and security problems.

Objective I: View biology as a process of inquiry into the living world

The above objective is an interpretation of the simple definition of Biology as the study of living organisms: origin, diversity, roles, relationship among and between one another as well as what may influence their existence. Hence, the subject quest for any thing (living and non living) that positively or negatively influence any of the inhabitant of the living world. It is a known fact that security and environmental problems are factors that directly affect the survival, reproduction and development of living organisms.

Security is defined in the Macmillan Dictionary (online version) as “the protection or the safety of a country’s secrets and citizens”. Lipman in Abubakar (2012) defined security in terms of war by saying that “a nation has security when it does not have to sacrifice its legitimate interest to avoid war and is able, if challenged to maintain by war” Similarly, Gashu’a defined security as “the progressive movement of the entire social system which involve feelings of being safe, highly protected and motivated with freedom from worries and loss, elimination of poverty by being an independent entrepreneur or employee as well as elimination of all institutional or customary obstacle”. The first hand practical experiences of security ‘apparatus’ as finger prints, blood groups, DNA and DNA test etc are all learnt in a course titled Biology practicals of the NCCE minimum standard.

Objective II: Critically analyse the activities of living things in their environment.

Activities of organisms in their environment include their roles as either producers, consumers or decomposers and how these activities may influence their environment positively or negatively. Product of respiration of producers (plants) for example is of benefit to consumers and other decomposers but detrimental to some organisms e.g. anaerobes. Similarly, the respiratory products of all consumers as well as man’s activities (industrial and domestic, such as constructions, minnings, use of automobile engines, refining oils) involve adding toxic gases as carbonmonoxide, sulphurdioxide, carbondioxide to the atmosphere. In addition to the discharge of sewage from
agricultural, domestic and industrial sources into bodies of water, it has also negatively affected the environment. Thus, biology as a course provides an in-depth knowledge of the above and the practical biology course at the NCE level clearly spells out the need to understand the lethal and dangerous levels in the atmosphere, their measurement and control techniques (NCCE: NMS Biology, 2008).

Adama, (2012) asserts that the role of education in the attainment of human goods and aspiration cannot be over emphasized. For instance, Millenium Development Goals (MDGs) and vision 2020 depend on education as the most veritable instrument for the attainment of the designed status quo. The MDGs aimed to successfully deal with the following:

i. Eradication of extreme poverty and hunger
ii. Reduction of child mortality
iii. Improvement of maternal health
iv. Combating HIV/AIDS, Malaria and other diseases
v. Environmental sustainability
vi. Promotion of gender equality and empowering women
vii. Attainment of universal primary education.

Looking at the first six MDGs above and the topics or units under NCE practical biology as mentioned would give a clue of the relationship of practical biology in attaining the above goals which in turn will lead to solving of issues as food security, nation/state security, environmental problems and empowering women based on the notions that a disease free nation/state is a healthy nation, and the popular slogan which says ‘Health is power’

Objective III: Demonstrate practical skills in handling scientific apparatus.

To efficiently demonstrate practical skills, appropriately handle apparatus and develop scientific attitudes, there must be practical exercises. Ali, Amshi and Abdullahi (2012) defined practical work as any teaching and learning activities involving at some point the
students in observing or manipulating real objects and materials. They described practical work as observable skills, knowledge and attitudes that are exposed in the laboratory, workshop or field and as such enable students acquire scientific attitudes and skills. Similarly, Honson (1990) in Mohammed, (2011) view practical work as cooperative processes that:

i. Motivate students by stimulating interest and enjoyment  
ii. Teach laboratory skills  
iii. Enhance learning of scientific knowledge  
iv. Develop scientific attitude with open mindedness and objectivity  
v. Give insight into knowledge (method) and develop expertise in using it  

Ali, (2002) in Mohammed, (2011) added that frequent practical work in Biology help students and teachers to:

i. Provide the students with skills to tackle global challenges  
ii. Help students develop manipulative skills as they handle specimen and equipment.  
iii. Develop scientific attitudes and values  

All over the world right now, the issue of national security is on the front burner (Nkanga, 2010). Also, Iredia (2011) asserted that national security cannot be equated to military or defence or law enforcement alone, but it goes beyond all of that to accommodate far reaching issues. Hence, it is the ability of states or the nation to overcome any challenge no matter what the type is. It was on this score according to Kayode, Tidsabia and Gundu (2012) that American President Barack Obama canvassed an all-encompassing world view in his own definition of America’s national security which included “strong innovative and growing US economy in an open international economic system that promotes opportunity and prosperity.

From the above views, the role of NCE Practical biology in resolving security issues can be put in the following units as blood groups, finger printing, hybridization (monohybrid and dihybrids) and the likes are practically demonstrated and taught to the students which
are all elements of security instrument that are used today in tackling a nation’s security problems related to food or the need of peace.

**OBJECTIVE IV: Demonstrate excellence and professional competence in teaching biology.**

It is generally believed that excellence and professionalism are achieved through effective practices (practice makes perfect). The teaching task itself is a practical demonstration of theories, laws and principles. The above objective is invariably the same as saying who is a professional biology teacher? A simple definition of teaching is a guidance to learning activities, which is a service profession. Hence, a biology teacher is a professionally qualified teacher that can effectively guide learners in all learning activities. Nwagbo (2008) in Osedum and Ezekiel (2012) noted that the major contributor to students failures in science among others is the poor quality of teachers. Similarly, Baikie, (2001) in Gadaka and Gadaka (2012) stressed that the future survival of and greatness of a nation may well depend on how we succeeded in re-orienting the potential leaders of tomorrow with the type of education that will help them develop the values, attitudes and discipline. Biology being a science aims to inculcate such attitudes as honesty, humility, curiosity, open-mindedness, suspended judgement and critical thinking which without doubt are tools for national security.

**OBJECTIVE V: Apply concepts and methods acquired in the course in new areas of study and in everyday situations.**

All field of studies in one way or the other are means of solving problems encountered directly or indirectly. Hence, Biology is not in an exception. Biology is more than just a field that deals with the living and non-living components of the environment. It equips students with skills necessary for solving social, political, economic, and environmental problems. Simple exploration of different fields as public health, medicine, veterinary medicine, forestry and wildlife, defence and intelligence agencies etc that provide security and solve human and environmental problems will reveal the need of the knowledge of Biology (Ali, 2011).
Conclusion

Nigeria is a land endowed with good educational planners. This is supported in the popular slogan which says ‘Nigerians are good in planning but failing to implement’. Though the good implementers may be available, the above assertion may be true due to the global rating of Nigeria as one of the most corrupt nations and the implementation of Akunyili’s rebranding programme of ‘Nigeria, Good people, great nation’. Therefore, the need of attitude change arise among all Nigerians specifically educators and those who impart knowledge (teachers) at the grassroots in order to prove that “a teacher is the hub of educational system because the school itself cannot be better than the teacher” Odinaka (2012). The teacher constitutes the most vital factor in the educational system because it is upon their number, quality and devotion to duty that the effectiveness of the education system depends. Science teachers should always bear in their minds the philosophy of science teacher education as outlined by National Commission for Colleges of Education (NCCE 2008) that “the curriculum is designed to produce knowledgeable, highly motivated professional and effective teachers of science subjects who will be able to develop in students an appreciation and understanding of science processes and principles. Science teacher education is designed to develop confidence in the teachers and enhance their ability to changing situations in science and the technologically oriented society”. As such, biology practicals if effectively taught will solve many environmental problems such as pollution, deforestation, desertification, greenhouse effects etc as well as increase security such as food security from the knowledge of hybridization, pathogens/disease control and nation security by the knowledge derived from genetic e.g. knowledge of blood groups, finger printing, DNA test to resolve social problems arising from matrimonial homes on the legitimacy of owning a child and the like.
Recommendations

Based on the discussions in this paper, the following recommendations are made.

i. Practical courses should only be allocated to the committed, devoted and dedicated lecturer(s) among others for effective teaching of the course as all lecturers of specific department are known with specific qualities among others.

ii. Teachers should honestly discharge their duties so that the name ‘committed teachers’ should be given to all.

iii. School administrators should endeavour to release all practical requests if any within the time possible for the course to be effectively taught.

iv. Lecturers whom such courses are allocated to should learn to cooperate with their lab technologist.

v. Allowing such lecturers to continue teaching the subject (Practicals) for at least three (3) consecutive years to enable the lecturer update and improve self in order to give the desired learning experiences to the students.

vi. Head of Departments should endeavour to inform other lectures of the department during their departmental meetings of his reasons for such allocations to avoid crises among the staff of the department.
References


