

Promoting National Development and Security Through Effective Teaching and Learning of Biology in Nigeria

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ABSTRACT

This paper focused on promoting national development and security through effective teaching and learning of biology in Nigeria. It looks at the concept of national development, security, teaching, learning biology, the role of effective teaching and learning of biology in promoting national development and security in Nigeria. The paper also highlighted the factors affecting effective teaching of biology in promoting national development and security in Nigeria. Finally, recommendations were made among which was the need for the training of the prospective biology teachers to be comprehensive and government providing the school with adequate biological equipments since it is very clear that effective biology teaching is expected to achieve an appreciable national development and security.

Keyword: National Development, Security, Teaching, Learning, Biology

INTRODUCTION

Insecurity in Nigeria has been obstructive to the country's already sluggish strides in development. Yet, rapidizing national development and the security bottleneck in the country demands the alignment of foundational sciences with socio-economic resilience, human capital formation, and environmental management. Nnamonu and Ezugwu (2026) agree that Biology, as fundamental branch of science, can constitute part of the empirical foundation to address areas such as food security, public health vulnerabilities, environmental degradation, and youth unemployment.

There are two standpoints from which education as a concept may be viewed. First, it is the action or process of educating or of being educated. Second, it consists of knowledge and development resulting from an educational process. Third, education is the field of study that deals mainly with methods of teaching and learning in schools. Education is the whole process of human learning by which knowledge is transferred and impacted, faculties trained and skill developed (Urevbu, 2001). Education is the process of teaching, training and learning in schools or colleges to improve knowledge and develop skills Hornby (2010). Teaching and learning are two complex interrelated processes found in our educational system. Teaching is the act of imparting knowledge or skill by a teacher to the student. It is also the guidance of pupils/students through planned activities so that they may acquire the richest learning possibilities from experiences and require the active participation of the child (Ekaete, 2002). Learning is an act or experience of one that learns knowledge or skills. It involves changes in behaviours which are demonstrated by people implementing knowledge, skills or practice derived from education (Anka, 2006).

In Nigerian educational system, students are exposed into various courses of study that might help them achieve what is intended to be achieved; one of such courses is science education. Science education is the study of science and how scientific and technology affects the society and culture of the people. Science

education is the scholarly and practical discipline concerned with the teaching and learning and assessment of science content, science process and the nature of science (Obialor, 2018). Some of the options offered in science education are chemistry, computer science, mathematics, physics and biology.

Biology is the branch of science that deals with the study of life and its processes. Biology studies living organisms, which include their structure (gross and microscopical), functioning, origin and evolution, classification, interrelationships and distribution (Elizabeth, 2000). Biology is also the study of all forms, plants and animals including man as individual and as inter-independent entity. Biology demonstrates the absolute dependence of man on all forms of life. It is incontrovertible that sound knowledge of biology is a pre-requisite for entrance into such professions as medicine, pharmacy, agriculture, nursing, engineering and science teaching of which in one way or the other involves life. Similarly, Okeke in Hafest, Abubakar and Ibrahim (2017) explained that science students who did well in biology could have prospects of becoming doctors, nurses, pharmacists, dentists, medical technologists, food science technologists, genetics, engineers, microbiologists, biochemists, biology teachers and other science subjects specialists. Biology also helps the individual to understand himself, his environment, appreciate the nature and also control environmental pollution. It exposes man on how to maintain good health through clean water, clean air, good hygiene and sanitation, balanced diet, vaccination against infectious diseases, exercise and adequate rest (Obialor, 2016). Hence, an application of biology knowledge gives us the opportunity to explain the world around us and also reduce illiteracy and poverty which are impediments to security and national development.

Security is the protection against crime or harm and safety of freedom. According to Oxford Advanced Learner's Dictionary (2011) "Security" is defined as the activities involved in protecting a country, persons, buildings against attack, danger as well as protection from harm that may happen in future. It is the freedom from fear and anxiety that leads to stability, harmony, unity and peace. National development could be regarded as an upward progression of nation toward achieving positive advancement in social, political, economic, technology and manpower growth to contain with the global best practices. Thus, this paper will discuss the concept of national development, security, teaching and learning, biology, the role of effective teaching and learning of biology in promoting national development and security Nigeria, factors affecting effective teaching and learning of biology in promoting national development and security in Nigeria, and recommendation on the way forward.

Conceptual Clarification

National Development

National development, according to Egwu in Adeyera (2011) is the establishment of a viable and buoyant national economy, the establishment of a just and egalitarian society, the enthronement of equality and social justice and the building of a unified and integrated society where the different ethnic, religious and geo-political identities develop a collective sense of imagination that they are one. In the same vein, national development, in the word of Emeh and Ogaboh in Okemakinde, Adewuyi and Alabi (2013) involves the total transformation of society making humanity the focus of the development drive and seeking to develop man's potentialities in a total sense. It includes reduction of poverty, wealth creation, equitable distribution of wealth, ensuring nutrition and health, housing and auxiliary services, social security and welfare. This presupposes that national development is an all embracing entity on the part of individual and societal change with such indications as quality food, gainful employment, and wealth creation, power reduction within the ambit of such framework as equality, dignity, social justice and equity. Hence, a nation cannot be said to have developed when a significant percent of her population are not literate and there is decay in the country's educational system. In line with this thought Opara- Onukwugha Nwokeji and Mbah (2005) opined that the need for quality human with at least basic foundation of education which is quality and quantity, free and compulsory and its curriculum did not ignore all round development of individual or learner (Cognitive, affective and psychomotor). In addition, National Education Research Development Council (2008) asserted that the attainment of the objectives of UBE will not be possible if functional curriculum hat capable of empowering the learners at the end of secondary school education is not available. This is why science education curriculum (i.e biology, chemistry, physics, mathematics, integrated science) accommodated the fundamental of both

National Economic Empowerment and Development Strategies (NEEDS) and the Millennium Development Goals (MDGS).

Security

Security is considered as any mechanism deliberately fashioned to alleviate threats that prevent people from pursuing their cherished values. Igbozor (2011) defined security as the condition or feeling of safety from harm or danger, the defense, protection and absence of threats to acquire values. Hornby (2011) defined security as the activities involved in protecting a country, persons, buildings against attack, danger, as well as protection from harm that may happen in the future. Audu, Lukeman and Muhammed (2014) opined that security has to do with freedom from danger or with threats to a nation's ability to protect and develop itself, promote its cherished values and legitimate interest and enhance the well being of its people. It is the freedom from fear and anxiety that leads to stability, harmony, unity and peace. However, Nigeria has been facing internal insecurity which is said to be the absence of those tendencies which could undermine internal cohesion and the cooperative existence of the nation and its ability to maintain its vital institutions for the promotion of its core values and socio-political and economic objectives, as well as meet the legitimate aspirations of the people. Hence, internal security implies freedom from danger to life and prosperity (Oche, 2001). It could also mean the search to avoid, prevent, reduce, or resolve violent conflict- whether the threat originates from other states, non-state actors, or structural socio-economic conditions (Stan, 2004). It is apparent from the foregoing that national security is a desideratum, *sine qua non* for economic growth and development of any country (Oladeji & Folorunso, 2007). Security seems to be critical in the life of any nation as it attracts and propels development.

Teaching is an art and the quality of teaching depends on the love, dedication and devotion of the teacher towards the subject knowledge. Akudolu in Onyemerekeya (2003) defined teaching as a systematic activity deliberately engaged in by somebody to facilitate the learning of the intended worthwhile knowledge, skills and values by another person and getting the necessary feedback. Smith (2005) viewed teaching as the process of attending to other people's needs, experience and feelings and making specific interventions to help them learn particular things. Ukoha, Opera and Zita (2016) also viewed teaching as a systematic, dynamic and purposeful activity performed by the teacher aimed at the overall development of the learner. Anokam (2009) added that teaching involves three major components or factors such as communicative strategies- the intentional use of variety of communicative strategies for proper delivery of subject matter strategies; helping to render accessible to students materials necessary for their inquiry and learning; projecting a body of knowledge, set of skills or groups of character traits deemed valuable for the actualization of the desired outcome.

Teaching is also in three phases - planning- setting of objective; implementing- selection of strategies and engaging the learners in activities; and evaluating –gathering information to determine whether his teaching had been successful.

Biology

The word biology is derived from two Greek words Bios meaning life and Logos meaning to study; hence biology can simply be defined as the study of life. Sargine (2010) defined biology as the study of living things which include plants and animals. It is a fascinating study that ranges from microscopic cellular molecules to the biosphere, encompassing the earth surface and its living organisms. Biology according to Wikipedia (2011) is the branch of science which studies living organisms and how they interact with each other and their environment. It examines the structure, function, growth, origin, evolution and genetic of living and non living things. The author went further to explain that biology as a study that classifies and describes organisms, state their functions and how species come into existence. Biology as one of the science subjects has every other science subject emanating from it. For instance, chemistry being the study of the composition, structure, properties and interactions of matter, emanated from biology. This is because the study of matter depends on life. Physics on the other hand deals with the fundamental constituents of the universe, the forces exerted on one another and the results produced by these forces. This also depends on biology because to be able to study the universe is the fundamental duties of mankind who is a biological being. The knowledge of biology as a

subject can only be acquired by this biological being through an educational institute. Madubine and Ikwuansine (2007) added that the objective of teaching biology is to:

- a) Equip the student to question superstitious beliefs due to ignorance of cause and effects in his world
- b) Prepare the individual for career and vocations in areas of agriculture, medicine, pharmacy, teaching and research
- c) Develop scientific and technological attitude to enable him live in his contemporary society

Knowledge of biology will also assist the society in solving many social problems which are biologically based, such as: Human overpopulation, food production, pollution, disease control, environmental protection and conservation, human genetics, drug addiction and abuse and HIV/AIDS control. It is therefore expected that biology teachers should be aware of this above stated objectives and in addition develop, promote and foster scientific principles and practice amongst the students in the classroom environment through effective teaching of the subject (biology).

CONCEPTUAL AND THEORETICAL FRAMEWORK

The framework passes policy and resources, comprising the National Policy on Education and curriculum innovation entailing Bio-entrepreneurship and Bio-economy; through effective Biology pedagogies including activity-based and inquiry-based learning, virtual and physical laboratories, practical skills and capacity development of teachers in modern digital tools; to national development and security as the targeted outcome evidenced in food security and hunger abatement, public health resilience using remote sensing, environmental sustainability and mitigation of resource conflicts like the continuing farmer-herder clashes, and reduction of youth employment, underemployment and disguise unemployment.

Maduabum, (cited in Nnamonu, 2026) and Ezugwu et al. (2020) confirm that Biology plays a critical role in the transmission process encapsulated in the theoretical framework just charted.

The Role of Effective Teaching and Learning of Biology in National Development and Security in Nigeria

The Nigerian government like all other governments in the world realizes the role of effective teaching of science (biology) for national development and Security. It is for this reason that their promotion is enshrined in section 18(2) of the 1999 Constitution of the Federal Republic of Nigeria. Ataga in Igbaji, Miswaru and Sadiyya (2017) in discussing the role of science in the development of a nation argued that Science (i.e biology, chemistry, physics, mathematics) gives man the power to foresee and judge the consequences of his own actions in reflection to the natural world in which he is. It is a social activity that serves human needs for it is a foundation for technology since it provides knowledge and technology provide a way of using this knowledge. Iheoma in Igbaji, Miswaru and Saidiyya (2017) in a similar vein while eulogizing the role of science in the development of a nation concluded that „.....science (had) laid the foundation for modern technology which has enabled modern man to achieve an unprecedented control of his environment and to enjoy a high standard of living unknown to his ancestors”. Pandit Nehru, the Prime Minister of India from 1946 to 1964, a natural science graduate of Cambridge University, who was widely respected and credited as the architect of modern India due to the solid foundation he laid, in emphasizing the role of science in the developmental agenda of a country, according to Fubara (1998), said; It is sciences alone that can solve the problem of hunger and poverty, insanitation and illiteracy, insecurity, superstition and deadening custom and tradition, and vast resources running to waste of a rich country which may lead to starvation of the people. Who could afford to ignore science today? At every turn we have to seek its aid. The future belongs to science and those who make friend with science. This assertion of Nehru in the thinking of Fubara (1998) is another way of re-echoing the order God Himself, the Master Scientist, gave when He decreed: Be fruitful and multiply and fill the earth and subdue it (using all its vast resources in the service of God and man) and have dominion over the fish of the sea, the birds of the air and over every living creature that moves upon the earth (Genesis 1:28). Science (biology) therefore, is the foundation of man’s knowledge of life and the universe. It is only through science which begets technology according to Fubara (1998) that can mankind obey this order of God and fulfill God’s ordinance for sustainable national development and security of the earth, the environment of

mankind. It is the adoption of science in the national life that makes the difference between the developed and the underdeveloped countries of the world as noted above. In essence the main cause of the competitive gap between Nigeria and the developed countries of the world is the creation and application of scientific knowledge. The rule of the competition today is dependent much more on the natural capabilities to exploit resources, rather than just gloat over possessing them. This, according to Ekpiwhre (2008) is exemplified in the fact that many of the industrialized countries of the world today are poorly endowed with natural resources and less friendly weather conditions. Yet they have attained leadership in the world economy, essentially through the effective application of scientific knowledge got from science education. Ironically, the least developed countries are those with favourable climatic endowments but due to less genuine emphasis on the development of science education, such countries have found themselves in the backwaters. Years back, India was a key member of the club of backward economies, but today the story has changed. India's transformation did not happen by accident; rather it is the result of that country's leadership vision on science education as a gateway to the development of its human capital. India is doing very well in the medical field as well all due to the country's leadership genuine commitment to science education. It is a known fact that currently India is one of the leading countries in the Information and Technology (IT) revolution flagged off in the 1990s. Countries like the United Kingdom and France benefited immensely from the Industrial Revolution of the 19th century due to their commitment to science education in their school curriculum. The USA emerged from an agrarian economy into an industrial superpower in the 20th century through the effective application of science education. In all these countries, heavy investment was made on their human resources and factories and their successes were based on carefully designed scientific plans and strategies. These are lacking in the Nigerian case as it is common with most African states. A country's innovative capacity, that is, the ability to create and/or apply new knowledge to solve practical problems according to Ekpiwhre (2008) greatly depends on four indices - the country's level of technological capability; the formal and informal institutions, as well their supporting systems; physical infrastructure; and an advanced knowledge infrastructure.

Using the above criteria, Ekpiwhre (2008) asserted that, Nigeria stands at the 71st position out of 75 countries in a rigorous assessment conducted in 2008 by a Nigerian, Professor Banji Oyelaran-Gyeinka, who heads the UN-HABITAT in Nairobi - Kenya. The message is clear - Nigeria has a long way to go surpassing 70 countries among who are South Africa, China, Israel, and Malaysia among others is no mean feat. Nigeria cannot afford to stagnate while other countries are making steady progress. This is so because countries with genuine interest in the development of science education have benefited immensely in wiping away most of such countries' superstitious beliefs through the application of the knowledge of science (technology) to live a satisfactory economic life. This is in addition to assisting such countries to raise the level of their socio-cultural life through the manufacture of modern devices that have equally made their lives much more comfortable in recent times which implies national development. In other words, science education has contributed to human knowledge through the production and use of tools in order to solve real life challenges. For Nigeria to exploit the blessing of science for its developmental agenda, the purveyors are trained resources in scientific skills who can apply knowledge gained in solving practical problems. It is through the growth of such a large scientific and technological manpower base that the country can be assured. This is because it is such manpower that will guarantee the efficient utilization of the abundant natural resources that will stimulate national development and security in a country; Nigeria inclusive.

Factors Affecting Effective Teaching and learning of Biology for National Development and Security in Nigeria

A number of factors impinge on the effective teaching and learning of Biology in the country for national development and security. The most critical factors are presently discussed.

Unqualified Biology Teachers: Many science teachers in secondary schools have inadequate training in science discipline biology inclusive (Olorukooba, 2007). Stressing on science (biology) teacher's competence, Denye and Gbamnja in Obialor (2016) noted that science graduate with no professional training are quickly drafted into the classroom to teach science in hope that scientific literacy and ultimately scientific culture would have been achieved. Anyanwu (2002) observed that the generality of such teachers do not understand the nature of science so as to inculcate science culture and a proper appreciation of science in students.

Similarly, Olorokooba (2007) opined that teachers who possess subject matter expertise and ability to present the subject usually engaged them in activities that will facilitate their understanding of curriculum content. In contrast, teachers with weak knowledge of subject matter contents will invariably affect biology learning.

Methods of Teaching Biology: Poor academic performance by the majority of students is fundamentally linked to application of ineffective teaching methods by teachers to impact knowledge to learners (Adunole, 2011). Similar, Okoli (2006) opined that most science teachers still prefer lecture method of teaching, that is, a teaching method in which the teacher presents a spoken discourse on a particular subject and avoids the use of activity- oriented teaching methods which are students-centered such as inquiry or discovering methods and investigating laboratory approach. Obialor (2016) added that such teacher-centered approach in which there is a steady flow of information going from the teacher to the student does not enhance achievement in science subjects particularly in biology. Hence, the method of teaching adopted by the teacher matters a lot in any learning situation. This is because the method may promote or hinder learning which may result into poor performance among the student and when this occur it may leads to drop out and such a person may cause nuisance to the society instead of contributing to the national development and its security.

Inadequate Supply of Biology Equipment: In many schools in the country, laboratory equipment like microscope, glass tubes beakers, slides, microtone, centrifuge incubators, ecological equipment are not adequate for effective teaching and learning. Also obsolete and ineffective equipment which abound in Nigeria laboratories obstructs teaching and learning. Hence the teacher may be competent and have qualities to impact knowledge but obsolete and insufficient biological equipment defeats the objectives of teaching biology and this will also hinder national development and security in the country.

CONCLUSION

The tendency of any particular country having national development and security depends upon the effectiveness of the biology teachers. This is because the knowledge acquire by the individual/ student through effective learning of biology as one of the science subjects gives him the opportunity of becoming doctor, nurse, pharmacists', dentists, medical technologist, food science technologists, genetics, engineers, microbiologist, biotechnologist, among others and if all this is actualized. It simply means that teachers' effectiveness in biology teaching has contributed to national development and security since a responsible citizen has been inoculated.

RECOMMENDATIONS

The training of the prospective biology teachers should be comprehensive and there should be fusion between the content knowledge and pedagogical knowledge.

Biology teachers should use different method of teaching that is students friendly or learner centered while teaching. The methods include activity based method, inquiry or discovering method, project method among others to attract students interest and enhance their level of attainment and comprehension in biology.

Government should provide the schools with adequate biological equipment. Faulty and obsolete biological equipment should be promptly repaired or replaced.

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