

INNOVATIVE PRACTICES IN BIOLOGY EDUCATION IN NIGERIA: PROSPECTS AND CHALLENGES

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Abstract

Science holds a unique position among all aspects of school curriculum because it offers countless employment and competitive opportunities for the students. Biology as one of science subjects has its own unique characteristic that makes it distinct from all other science subjects. This paper examined the Prospect and challenges of innovative practices in Biology Education in Nigeria. Innovation means introducing a desired change in teaching and learning of biology. Some of the innovative practices but not limited to interactive multimedia teaching practice, scenario analysis-based teaching, computer simulations, mind-mapping, concept mapping, minds-on hands-on approaches, out-door activities, peer instruction, outcome-based learning, uses of games, the hip hopped approaches, process-oriented guided inquiry lessons, project-based learning, and reality pedagogy. It was recommended among others that Biology teachers should utilize innovative practices in their lesson delivery so as to enhance students' active participation in the lesson for enhancement of academic performance. Thus, it is only when teachers adopt innovative practices in science education, that the students' academic achievement would be greatly enhanced and thus employability and competitiveness is guaranteed. Hence by engaging in innovative practice, the learners' needs are met because it supports students' preference for learning by doing.

Keywords: *Biology Education, Challenges, Innovative Practices, Prospects*

Introduction

Biology is a branch of science which deals with the study of living things. It is a natural science that deal, with the living world, how the world is structured, how it functions, how it develops and how living things come in to existence, how they react to one another and with their environment (Umar, 2015). Also, Sarojini (2018) defined biology as the scientific study of life and structure of plants and animals. It is simply concerned with the study of the characteristics, classification and behavior of organism, how species come into existence and the interaction they have with one another and with the environment. Thus, there are various sub-disciplines of Biology which are defined by the scale at which organism are studied and the methods used to study them. They are: Biochemistry which examines the rudimentary chemistry of life: Molecular biology studies the complex interactions among biological molecules: Botany is the study of the biology of plants: Cellular biology examines the basic building blocks of all life cells, Physiology examines the physical and chemical functions of tissues, organs and organ system of an organism: Evolutionary biology examines the processes that produced the diversity of life: Ecology examines how organisms interact in their environment: Zoology is the study of animals: Pathology is the study of disease of plants, animals and methods of controlling them: Entomology is the study of insects: Algology is the study of algae: Parasitology is the study of parasites and Microbiology is the study of microorganisms. The subject biology is a core science subject at the senior secondary school level.

Biology is one of the major science subjects with which a pass at credit level determines whether or not a candidate will be eligible to be admitted into the university to study any of the professional life science disciplines such as Medicine, Pharmacy, Nursing, Biotechnology and Biology Education (Idodo, 2016). The cardinal objectives of teaching Biology are to prepare students to acquire: adequate laboratory and field skills, meaningful and relevant knowledge, ability to apply scientific knowledge to everyday life in matter of personal and community health and agriculture; lastly reasonable and functional scientific attitudes (Idodo, 2016). Biology education is simply education which specific aim is the training of an individual to understand himself or herself, the parts of his or her body and how the body parts function. According to Adeoye (2016)

biology education is meant to expose learners to the principles, concepts, and processes and then equip them with necessary practical skills, as the knowledge of nature (mostly biology oriented) may help in solving many social problems relating to health, poverty, food shortage, crop production, environmental pollution and conversation. The major objectives of biology education in Nigeria are:

1. To provide the youths with sound knowledge of the basic principles and techniques of biology.
2. To produce knowledgeable, highly motivated, professional and effective teachers of biology who will be able to develop in students an appreciation and understanding of biological processes and principles.
3. To develop confidence in biology teachers and enhance the ability to adapt to the changing situation in science and the technological oriented society.
4. To view biology as a process of inquiry into the living world.
5. To analyze the activities of living things in their environment.
6. To demonstrate practical skills in handling scientific apparatus.
7. To demonstrate excellence and professional competence in teaching secondary school biology.
8. To inculcate positive scientific attitude and value in the society and promote positive disposition towards biology, science and the scientific enterprise.
9. To apply concepts and methods acquired in new areas of study and in everyday situation

Despite the vital position of biology in life science and national development, the teachers of biology still make use of conventional method. Many biology teachers are stereotype in their lesson delivery and conventional teaching approaches for effective teaching of science subjects. Thus, there is need for a change in the teaching of biology. Change certainly presupposes among other things a shift from an old practice to a new one which in most cases is a better option. There is no doubt that science in the contemporary global world is changing in reprehensive pace and organizational form and its very spirit of discovery and forging frontiers are now giving way to an idea of science as wealth. Change is a necessity and necessity is the mother of invention (innovation). Innovation is defined as the application of an idea or invention adopted or refined for specific uses or in its particular contexts (Gertner, 2018). It is a general change that is deliberate and must never be regarded as simple adjustment (Okoye, 2018). The aim of innovation is to replace the standard product, program, practice, or process with something better. As the majority adopts it, the innovation then becomes the new standard. Innovation is done by taking an existing ideal, concept or product and improves it. However, what is more remarkable is to be able to think beyond what already exists, and come up with a brand-new concept. All firms including education sector need to be innovative, as innovation is the lifeblood of future revenue streams. The reality however is that most schools in Nigeria still find it difficult to understand what innovation is and how innovation can be effectively managed. Any individual company or industry can be innovative. Innovation is a process, not a destination. Successful innovation is strongly linked to financial performance. Innovation is a key driver of all round growth. It also brings wider benefits for society in the sense that the ideas and discoveries improve our standard of living, leads to better standards of safety, better health care, provision of teaching resources, as well as creating conducive learning environment in the education sector. In education,

Nwafor (2017) describes innovation as a deliberate, systematic, novel specific and persistent change in the system of a particular society, which is aimed at improving the system, or creating a new one for a more effective and efficient means of attending to the educational needs of the social group. In other words, innovation refers to new creative ideas which are meant to bring effectiveness and change to education such as biology education. Kirsi and Seppo (2016) stated that innovation in education is a creative, new educational innovational policy, a creative way to renew education, a creative solution, a creation of new educational culture, a new opening, and a new idea to overcome some problems in education. Continuing, Kirsi and Seppo maintained that Innovation in Education is a starting power, an idea that makes things move. Adoption of an innovation in education means to take up or accept an innovation and make use of it in the educational sector. It simply means having new creative ideas implemented. This is necessary because a healthy system should tend towards inventing new procedures, move towards new goals, produce new kinds of products, diversify itself and become more rather than less differentiated over a period of time (Okoye 2018).

According to Nwafor (2017), it is necessary to adopt innovations because the needs and problems of the society changes from time to time. Education therefore should change to meet the changes of the society. The adoption of innovations in education offers the educational institutions the opportunity of making changes or

improvement in the educational sector. This is because it is when innovations are widely adopted that the reforms that have always been desired in the educational sector will be achieved. Therefore, any move in education to accommodate new knowledge, is likely an innovation in education. Innovations in Education therefore are new, creative ideas which are meant to bring effectiveness and change to the educational sector. They can simply be said to be the new things in the educational sector meant to bring more efficiency and effectiveness. Meanwhile, research studies have shown that students' academic achievement in the three core science subjects (Biology, Chemistry and Physics) have been very poor with little or no appreciable improvement over the years (Oloyede, 2016). It is believed that innovative practices in biology education can help to enhance the students' academic achievement in Biology.

Innovative practice is entirely a new package or an old approach with new ideas harmoniously integrated or aspect of old and new ideas holistically integrated to improve effectiveness or efficiency. Example of innovative practices as enumerated by (Ezeano, 2019) include the following; Interactive Multimedia Teaching Practice, Scenario Analysis Based Teaching, Computer Simulations, Mind-Mapping, Concept Mapping, Minds-On Hands-On Approaches, Out-Door Activities, Peer Instruction, Outcome-Based Learning, Uses Of Games, The Hip-Hop Ed Approaches, Process-Oriented Guided Inquiry Lessons, Project-Based Learning, Reality Pedagogy, Flipped Classroom Learning And Progressive Science Initiative And Progressive Maths Initiative (PSI-PMI), Cooperative Learning, Collaborative Learning, Scaffolding, Story-Telling, Role-Play, Sports-Based Learning, Visual Clues, Instructional Conversations, Science Text-Card, World Games, Graphic Organizers, Word Parts, Social Media, Virtual Science Laboratories, Word Walls, Thinking Maps, Mini Anchor Charts, Crossover Learning, Argue With Science, Context-Based Learning, Computational Thinking, Remote Laboratories, Embodied Learning, Science Museums, Multimedia Approach, ICT-Enabled Learning, Video Clips, Power Points, Mini-Laboratories, Science Fair, Research Books, Documented Problem-Solving, Science Kit And Apparatus, Science-Stations, Observation Science Exhibitions, Mobile Apps For Science Teaching, Field-Trips, Science-Clubs, Reward Discovery, Interactive Science Journals, Science At Home, Guided Discovery Problems, Fishbone, Science-Quiz And Build-Your Model.

Prospects of Innovation in Biology Education

There is no doubt that the method of teaching biology has a great effect on the understanding of the students. Biology teachers should be encouraged to adopt simulation instructional package, hand on activities as well as other learner centered instructional methods to enhance the teaching and learning. These innovative approaches amongst others have potential to motivate learners towards learning biology. More so, the teachers should always include science practicals in their teaching in order to boost the students' interest and understanding in the subject.

Challenges of Biology Education innovation in Nigeria

The challenges of biology education in Nigeria include: inadequate funding, infrastructure, equipment and material, inability of teachers to effect the desired change or innovation and ignorance of the importance of curriculum change or innovation to mention but a few. There is therefore the need for educational stakeholders to take cognizance of these challenges. More so, Onwumere (2019) opined that if Nigeria still nurses the dream of becoming relevant in the technological arena, she must of necessity pay a rapt attention to the development of science education or run risk of occupying the position of a western science evolution dumping ground. Adikwu (2018) revealed that over usage of conventional method and ineffective teaching approach is a major cause of students lack of interest and mass failure in sciences. When teachers adopt innovative practices in biology education, the students' achievement will be greatly enhanced. Problems Facing Innovation in Biology Education Among several problems responsible for the poor innovative development in biology education are:

1. Lack of innovative awareness: Majority of the Nigerian Population still remain in the darkness of illiteracy. Even among the educated, the percentage with the awareness of innovation is very small. School curricula at the primary and secondary level do not get the opportunity to develop inquisitiveness and ingenuity in the children. Moreover, such schools and children's homes have mechanical contrivances to play with and become curious about how they work (the innovations).
2. Inconsistencies and poor implementation of policies in science and technology: The ministry of science and technology was established in 1979. It was later merged with the Ministry of Education in 1984 only to be resuscitated as a ministry in 1985. The number of Research Institutions in the ministry also kept changing with years. These changes have negative effects on the ministry and its

ability to coordinate Science and Technology. The creation of six (6) University of Technology was followed by their reduction in number and non-implementation of the 60:40 ratio policies in admission to universities in favour of sciences and technology. It is at the first quarter of 2012 that approval was given for the new policy of Science, Technology and Innovation (STI) by the government as announced by the Hon. Minister of Science and Technology, which will give more opportunity in science technology and innovation in Nigeria.

3. **Poor Training Facilities:** Although some states have established science and technical secondary schools, the schools are poorly equipped. The country's tertiary institutions too lack equipment and other facilities. Moreover, they have large student population which do not allow for effective teaching.
 4. **Poor Funding and Management of Research and Development:** Nigeria has not been adequately funding institutions and universities to have any meaningful impact on research and development. The private sector has not paid much attention to research and development either. Moreover, inventors in the country have not been encouraged by either government or private enterprises. While some research institutes operate under the federal ministry of science and technology. There is no simple, effective and organized body in charge of research and development for the country. However, the efforts of the National Agriculture Research and Development Project (NARDP) and Raw Materials Research and Development Council (RMRDC) are appreciated.
- Conclusion Innovative practices are promising for instructors because they support teachers to engage students with hands-on inquiry learning. When teachers and students fully embrace innovative practices in biology education, students' academic achievement will be greatly enhanced. Thus, only when teachers adopt innovative practices in science education, that the students' academic achievement would be greatly enhanced and thus employability and competitiveness is guaranteed. Hence by engaging in innovative practice, the learners' needs are met because it supports students' preference for learning by doing.

Conclusion

Innovative practices in biology education increases students' strength to grasp and utilize scientific knowledge to solve daily problem. It helps students to acquire practical ability to solve difficult problems and to make them employable. It may also enable the students to marshal their scientific knowledge at will and concentrate it upon a given problem in order to proffer solution to such a problem. Hence, innovative practices in Biology education help students to acquire and practice scientific knowledge in order to achieve success in life. More so, a scientifically literate student is expected to be one who is so trained in his perceptive abilities and analytical powers. Therefore, the important thing that should be uppermost in the minds of biology educators in order to improve students' academic achievement in the subject should be the utilization of innovative practice in the classroom in order to make them employable and to compete favourably with counterpart.

Recommendations

Therefore, the following recommendations are stated in order to ensure innovation practice in biology education

1. Biology teachers should utilize innovative practices in their lesson delivery so as to enhance students' active participation in the lesson for enhancement, academic achievement and employability.
2. In-service programs should be organized intensively to get the biology teachers acquainted with and trained on how to effectively utilize innovative practices in biology education.
3. Biology teachers should be allowed to visit schools that are utilizing innovative practices to observe new methods and materials in action.
4. Biology teachers and school managements should be encouraged to become more cosmopolitan in approaching and teaching techniques.

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