
ICT AND STEAM TEACHER EDUCATION IN DEVELOPING BIOLOGY STUDENTS TEACHERS' LITERACY IN NIGERIA

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Abstract

This paper examined Information, Communication Technology (ICT) and Science Technology, Engineering, Arts And Mathematics (STEAM) teacher education in developing biology students teachers' literacy in Nigeria. It enumerated various definitions of ICT and STEAM and their importance. It also enumerated the most important objectives of teachers' education and the Importance of Integrating ICT and STEAM in teacher Education. The study concluded that integrating ICT and STEAM in Teacher Education in Nigeria will help in developing biology students' teachers' literacy to meet the present global challenges. It was therefore recommended that government should equipped biology laboratories in all institutions offering biology education such as Colleges of Education, National Teacher Training Institutes and Faculties of Education in all the universities with ICT facilities to facilitate the teachers' literacy. so also lecturers in all teacher training schools should include the use of Information and Communication Technology (ICT) as one of the strategies to be employed in teaching and learning of biology concepts and that Student teachers in all the tertiary institutions should develop their literacy skills through the regular use of ICT facilities in order to function effectively and contribute to the national growth and development of their society. It was also recommended that: education policy makers should focus on STEAM education to make learning more of a fun and make learners to be more creative in order to facilitate biology students' teachers' literacy in Nigeria.

Key words: Biology, Biology literacy, ICT, STEAM and Teacher Education

Introduction

Information Communication Technology (ICT) plays prominent role in national development it has ability to develop biology students' teachers' literacy in all ramifications of life. Literacy in this context is the competence or knowledge of students in biology, ICT and STEAM teacher education. Techterms Computer Dictionary (2010) define ICT as technologies that provide access to information through telecommunications. It focuses primarily on

communication technologies which involves internet wireless networks and cellphones. According to Bello, Ahmed, Alabi, and Ahmed (2016) ICT is electronic technologies used for receiving, storing, processing and retrieving information. It involves communication and is applied to almost every field of human endeavor. STEAM education is an innovational approach to scientific teaching. It is made up of five subjects which are Science, Technology, Engineering, Arts And Mathematics.

According to Feldman (2015) the combination of science and arts in form of STEAM education is essential for producing a creative, scientifically literate and ethically astute and workforce for the 21st century. STEAM approach involves learning through the application of Science, Technology, Engineering, Arts and Mathematics to solve diverse human problems. STEAM is defined as an educational approach of learning that uses science, technology, engineering, the arts and mathematics as an access points for guiding students inquiry, dialogue and critical thinking (Education closet, 2016 p.1)

According to Olorundare (2014) science is defined as the quest for knowledge generally in the physical earth and biological disciplines. Science and scientific method are significant instruments used in solving man's practical problems. According to Abimbola (2009) science is now seen as a human activity which people engage in daily. This is in support of Omosewo (2008) who submitted that science is the bedrock of development of any nation and should be seen as essential experience for all citizens.

The American Association for the Advancement of Science(AAAS) launched a long-term effort to reform science mathematics and technology education called project 2061.This project emphasize the knowledge and skills that today's students will need as adults in the 21st century with the ultimate aim of helping all Americans to become literate in Science, Mathematics and Technology for rapid development.

According to Gormally, Brickman and Lutz (2012) science educators, scientists, and policy makers agree that development of students' scientific literacy is an important aim of science education. Science is classified into two broad areas: the pure

science and the applied science usually referred to as technology. Pure science includes Biology, chemistry and physics. The performances of students in these subjects are the major concern in science education as identified by many science educators among which are Abimbola, Olorundare, Omosewo, Ahmed, Upahi and Yahaya (2011)

If Nigerians are to develop and maintain a democratic republic where the citizens would be knowledgeable enough to intelligently participate in decision making on public issues, then they must be scientifically literate. The focus of this study is the integration of ICT and STEAM in teacher education for the development of biology students' teachers' literacy. Biology as a science subject deals directly with human being. It is the science subject that deals with the study of life. And everyone who needs life needs the knowledge of Biology that is, needs to be literate in Biology. Biology is made up of topics and concepts which would bring about human good health and happiness. Human beings need the knowledge of Biology to maintain good health, safe shelter and environment to be able to pursue their goals in life. (Soyibo Ekpunobi, Akinade, Tureta (2013).

Coll and Taylor, (2009) opined that biology literacy which is a sub-set of science literacy is viewed as a primary goal of biology Education. This is in agreement with Abimbola and Abidoeye (2013) who submitted that the goals of biology education are to:

1. Provide basic literacy in biology for functional living.
2. Acquire essential scientific skills and attitudes as a preparation for the technological application of biology.

3. Acquire basic concepts and principles of biology as a preparation for further studies
4. Stimulate and enhance creativity.

According to Miller (2011) biology literacy deals with acquisition of biological attitudes, skills and knowledge that allow people to participate in biological debates and develop problem-solving skill and decision making skills in their everyday lives. Khan (n.d.) identified the following as the most important objectives of teachers' education:

1. Imparting an adequate knowledge of the subject-matter: the objective of teacher education is to develop a good command of the subject matter of the assignment given to him in the colleges
2. Equipping the prospective teachers with necessary pedagogic skills: - the main objective of teacher education is to develop a skill to stimulate experience in the taught, under an artificially created environment, less with material resources and more by the creation of an emotional atmosphere. The teacher should develop a capacity to do, observe interpret and to generalize.
3. Enabling the teacher to acquire understanding of child psychology. – The objective is to understand the child psychology so that the teacher is able to appreciate the difficulties experienced by children so as to bring about new modes and methods of achieving the goals in consonance with the reactions of the children.
4. Developing proper attitudes towards teaching: as a result of which he will be able to maximize the achievements from both the materials and human resources.
5. Developing self-confidence in the teacher: the objectives of teacher education are development of the ability to take care of himself in terms of:
 - (a) Adjustment with the physical conditions,
 - (b) Healthy adjustment with the social environment
 - (c) Adjustment with himself to derive emotional satisfaction with his life.
6. Enabling teachers to make proper use of instructional facilities: The objectives of teacher education is to develop the capacity to extend the resources of the school by means of improvisation of instruction facilities.
7. Enabling teachers to understand the significance of individual differences of child and to take appropriate steps for their optimum development. The objective of teacher education is to know the causes of individual differences as a result of which he will be able to develop the ability to be a child with children, an adult, and a responsible citizen among the community.
8. Development of the ability to give direct satisfaction of parents from the achievement of children in terms of:
 - (a) Proper habits of taking care of the body
 - (b) Proper attitudes reflected in the behavior of the children at home, in the school, in the streets, at the farms and fields e.t.c
 - (c) Progress in the class. The duties of the teacher is very much relevant in nursery, primary, middle, secondary, higher secondary schools. Hence the scope of teacher education is very vast. The duties of the teacher in different

stages of education depend on the foundational general education of the teacher. Emphasis is to be on the practical aspects rather than theory. This is the more reasons why ICT and STEAM approach must be integrated into teachers' education to facilitate effective teaching and learning through practical works. So also teacher education is an important means through which students are exposed to the knowledge of STEAM. The knowledge of STEAM will help biology students achieve the goals of biology education through technological application of biology knowledge. It will also help to stimulate and enhance creativity.

Teacher Education or Teacher Training: - Refers to the policies, procedures, and provision designed to equip (prospective) teachers with the knowledge, attitudes behaviors and skills they require to perform their tasks effectively in the classroom, school and wider community. The professionals who engage in this activity are called teacher educators (or in some contexts, teacher trainers) Wikipedia (2018)

Information and Communication Technology (ICT) is an extensional term for Information Technology (IT) which stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals) computers as well as necessary enterprise, software, middle ware, storage and audio-visual systems, which enable users to access, store, transmit and manipulate information. (Information and Communication Technology Wikipedia 2018)

Importance of Integrating ICT and STEAM Teacher Education for the Development of Biology Students Teachers Literacy in Nigeria Integrating ICT and STEAM in Teacher Education will help in the following ways

- 1 It will help the prospective teachers to actively involved in teaching and learning processes
- 2 It will expose the prospective teachers to information beyond their immediate environment and their subject area.
- 3 It will help the prospective teachers to be literate in their subject area and in ICT and STEAM.
- 4 It helps to develop citizens that are not inferior to other STEAM literate population of the world.
- 5 The correct application of Arts components of STEAM will help in development of the political power of the nation.

Akanni (2016) submitted the following as the importance of using ICT and STEAM Education

- ICT is used in enlarging small objects thereby helping the learner to see clearly the details in biology
- It help to slow down time so that events that happen too fast for the human eyes and brain to comprehend can be seen at an understandable speed. It can also be used to speed up time so that event which happen slowly can be viewed and understood in short time
- ICT conveys ideals skillfully, it hastens the understanding of abstraction by presenting situations in concrete terms.
- It serves to provide additional information for the students through online textbooks, reference books, periodicals, journals and newsletters by using internet

- It helps to obtain current information as soon as it is accessible, it enhances knowledge sharing, quality of knowledge, authentic and unique knowledge through internet browsing

Factors that Hinders the Effective Use of ICT and STEAM in Teachers Education

There are some factors which served as barrier to the use of ICT and STEAM in teachers' education some of these barriers as discovered by Duwan (2017) are as the following:

- inadequate ICT infrastructures, lack of effective training background in ICT and the paucity of ICT gadget make it impossible to teach effectively in all the higher institutions of education such as Colleges of Education, National Teachers Training Institute, Faculties of Education in Universities
- insufficient ICT knowledge and skills among lecturers.
- incompetence of lecturers and lack of confidence in using ICT.

Nwagbo and Adam (2012) discovered that biology students are at the low level of biology literacy. Teacher's literacy skills in biology, ICT and STEAM must be properly developed so as to bring about economic, social and political development.

Developing teacher's literacy in biology, ICT and STEAM will help in the following ways:

- It will help in reducing the number of people living with e.g. hereditary diseases such as sickle cell anemia, communicable diseases such as tuberculosis, HIV/AIDS e.t.c
- It will help through the use of biotechnology in improving crop yields

- It will help in population control by using biotechnology through contraception
- It will also help economically in reducing the amount of money that people spend in treating sicknesses and diseases.
- It will also help people to live a quality life.
- It will help to identify ecological problems and to be able to solve them

Conclusion

The study concluded that integrating ICT and STEAM Teacher Education in Nigeria will help in developing teacher's literacy to meet the present global challenges.

Recommendations

It was recommended that:

- Lecturers in all teacher training schools should include the use of Information and Communication Technology as one of the strategies to be employed in teaching and learning.
- Government should equipped laboratories in all institutions such as Colleges of Education, National Teachers Training Institute and Faculties of Education in all the universities with ICT infrastructure such as computers and internet services to facilitate the teachers literacy
- Student teachers in all the tertiary institutions should develop their biology literacy skills through the regular use of ICT facilities in order to function effectively in the society and contribute to the national growth and development.

It was also recommended that:

- education policy makers should focus on STEAM education to make learning

more of a fun and make learners to be more creative.

- the curriculum developers should incorporate into the curriculum of teacher education programme in Nigeria the teaching of hands-on mind-on approaches that are Arts related to facilitate biology students teachers' literacy in Nigeria.

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