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Repositioning Science Education Through the Integration of Digital Learning for Sustainable National Development

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ABSTRACT
Science education for Sustainable Development requires far-reaching changes in the way it is often practiced today. Most needed in our society, is a shift in our institutional framework, and what better way to do that, than instilling a new type of mindset in the young, and allowing the future to be rooted in a sustainable way of thinking. Science growth in particular identify the status of any nation in the global village. It has become the dominant world culture; it has also become the index of development among nations. Countries that have invested heavily in science and technology have achieved greatness, while those that have not done so are lagging behind. We are in the era of science and technology where scientific knowledge has grown exponentially and technology has progressed at a rapid pace. Nigeria, as a nation, is still wadding in a muddy pull in seeking the right way to terminate her total dependence on foreign nations for expertise in fields of Science. The nation has produced many scientists, engineers and technologist yet we import services and goods in these fields from other countries which resulted in a recessed economy. This can be achieved through developing sustainable science and technology education curriculum that is integrated with ICT, other modern and novel approaches that will actualize the main goals and objective of national policy on education. If we want a future world where the sustainable development goals become a reality, we need to give the youngest of our society the opportunity to shape the world that we are living in. If we want to achieve global goals, we need to teach them from the very beginning by giving them the chance to become active global citizens and allowing them to become part of the process of creating a sustainable future; empowering them from young. Therefore, there is need for educational institutions to remain resilient and find new ways to continue with the teaching and learning of Science. Hence, fully embracing digital learning is not only necessary but also a last resort. This paper is focused on the need to integrate digital learning in the teaching and learning of Science in Nigerian schools for sustainable national development.

Keywords: Digital Learning, Education, Integration, Science, Sustainable National Development

INTRODUCTION

Education as a vital instrument for national and sustainable development and it involves the acquisition of fundamental knowledge and essential development skills needed for technological breakthrough and socio-political development which accelerates economic growth (Onyido & Duru, 2019). Science education is pivotal in the development any nation scientifically and technologically. The gateway to the survival of a nation scientifically and technologically is scientific literacy which can only be achieved through science education. Science education is therefore a veritable tool for scientific and technological advancement of any nation. This fact is enshrined in the National Policy on Education (Federal Republic of Nigeria (FRN), 2014) which states that science and technology education should among other things equip students to live effectively in the modern age of science and technology (Samuel, 2019).

Science education deals with sharing of science content and process with individuals who are not considered traditionally to be member of the scientific community; the individuals could be students, farmers, market women or a whole community. Science education in Nigeria focuses on the teaching of science concepts, method of teaching and addressing misconceptions held by learners regarding science concepts. Science education is very vital to the development of any nation that is why every nation must take it very serious in all institutions of learning. Many of the developed nations were able to achieve so much in science and technology because of science education. Launching of sputnik by the Russian government in October, 4 1957 would not have been possible if not for the position they placed physics in science education. An essential prerequisite to a country's development is early recognition of necessity of a good educational system. Science education is interdisciplinary in nature. It is linked to other bodies of knowledge such as philosophy of science, science, history of science, educational technology, and further disciplines (e.g., sociology, Anthropology, Linguistics, Ethics). The relevance of the specified bodies of knowledge to science education is well explained by (Nwafor & Aja, 2017).

Science education comprises Physics, Chemistry, Biology and Mathematics which provides students with scientific knowledge and skills which enable them to contribute their own quota towards nation building, (Aina, 2013; Agu & Samuel, 2019). Enemarie (2016) opined that, Nigeria is looking forward to be among the most scientific and technologically advanced nations of the world. The reason is not far-fetched from numerous contributions of science and technology to human development. For any nation, especially Nigeria, to achieve scientific and technologically advancement, it becomes imperative to start planning for a firm basic scientific education foundation for her citizens from the school going age. Since science is part of the national development strategy, its literacy is significant in Nigerian economic sector.

Importance of Science Education in National Development

The roles of science education in national development cannot be over-emphasized. Through science education, an individual can become self-employed (Owolabi, Akintoye & Adeyemo, 2014). Science education leads to several scientific fields and professions like engineering manufacturing, mining, and construction industries (Omosewo, 2019). Science education prepares the youths of Nigeria and other nations for fulfilling career prospects and trains their minds for employment opportunities. Science has become crucial factor for sustainable national development. In line with this, Ezeliora, (2015) documented that in a developing country, issues of science and technology education are very important, as it is a means through which the nation can achieve national development. Science education has made significant progress in agriculture, health, energy, water and environment to alleviate poverty. Advances in scientific knowledge and its application have helped slow the trends of high infertility, high mortality and led to increasingly better health. Therefore, science has provided the basis for the aggregate improvement in human health, certain scourge diseases have been eliminated, example (small pox) and mortality associated with everyday health-related events and infectious diseases have also been reduced. Advances in science have facilitated higher yields and greater efficiency in agriculture. Mechanized agriculture, use of fertilizer and other agro-chemicals in the farm, have led to more food production with a reduced labour. Improved knowledge of plant biology and breeding technique have led to better seed and cultivation practices and improvement in herbal medicine. Study of some scientific courses like fisheries and aquaculture has led to entrepreneurship, thereby reducing unemployment. Generally, the problems of mass unemployment,

inflation, infrastructural decay, collapse of health and educational services and many others can all be traced to inadequate attention paid to science education.

Science Education for Sustainable National Development

Sustainable development implies the development that can be sustained over a period of time. Since science is part of the national development strategy, its literacy is elemental in Nigerian economic sector. Part of what is needed to enhance that process is public pressure to encourage more Nigerians to study science and technology. Hence, there is no doubt that these are vital tools for national development of any country including Nigeria (Emaviwe, 2016). Due to its utilitarian value to national development, every effort should, therefore, be made to promote its development by any state that wants development. Nigeria as a state yearning for development can, therefore, not shy away from it in its developmental agenda (Igbaji, 2017). The relationship between science and technology and industrialization is such that the dividing line between them is very thin. While industrial development of any nation depends very highly on the level of advanced science and technology that the nation had achieved. Thus, it is worthwhile to note that science and technology are prime instruments in the exploitation of resources for human use.

Science education is a vehicle for an economy to achieve sustainable development but steering the formal education system in a direction towards the non-booming tradeable sector, is a key step in reaching that destination particularly because it will create sustainable jobs. Education for Sustainable Development allows every human being to acquire the knowledge, skills, attitudes and values necessary to shape a sustainable future. Education for sustainable development means including key sustainable development issues into teaching and learning; for example, climate change, disaster risk reduction, biodiversity, poverty reduction, and sustainable consumption (Onyido & Duru, 2019). It also requires participatory teaching and learning methods that motivate and empower learners to change their behaviour and take action for sustainable development. It consequently promotes competencies like critical thinking, imagining future scenarios and making decisions in a collaborative way. It requires far-reaching changes in the way education is often practised today (Isife, Ogakwu, Chiaha, Agu & Takon, 2014).

In many developing countries the economic shock has come first, as governments have locked down their economies to reduce the speed of infection. As a result, developing countries are suffering. This greatest economic decline is closing on their education and transportation system (Haleem, Javaid & Vaishya, 2020). Hence, digital learning is increasing attention as educational institutions alternatively resorted to various digital modalities and strategies to provide digital learning. This is connected with the benefits the practice is said to have on educational activities in the times when pandemics could strike (UNESCO, 2020a). Prominent among these benefits is giving students some element of control over time, place, and pace (Florida Virtual School, 2020). This is courtesy of the fact that learning is no longer restricted to the school day or the school year, walls of the classroom, pedagogy used by the teacher and to the pace of an entire classroom of students respectively. The fundamental concept is "sustainable requirement," namely that the fulfillment of the needs of the present generation should not compromise the ability of future generations to meet their own needs. Furthermore, ICT for sustainable development on the other hand represents a catalytic process for social change that seeks to foster through education training and public awareness-the values, behaviours and lifestyles required for sustainable future. It is about learning needed to maintain and improve our quality of life of generations to come. It is about individuals, communities, groups, business and government to live and act sustainably; as well as giving them an understanding of the environmental factor, good moral behaviours and economic issues involved (Ayodele, 2017).

Information and Communication Technology (ICT)

One of the problems that are facing developing countries today is sustainable development. Information and Communication Technologies (ICTs), which include radio and television, as well as newer digital technologies such as computers and the internet have been touted as potentially powerfully enabling tools for educational change and sustainable development. When used appropriately, different ICTs are said to help expand access to sustainable development. Strengthen the relevance of ICT in education; organization (both private and public sectors) will lead to the success of achieving goals and objectives for self-reliance. ICTs stand for information and communication technologies which can be defined as a "device set of technological tools and

resources used to communicate, and to create, disseminate, store, and manage information" These technologies include computers, the internet, broadcasting technologies (radio and television), and telephony (Hramiak & Boulton, 2013). The term "ICT" describes the use of computer-based technology and the internet to make information and communication services available to a wide range of users. The term is used broadly to address a range of technologies, including telephones. Central to these is the internet, which provides the mechanism for transporting data in a number of formats including text, images, sound, and video. Additionally, ICT deals with the application layer, the systems that enable information to be collected and distributed, analyzed, and processed. ICT is an integration of the technologies and the process to distribute and communicate the desired information to the target audience and making the target audience more participative in nature. The term ICT also refers to: information channels such as the World Wide Web, online database, electronic documents, management and accounting systems, intranet, etc. communication channels such as e-mail, electronic discussion groups, electronic conferences, the use of cell phones, etc. hardware and software used to generate, prepare, transmit, and store data, such as computers, radio, TV, computer programmes/tools, etc (Ogbonnaya, 2015).

Integrating ICT into Science Education

Information and communication technology (ICT) is a catalyst for future innovation in teaching and learning practices. ICT transforms the method of delivering the content between the teacher and the learner and also creates an easy access to information. During the 19th century the use of ICT in both public and private sectors was minimal. The production chain relied mostly on the use of human labour. However, in the 20th century it became obvious that more developments emerged in ICT. There were a number of people interacting with the rest of the global community through modern technology systems. Most of the students at academic institutions (i.e. primary schools, high schools, further education and training colleges, and universities) performed multitasks, and others worked from home by accessing material through web-based tools such as Blackboard. These tools and new gadgets enabled the students to create, communicate and access information and solve problems (Maribe & Twum-Darko, 2015). Contextually, Holzberger, Philipp and Kunter (2013) regarded digital learning as delivery with digital forms of media such as the internet in order to enhance learners' learning, to improve teaching effectiveness and efficiency or promote personal knowledge and skills. This implies that the analog teaching-learning learning is meant to enhance learning by exploring new technologies and applying them to learning contexts and not to totally rely on digital means of instruction delivery. Explicating further, Nwachukwu, Ugwu and Wogu (2021) opined that digital learning is a digital tool used to encode and decode teaching materials for online or offline learning activity through wire or wireless networks respectively.

Digital learning is a catalyst and on innovation in teaching and learning practices. It transforms the method of delivering the content for instruction between the teacher and the learner and also creates an easy access to information. More innovations are introduced at a fast pace and allow people to share information and communicate instantly. The social media such as Twitter, Facebook and Instagram have an increased interaction and information sharing. Alhawiti (2013), opined that the integration of technology in the classroom is a necessary measure to improve the teaching-learning process. A modern way of delivering knowledge is important and necessary, especially at the basic school level. Therefore, digital learning is an instructional practice that ultimately helps students through various digital means such as the internet, corporate network, computers, satellite broadcasting, audiotapes, videotapes, interactive TV, compact disks, among others (Ming-Hung, Huang-Cheng & KuangSheng, 2017; Eshi, 2019).These mediums are applied in a broad range of technology-enhanced educational strategies including blended learning, network-based learning, computer-based learning, virtual classrooms, digital cooperation and other strategies that rely on digital tools (Lauren, 2020).

Most secondary schools in Nigeria are currently based only on traditional methods of learning. This means that they follow the traditional set up of face-to-face lectures in a classroom. However, some academic units have introduced the use of technology to facilitate academic activities and revamp old procedures. However, the level of digital learning in Nigeria is still at a low ebb due to the resistance to change from traditional pedagogical methods to more innovative, technology-based teaching-learning methods (Dhawan, 2020). This is not far connected to the facts that there is inadequate ICT

infrastructure, the educational sector is generally underfunded and limited expertise, lacks effective co-ordination of the various ICT for education initiative and as well the overdependence of educational institutions on government (Aduke, 2018). For instance, Digital readiness indicates a nation's ability to implement digital learning and harness advantage of ICT.

More innovations on technology are introduced at a fast pace and allow people to share information and communicate instantly. The social media such as Twitter, Facebook and Instagram have an increased interaction and information sharing. Alhawiti (2013), opined that the integration of technology in the classroom is a necessary measure to improve the teaching-learning process. A modern way of delivering knowledge is important and necessary, especially at the basic school level. The expectation is that ICT integration in the classroom should bring about the solution to skills shortage, especially in the areas of technology, education, engineering and medicine. It is also necessary for bridging the gap between the disadvantaged and advantaged groups in a multiracial classroom environment. This paper discussed the significant role of the ICT in modern-day classroom at the school level and how it should be integrated into daily learning modes to allow and encourage active science learning for sustainable national development. The paper also highlights the significance of the rationale behind the strategies for incorporating technology in the classroom.

The significance of ICT integration in Science Education

The importance of ICT is quite evidence from the educational point of view. Though the chalkboard, textbooks, radio, television and film have been used for educational purpose over the years, none has quite impacted on the educational process like the computer for example. While television and film impact only on the audio-visual faculties of the users, the computer is capable of activating the sense of sight, hearing and touch of the users. ICT has capacity to provide higher interactive potential for users to develop their individual intellectual creative ability. The main purpose of technology "consists just in the development of human mental resources which allows people both successfully apply the existing knowledge and produce new knowledge. ICT provides numerous tools that teachers can use in and out of the classroom to enhance students learning. Using teaching and learning resources that can be manipulated electronically can extend the learning experience of students beyond the time and space limitations of conventional materials (Unwin, 2014). There is no doubt that ICT provides productive teaching and learning in order to increase students' creative and intellectual resources especially in today's ICT driven world. Though the simultaneous use of audio, text, multi-colour images, graphics, motions, electronic boards, marker boards, computers, internet, projectors and others, gives ample and exceptional opportunities to the students to develop capacities for higher quality learning and increased ability for innovation (Aldossari, 2013). The relevance of ICT to the entire educational sector cannot be under-estimated; therefore, the challenges of the school system in the 21st century will be incomplete if the demand for ICT is not met. The ability for timely acquisition, utilization, communication and retrieval of relevant and accurate information has become an important attribute for better teaching-learning process.

The integrated ICT curriculum pedagogy allows students to use computers to access information and form collaborative groups to solve complex tasks in various learning areas. Alhawiti (2013) believed that the success of ICT integration is based on evidence-based policy formulation. This policy formulation should guide the strategic implementation of such a technology within the universities. Chima (2021) argued that the central role of educational technology is to provide additional strategies that can be used to address the seriousness of environmental and educational challenges in Nigerian secondary schools. Therefore, the formulation of evidence-based policy should speak directly to these challenges and proposes the solutions needed. This will enable students to acquire more knowledge and to adapt to evolving technology innovations by doing things differently. The role of technology in education is vital in globalising challenges faced at the secondary school level. It has the ability to change and shape the educational system to conform to current practices (Eshi, 2019). However, ICT integration is significant because of its prevalence in the 'modern era' and its potential to change education environment, and it is also an effective tool for classroom management for teachers (Aldossari, 2013). No nation can strive for meaningful development without according priority to its education sector and particularly on the ICT for effective teaching and learning. ICT has come to stay and to change our way of teaching and learning, which must be welcomed by everyone especially the educators' at all educational levels. ICT indeed has become a critical tool for achieving success in

education (Unwin, 2014). It is disheartening to note that ICT has not been fully integrated into the science curriculum in spite of the elaborate emphasis laid on technology education in Nigeria. Poor integration of ICT into science curriculum seems to have given rise to very poor utilization of ICT facilities in instructional delivery with the view to improving the teaching – learning process which will in turn yield sustainable development.

CONCLUSION

Quality science education as a key to National development cannot be relegated to the background but must be fully funded and adequately equipped to face the challenges of sustainable development goal. Science education has been discussed as a means of repositioning education for further sustainable development in Nigeria. It is pertinent to note that development can best be achieved when concerted effort is made by government in areas of science education. If Nigeria is to develop and build a self-reliant nation, emphasis has to be made continually on the development, growth and restructuring of science education in our school system. The global communities are advancing towards technology-centred education, therefore, the integration of ICT in modern-day classroom is possible if the strategy for implementing educational technologies is in place and supported by all stakeholders. Government must need invest in infrastructure, while training and retraining lecturers on new technology applications are imperative to make the switch over to e-learning through virtual possible if we must be like Institutions in Europe and the United States that were able to adapt such technologies because they had the funding and the basic ICT infrastructure to do so.

RECOMMENDATION

The integration of ICT into science teaching is very significant for the transformation of science education for relevance and sustainable development. Therefore, the following were recommended;

1. There is a need to devise new learning outcomes with the use of ICT facilities to enhance teaching and learning environment, as well determine whether science educational pedagogies, tools and learning environments are really helping to educate citizens to live sustainably.
2. Classroom instructions and learning packages should be driven by the fast-moving communication technologies.
3. Science teacher education should focus on training teachers to be reflective in practice, be active in learning and be innovative, creative and partnership building. The teachers must be well informed about the new change that is going to take place and should receive proper training on how to use the new technologies.
4. The government and science education stakeholders should provide all the relevant ICT facilities and ensure adequate training for educators to enable them utilize ICT effectively for teaching tasks.

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