European Journal of Research Development and Sustainability (EJRDS)
Available Online at: https://www.scholarzest.com
Vol. 6 No 01 January 2025
ISSN: 2660-5570

TECHNOLOGY-DRIVEN EDUCATION: AN IMPERATIVE FOR SUSTAINABLE DEVELOPMENT

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Article history:
Received: 28th September 2024
Accepted: 26th October 2024

Abstract:
The significance of technology-driven education in the pursuit of sustainable development is becoming more widely recognized. It enhances the accessibility, quality, and relevance of education in the modern digital era by transforming traditional educational paradigms. This article investigated the critical role of technology-driven education in the promotion of sustainable development using contextual hermeneutic research method. It investigated the methods by which technology can reduce educational disparities, encourage continuous learning, and equip individuals with the requisite skills for the digital economy. The results of the study suggested that technology-driven education is essential for the promotion or attainment of sustainable development. Additionally, it revealed that technology-driven education is currently confronted with a multitude of challenges, including the digital divide, infrastructural constraints, and the necessity of teacher training, despite the significant role it plays in promoting sustainable development. Nevertheless, it is not entirely unwarranted to assert that Nigeria has the potential to achieve sustainable development. Through technology-driven education, the promotion of equity, diversity, and resilience in educational systems worldwide is facilitated by the use of digital tools and platforms. The study posited that in order to facilitate effective technology-driven education, authorities should provide the necessary technological instruments. Furthermore, it is imperative that they strive to guarantee the accessibility and utilization of technological facilities that are both reliable and robust for students and lecturers.

Keywords: *Technology, Education, Technology-driven education and Sustainable development*

INTRODUCTION

Technology has become an essential part of our daily lives in the fast-changing world of the 21st century, reshaping how we study, communicate, and develop. The integration of technology and education has resulted in a new model, known as technology-driven education, which is transforming the way we approach learning and the acquisition of skills. This transition is not only timely but also necessary for achieving sustainable development, as it has the capability to tackle some of the most urgent challenges of our era, such as ensuring equal access to education, improving the quality and relevance of learning outcomes, enhancing cost effectiveness and efficiency, providing adequate teacher training and capacity building, and preparing students for a rapidly evolving workforce, among others.

The progress of technology in educational methods has significantly enhanced and influenced our lives. The utilization of scientific inventions in educational settings has greatly facilitated the simplification and streamlining of our daily lives. It has facilitated the progress of relationships between educators and students, revolutionized our methods of learning and collaboration, reduced longstanding disparities in fairness and accessibility, and adjusted teaching and learning experiences to cater to the requirements of all educators and students. Utilizing technology in education provides a potent means of attaining the United Nations' Sustainable Development Goals (SDGs), namely SDG 4,

which seeks to guarantee inclusive and fair quality education and foster lifelong learning opportunities for all individuals. Through the utilization of technology, we can establish an education system that is comprehensive, efficient, and environmentally friendly. This system will provide students with the necessary skills and knowledge to thrive in the future and tackle the intricate problems of the 21st century.

Unfortunately, Nigeria has not been able to effectively utilize technology-driven education as a catalyst for sustainable development, despite its abundant potential and resources. Although technology-driven education offers many advantages, Nigeria's education sector is predominantly traditional and inefficient, impeding the country's advancement towards sustainable development. The country's failure to embrace technology-driven education serves as a clear indication of its inability to prioritize and invest in its human capital. This is especially evident in the areas of limited access to quality education, particularly in rural areas, outdated curricula and teaching methods, inadequate infrastructure and resources, inefficient learning processes, poor student outcomes, and limited opportunities for skills development and employability.

The failure has extensive ramifications, including the perpetuation of poverty and inequality, the restriction of economic growth and development, the inability to address the skills gap and brain drain, the undermining of the country's competitiveness in the global economy, and the neglect of empowering future generations. The country's failure to effectively incorporate technology-driven education as a necessary component for sustainable development serves as a clear indication of squandered chances and untapped possibilities. This work investigates the role of technology-driven education as a catalyst for sustainable development in Nigeria, considering the current situation. Utilizing technology in education is not just a privilege but a necessity for achieving long-term development. It is a crucial element of sustainable development in Nigeria, since it provides a potent instrument for tackling the country's developmental obstacles. To deepen the discourse, a conceptual analysis is provided for key ideas such as "Technology," "Education," "Technology-driven Education," and "Sustainable Development" in order to attain the desired purpose.

Technology

Technology is a highly intricate concept, leading to various definitions provided by academics and organizations that capture its diverse applications and consequences. As indicated by Franklin (1999), technology can be defined as a comprehensive system that encompasses organization, protocols, symbols, new vocabulary, equations, and most importantly, a particular way of thinking. This definition underscores the integration of technology into societal institutions and modes of thinking, emphasizing its systemic and cultural dimensions. In the words of Castells (1996), technology refers to the collection of tools, equipment, modifications, arrangements, and methods that individuals use. His definition focuses on the tangible and observable aspects of technology that facilitate human pursuits.

In the view of Ellul (1964), technology can be defined as the complete set of systematically developed methods that are highly effective in all areas of human activity. Ellul's description underscores the logical and efficiency-oriented nature of technical techniques. Technology encompasses the assortment of techniques, skills, methods, and procedures employed in the creation of things or services, as well as in the pursuit of objectives, such as scientific inquiry. For the sake of this study, we will adopt the National Academy of Engineering's definition of technology, which highlights its capacity to address challenges and promote human well-being. According to the National Academy of Engineering (NAE, 2003), technology is the application of scientific and mathematical knowledge to address problems and create novel tools and systems for the betterment of humanity.

Education

The term "education" originated from two Latin words: "educere," meaning to guide towards enlightenment, and "educare," meaning to foster, raise, or nourish (Isichei & Olufowobi, 2012). Education can be defined as the deliberate and systematic process of fostering the development and growth of young individuals or learners. The process entails guiding an individual from a state of darkness to a state of enlightenment or brightness (Mgbomo & Elechi, 2021).

In addition to this etymological explanation of education, numerous experts have presented their own interpretations. Fafunwa (1980) provides a definition of education as the combined processes by which a child or young adult acquires the abilities, attitudes, and other types of behavior that are beneficial to the society they belong to. Nduka (1975) asserts that education entails the transfer of culture and the utilization of culture to encompass all aspects of society, including art, music, literature, philosophy, religion, business, political organization, science, and technology. Ogbebor (1992) regards education as a method of safeguarding the individual's cultural values and traditions. Education is a structured and organized method of enabling individuals to gain knowledge, skills, attitudes, beliefs, and habits.

Peters (1966) asserts that for something to be considered education, the knowledge acquired must be deemed valuable, and the method of learning must be ethically acceptable. Not all learning can be considered educational based on the substance being learned. Upon careful examination of the aforementioned definitions, it becomes evident that they all highlight the imparting of valuable skills, attitudes, knowledge, and behavior necessary for the growth and usefulness of young adults to both themselves and society at large (Nsirim & Mgbomo, 2021).

Technology-driven Education

Technology-driven education is an educational method that incorporates different types of technology to improve teaching, learning, and educational results. Supporting the concept mentioned above, Knezek and Christensen (2006)

stated that technology-driven education is an educational method that utilizes technology to enhance learning, improve student results, and expand access to education. It employs digital tools, software applications, online resources, and technical platforms to enable and assist in the provision of educational content, communication between educators and learners, and administrative procedures in educational institutions.

Sustainable Development

Sustainable development encompasses the holistic advancement of a society, with a specific focus on the effective utilization of natural, economic, and social resources in a manner that safeguards the environment. This approach ensures that future generations can reap the benefits of the advancements made by previous generations. The United Nations General Assembly in Emas (2015) provided a definition of sustainable development as the process of development that aims to fulfill the requirements of the current generation without jeopardizing the capacity of future generations to fulfill their own requirements. Implicit in this description is the notion that development should continue indefinitely, and sustainable development embodies this principle. In addition, sustainable development prioritizes the establishment of lasting enhancements in the standard of living for all individuals by increasing real income per person, enhancing education, health, and overall quality of life, and improving the quality of natural environmental resources.

Sustainable development alludes to a form of development that may be maintained indefinitely across time. It entails a procedure in which the natural resource base is prevented from deteriorating. Therefore, the objective of sustainable development is to uphold economic progress while safeguarding the enduring worth of the environment. It strives to enhance the quality of life encompass improving healthcare and educational prospects, providing equal possibilities for public engagement, safeguarding the environment, and fostering fairness between generations (Jhingan, 2005). The notion of sustainable development offers a worldwide framework for effectively combining economic and environmental policies with development initiatives.

Technology-driven education and sustainable development

Technology is vital in all sectors and segments across all regions. Its significance cannot be underestimated considering its relevant applications. It has various applications in education for enhancing digital literacy and creating diverse resources, in building infrastructure, in managing logistics, in healthcare, for generating livelihood opportunities and empowering the masses, in administration and finance, for specialized business and industrial purposes, in agriculture, in research and development, and for promoting economic growth and reducing poverty. Information technology plays a crucial role in schools and educational institutions by facilitating various activities and functions, including record keeping, research, instruction, presentations, financial analysis, examination result management, communication, supervision, teaching and learning activities, and overall school management.

The use of technology in education has undoubtedly resulted in significant transformations, facilitating global connectivity and transcending language and cultural barriers, thereby shrinking the world into a small community. It has revolutionized the education system by replacing the conventional face-to-face interaction between teachers and students in the classroom with virtual education. This enables the acquisition of knowledge not only within the physical classroom, but also outside its boundaries. Despite being a recent addition in developing countries, technology offers students the chance to have tailored learning experiences by allowing them to progress at their own speed. The platform offers students various interdisciplinary opportunities to engage in transactions that involve assessing, collating, processing/analyzing, saving, retrieving, and transmitting data in different formats. These opportunities are available to all students regardless of their gender, race, or location, and are designed to connect and serve all users effectively (Okwor, 2002). From a financial perspective, this strategy is both economical and efficient compared to the conventional approach, which necessitates both the teacher and the learner to acquire textbooks and related resources. Dua, Wadhawan, and Gupta (2016) observed that the present trend eliminates these requirements, which is beneficial for both the student and the instructor. One must acquire the skill of effectively monitoring and maintaining reliable records of the websites. At home, individuals have easy access to their resources, allowing them to engage in study and learning. This enables them to not only be efficient and productive, but also to be creative. As a result, they get a sense of fulfillment through methodical reasoning. According to Singh (2020), this provides them with the chance to enhance their learning and easily share knowledge. By uncovering and perfecting shortcuts, individuals can accomplish a significant amount of tasks in a limited timeframe.

Unfortunately, although other sectors in Nigeria are undergoing significant transformations, the education industry is lagging behind in adopting these informative improvements. Although technology-driven education has the potential to play a significant role in education, the Nigerian educational system has not fully embraced it for teaching and learning purposes. The endeavors aimed at incorporating technological infrastructure into the educational system have yielded limited results. An initial examination of the educational system in Nigeria reveals that a significant number of teachers in the system continue to depend on the conventional way of teaching known as "chalk and talk," instead of adopting the use of technology tools. Regrettably, the Nigerian educational system lacks adequate provision of the many technical resources required for effective teaching and learning in schools. Furthermore, the majority of teachers in the Nigerian school system do not possess the necessary expertise in utilizing these technologies for instructional purposes. This could explain why teachers are not utilizing them in their instruction, therefore presenting a hurdle in the advancement of the Nigerian educational system and subsequently the attainment of sustainable development. This leads us to the identification and analysis of the obstacles that impede the acceptance and effective incorporation of technology-driven education for sustainable development in Nigeria.

Challenges of Technology driven Education for Sustainable Development in Nigeria

The importance of incorporating technology-driven education in contemporary Nigeria cannot be overstated, as it offers significant advantages when utilized effectively. Nevertheless, despite the recognition and extensive integration of technology in various educational settings, substantial limitations hinder the successful deployment of these technologies. Several constraints that impede the effective usage of technological resources in teaching and learning within the Nigerian educational system include;

i. **Finance:** The availability of funds to acquire technology tools for teaching and learning is sometimes insufficient. Attempting to foster student collaboration or engagement in learning activities without the use of technical resources such as computers, laptops, or tablets is ultimately ineffective. Furthermore, the pace of technological advancements is swift, and the expenses associated with upgrading equipment can be substantial. In many cases, educational institutions may lack sufficient financial resources to undertake such endeavors. The majority of classes typically accommodate 25-30 students. When these students are actively using computers, laptops, and other devices, it can significantly strain the available internet bandwidth. In addition, the majority of kids were unable to complete their schoolwork at home due to their parents' inability to purchase laptops or computers for them. Osaat (2012) discusses the financial issues in Nigerian universities and emphasizes the importance of finding alternative sources of funding. The author expresses concern about the scarcity or decreasing availability of resources and money for university education in Nigeria. He stated that Nigeria's universities are in a state of anarchy and disarray due to insufficient finance. The persistent financial hardship has had a detrimental effect on nearly every aspect of university growth and the overall national economy" (2012:276). Additionally, a report by the National institutions Commission (NUC) in 1991 revealed that the government's funding of Federal institutions in Nigeria only fulfilled approximately 53.1 percent of the universities' financial requirements between 1980 and 1990. This ongoing challenge poses a significant threat to the progress of technology-driven education for sustainable development in Nigeria. It is crucial to address this issue promptly to prevent any detrimental impact.

ii. **Irregular Power Supply:** Osakwe (2012) states that the issue of electricity or power availability poses a significant obstacle to the successful progress of technology-driven education in Nigeria. The electricity supply in Nigeria is inconsistent, and there are multiple regions in the country that do not have access to electricity. The insufficient power supply hampers the effective application of technology resources in the Nigerian educational system. Insufficient power supply poses an additional obstacle as the majority of modern resources (such as desktop computers and projectors) found in Nigerian schools require a significant amount of electricity to function.

iii. **Lack of Training Opportunities in Teacher Education Programmes**: Teachers are held to high expectations. Successful incorporation of technology in education necessitates teachers who are highly skilled and knowledgeable. If teachers do not receive sufficient training in the utilization of technologies in educational programs, they will not be proficient or productive in incorporating technologies into their teaching and learning methods. Teachers in education programs are not provided with enough training and technical assistance necessary for their effective functioning. In addition, due to the multitude of courses to be covered, there is an inadequate amount of time available to engage in practical exercises using the new and constantly evolving technology. In the 21st century, instructors will need to possess fundamental literacy skills and a thorough understanding of the advantages of technology. Professional development programs should be specifically tailored to provide educators with the essential abilities to proficiently employ digital tools and resources. This encompasses instruction in digital pedagogy, the development of educational materials, and techniques for teaching online. Overall, the lack of teaching materials, proficiency in using technology, and desire in utilizing technological tools, along with a dearth of competent teachers and a lack of training and retraining, can hinder the progress of technology-driven education for sustainable development in Nigeria. (Osaat, 2015).

iv. **Administrative Barriers:** The lack of software and hardware infrastructures poses significant obstacles to the exploitation and integration of technology capabilities in the educational system. This software encompasses all the programs that facilitate technocrats in efficiently operating their systems to execute desired tasks. Software examples include Microsoft Office and Corel Draw, whereas hardware encompasses all the physical components that technocrats utilize, such as printers, keyboards, and scanners. If the technology resources are inadequate, the school administrators and teachers are unable to effectively utilize the technological capabilities. Ocharo et al (2015) found that the ineffective use of technological tools in Nigerian schools can be attributed to insufficient teacher training, inadequate technological facilities, and inadequate policies governing their usage. This has restricted the practical implementation of technology instruments in the context of teaching and learning.

v. **Distraction:** Several educators believe that tablets, smartphones with internet access, and text messaging services are perceived as diversions for students rather than being viewed as educational aids. Monitoring a large class to determine if students are using instructional programs on their laptops or smartphones or perusing Facebook will provide a challenge for teachers. In order to counteract this issue, the teacher may opt to implement filtered browsing on the devices to eliminate distractions. However, this may not be feasible if the students possess ownership of the gadgets. The teacher should prioritize providing relevant content and

implementing digital-based strategies that are highly engaging for students, in order to make the session more entertaining. According to Osaat (2010), the level of distraction in a classroom is influenced by factors such as the teacher's proficiency in teaching methods, ability to handle difficulties maturely, intellectual capacity, number of students in the class, and effectiveness in supervising and controlling the class.

vi. **Resistance to Change:** Teachers who are familiar with conventional teaching approaches may be reluctant to embrace the integration of innovative technologies. Certain educators and school officials' exhibit reluctance towards change when they see that the change will extensively transform a system and provide various obstacles or issues, without adequately considering the advantages, particularly in the long term. They have a preference for operating within their comfort zone. Osaat (2010) stated that teachers exhibit resistance to change due to factors such as insufficient motivation, inadequate retraining, and the incapacity to effectively undertake time-consuming and challenging duties, particularly in the teaching of some science courses. They frequently perceive technology experimentation as outside the scope of their employment responsibilities. The consequence of this is that computers and other technical instruments are not fully utilized, either not used at all or employed in instructional methods that fail to demonstrate their novelty and ability to engage pupils. The resistance may arise due to a deficiency in trust in utilizing digital tools or uncertainty over their efficacy. To overcome this resistance, it is necessary to provide specialized training and continuous assistance.

vii. **Digital Divide:** The term "digital divide" refers to the disparity between individuals who have access to contemporary information and communication technology (ICT) and those who do not. The digital gap continues to be a major obstacle to education that relies on technology. Inequities in schooling can be worsened by disparities in access to digital devices and dependable internet connectivity. This is because students hailing from low-income households may face a dearth of resources, such as computers, tablets, and high-speed internet, which are crucial for their education. This results in an imbalanced competitive environment where only individuals with financial resources can fully exploit educational opportunities driven by technology. This inequality impedes the capacity of pupils from such socio-economic backgrounds to get advantages from education that is driven by technology. It is imperative to make concerted efforts to promote equitable access to digital devices and internet connectivity for all students, irrespective of their socio-economic status. Government policies and initiatives should prioritize the provision of cost-effective technology and internet services to underprivileged populations.

RECOMMENDATIONS

i. The Nigerian government should augment its allocation of funds towards public universities and education as a whole. This will assist the university authorities in delivering appropriate technological resources for efficient technology-based education.

ii. Given the current state of Nigerian public universities and education as a whole, which is not adequately equipped for effective and comprehensive technology-driven education, it is not advisable to completely abandon traditional classroom learning. Instead, it should be used in conjunction with technology-driven education, based on their specific requirements. Put simply, hybrid or blended learning is recommended as a temporary solution until technological-driven education gets deeply integrated into Nigerian public universities.

iii. It is important to consistently inspire and incentivize students and professors to stay informed about technology and understand the advantages of technology-driven education. Therefore, educational authorities should make every effort to ensure that they have robust and reliable websites that professors and students can enroll in. It is imperative that they uniformly enhance their networks to ensure that every area of the campus has robust connectivity.

iv. It is important to prioritize the training and ongoing education of university teachers in computer proficiency. Many university lecturers are apprehensive and uncertain about the success of technology-driven teaching because they lack the necessary computer and internet abilities. Some individuals may be biased and hold incorrect beliefs that the new system will not be successful because it deviates from the usual method of lecturing or teaching that they have been accustomed to for many years. It is considered that by providing training and retraining exercises, many university teachers can be encouraged to learn and gain the necessary abilities to effectively offer learning materials using technology. Furthermore, it is imperative to expand this orientation and computer/internet-based proficiency to all students, as the entire process would be meaningless without their participation. Given that students are the intended recipients, the effectiveness of technology-driven education cannot be accurately assessed without their engagement and active involvement.

CONCLUSION

To attain sustainable progress in Nigeria, it is imperative to have education that is based on technology. If technology is used to enhance the quality of education, expand educational opportunities, and promote digital literacy, the education system in Nigeria has the capacity to undergo a significant revolution. To fully actualize the potential of technology in education, it is imperative to surmount challenges such as the digital divide, insufficient infrastructure, and teacher training. Nigeria have the capacity to attain its sustainable development goals and construct a more

promising future for its populace by harnessing technology, contingent upon the collaboration of the government, corporate sector, and educational institutions in pursuing this objective.

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