Enhancing Science Classroom Interactions with Relevant Technologies for Future Sustainability

Dr (Mrs.) L. F. Ajayi

Department Of Science Education,

Faculty Of Education

Ekiti State University, Ado-Ekiti

DOI: https://dx.doi.org/10.47772/IJRISS.2024.803472S

Received: 20 December 2024; Accepted: 25 December 2024; Published: 21 January 2025

ABSTRACT

This paper explores the use of technology in science education. Integrating technology into classroom teaching aims to enhance the learning experience and prepare students for the digital age. Academically, the study aims at familiarizing learners with novel potentials, and essentials of the technologies provided in the technology package when practiced with reference to fostering sustainability. The paper also focused on expatiating the significance of technology-driven classrooms where innovations and scientific growth are made possible. It expresses the current state of technology usage in the classrooms and highlights the benefits of technology classrooms. The paper further discussed the challenges facing using digital classrooms and their remedies. It finally suggests approaches by which science educators can use various technology tools relevant to fostering a sustainable future when conceptualized through constructive activities.

Keywords: Science; Technology; Sustainability; classroom interaction; learning experiences.

INTRODUCTION

Global development in science and technology has occurred at exponential rates. The growth today is reflected in all sects of life including Education. Education is as important as other sects therefore there is a need to incorporate these technologies into present school education to result in future sustainability. Intensive and extensive applications are to be organized in various fields such as education – smart boards and laptops, smartphones, and smart environments are essential tools in the field (Ajayi, 2020). Present configurations are driven by Artificial Intelligence (AI) applications that transform the operation and features of science and technology devices.

This paper explores the use of technology in science education. Technological advancements have brought new environments to the science classroom, thus equipping students to access various worlds of knowledge. However, a pedagogical flaw is noticed in science classrooms whereby professional technologies, developed based on vast sociocultural studies, are integrated to enhance the social interactions of the classroom, which the students will undoubtedly find inappropriate for the workplace. There is a dire need for developing, not classroom simulations of professional technologies, but genuine applications, thus affecting the ordinary interactions in the classroom. Moreover, this curriculum approach to science education seems relevant and significant as our very future depends on sustainable development and justifies a closer integration of technology to support teaching and learning in these areas (Adedayo and Ajayi, 2022).

The use of technology in science education has a long history. Previously, technology's role has been to support the learning content more than the learning itself. The rationale behind the use of technology depended on the availability of computers in classrooms, and the widespread facilities of networks and the Internet (Alade and Ayodele, 2017). But these technologies have now become indispensable in education, and it has become a

commonplace to talk about the educational consequences and potentials of these technologies rather than scarcely the facilities they offer on their own.

In the latter part of the past century, schools and colleges started using computers and interdisciplinary projects to enhance learning. Knowing that students love using computers can be seen as a rationale for using computers in science education (Olaniyi and Ajayi, 2020).

Scope and Objectives

The focus of this study "Enhancing Science Classroom Interactions with Relevant Technologies for Future Sustainability," is on the approaches by which science educators can make use of various technology tools that are relevant in fostering a sustainable future when conceptualized through constructive activities. In the use of technology in science classrooms, educators would need to remain patient, attentive, receptive, and supportive, always recognizing and being ready to adapt to the realities of each situation they find themselves in. This paper primarily provides an overview of some of the potentials that are not immediately apparent when thinking about these technologies in conjunction with ideas of future sustainability. Though this paper does not include specific instructional strategies or pedagogical frameworks for using these technologies in promoting a sustainable future but creates awareness of its importance in realizing the objectives.

The role of educational technologies has come to play a central role in twenty-first-century education, not only because of the capacity of technologies to deliver content but also because of its capabilities of converting classrooms into technologically enhanced education which can be used to interact and cooperate in digital environments. In tracking the relationship of technologies with education and people, the idea of 'sustainability' has gradually been transformed from notions such as carrying on an enterprise, self-reliance, economic viability and development, ecological impact, learning from the past, taking bearing, safeguarding rights and resilience, to developing in perpetual progression, a sustainable pathway. The potential for teaching school subjects in teams with technological enhancements provides a good strategy for coordinating education for sustainability.

Importance of Technology in Education

Technology has served to enhance many aspects of the human experience, including education. Its role in modern society is demonstrated in the popularity of remote working, entertainment, and networking, in education, technology has primarily served to improve instruction and enhance learning experiences. One area of considerable focus for using technologies to improve learning is in the field of Sscience, Ttechnology, Engineering, and Mmathematics (STEM) education. More specifically, technology and science instruction investigations have primarily focused on teaching and learning with data representations, simulations, modelling, and virtual or remote Laboratories. Use of technology in classroom might take various forms depending on some factors which include: the teacher’s knowledge and level of experience in the use of the technological tools, the learning environment, the concepts to be taught and the students’ level of maturity, some of the technology tools that could be deployed during the class lessons include the computer set, cellphone, tablets projectors and smartboard. This paper believes that if software and digital applications, as well as mobile devices including smartphones, are freely permitted to be used in the science classrooms it would offer students more opportunities to interact with data, represent models, and show evidence of learning in various ways.

In summary, technology has the potential to make learning more active, emphasize inquiry, enable students to visualize abstract concepts and engage in multiple modes of communication with others. Because of its potential to enrich the traditional practice of science, it could be suggested that technological tools should be incorporated into classroom practices. While technology is available in classrooms and quantitative evidence suggests that classroom practice remains effective, this is where research on technology in science provides a key opportunity.

Sustainability in Education

The term 'education for sustainability' is an educational process that emphasizes the link between community and the environment that attempts to showcase an intimate and inseparable relationship between the human and natural worlds. In this perspective, the nature of sustainability is a moral duty that extends to the classroom

activities of future generations. This implies that sustainability is more about caring for the environment and one another. To accomplish this, there must be a conscious attempt to find and create educational policies, practices, and programming that communicate and act on the change in humans and the environment. This attempt must encompass all manner of educational initiatives that seek to equip learners of all ages with the knowledge and skills to be planet-wise and self-sufficient concerning the environment. Informal and formal settings, non-vocational and vocational curricula, pre-service and teacher training programs, and adult and workplace concurrent courses.

Current State of Science Education

The current worldwide demand for educated students and citizens is changing rapidly to live and work in a future of ever-increasing complexity and change. Science and technology have been recognized as breakthroughs needed to avert the looming environmental collapse coupled with fast-increasing decadence among the youth and provide a future world of global social sustainability and environmental sustainability, with many unique possibilities in every aspect.

In Nigeria today, several attempts have been made by researchers to improve the classroom teaching-learning process. Several teaching strategies are suggested yet only a few emphasize the use of a full-blown technology environment for learning. Rarely do we have a learning environment with steady internet and online facilities and gadgets. The percentage of both teachers and students taking advantage of these technologies is of no significance. Virtually in all primary and secondary schools, students are banned from the usage of cell phones during the school period. From investigations carried out by the writer of this paper, 99% of the students in the schools sampled own at least a cell phone. These cell phones are glued to outside the school.

The total number of science students who investigated the usage of technologies for academics in both senior secondary and tertiary institutions in southwest Nigeria was 300 picked at random

Table 1: analysis of usage of technologies among science students

Function	**Computer**	**Tablet**	**Cell-Phone**
In possession of	19 (6.3)	28 (9.3)	297 (99.0)
Used for academic purposes	19 (100.0)	23 (82.1)	115 (38.7)
Used for social and other personal purposes	0	5 (21.7)	182 (61.3)

Table 1 revealed that 99.0% of the sampled students have and use Phones out of which only 38.7% of those having a Phone engage in academic stuff using the cell phone. The remaining 61.3% use the phone for social satisfaction. This report is a clear indication that technology is not yet perceived as a means for future sustainability among the students

Total number of science teachers investigated on the usage of technologies for academic in both senior secondary and tertiary institutions in south west Nigeria was 120 picked at random

Table 2: analysis of teachers using technologies for teaching science.

	Fully	Seldomly	No attempt
Surfing the internet for relevant teaching aids and materials	16 (13.3)	10 (8.3)	94 (78.3)
Teaching and directing the class through the internet	29 (24.2)	4 (3.3)	87 (72.5)
Organizing online teaching with the students	22 (18.3)	3 (2.5)	95 (79.2)
Giving online activities to the students	11 (9.2)	6 (5.0)	103 (85.8)

Table 2 further revealed that the use of technology for future sustainability is not yet a reality in our classrooms. The table showed that 78.3% of the science teachers sampled do not bother about the applications of technology in the classroom while 72.5% do not at any time teach or direct the class through internet usage. It was further revealed that 79.2% of science teachers do not have any plan to organize online teaching either in the physical classroom or outside of the four walls of the classroom. 85.8% of the teachers were also found not to engage the

students at any time with any online activity. This shows the level of compliance with the global technology trend. For Nigeria to be ready for future sustainability, there must be a paradigm shift from what operates in the classrooms today. The content and activities of education curricula would also need a complete overhaul.

Challenges and Opportunities

Despite the emphasis on wide array of skills attainable in science education, scientific literacy remains a relatively privileged space with limited potential to enhance learner transitions, life coping, and future sustainability Efforts to promote and support these aspects of scientific literacy have involved frameworks on systems, sustainable stewardship, and leadership. note that technology integration is expected to leverage new ways of thinking and improve learners' abilities and fixtures for securing wellness, security, pleasure, meaning, love, and humanity across times, places, relationships, nations, languages, and economies.

The most pressing challenge for further development of our educational technologies for use specifically in science classrooms is the very differing hopes of myriad publics, communities, and practicing scientists – let alone educators – in imagined futures for science education and therefore the confusion of purposes underpinning our current work. It might be possible to position some trace of the most progressive of these envisaged directions as 'the best of what might be' or a shared vision'. Otherwise, we might engage to foster a more integrated form of educational technologies

Benefits and Best Practices

In recent years, technology has been successfully integrated with science education at an ever-increasing rate globally, showing the many benefits that can be reaped in each setting by combining tools and strategies. One of those benefits includes engaging technology in making real-world connections to science, which has been a long-held pedagogical best practice in the advanced world. Other advantages include reinforcing classroom engagement, diversifying instruction strategies to reach students' various styles and preferences, and improving the students' interest in science and technology careers.

Pedagogical Strategies

For some time now, several pedagogical approaches have emerged focusing on teaching and learning processes: behaviourism, cognitivism, and constructivism. These approaches have implications for teaching and have led to changes in teaching and learning strategies and technologies. The role of the teacher and student is unique to each approach. Behaviourism is central to the role of the teacher, and students can learn. Teachers and technology are just vehicles for teaching and learning. On the other hand, in the constructivism approach, the focus is more collaborative and is the responsibility of the students in the learning process, which has aspects of understanding, interpretation, and accommodation of new meanings.

Regarding the new philosophy that has given priority to the assimilation of the actions of the different actors engaged in the teaching and learning process and the need for the future, the present educational paradigm has changed from "teaching" learning to the sense of "researching"-learning. The strategies are also focused on the inclusion of group work in the context of teaching the respective subject contents. Collaborative learning is one of the teaching methodologies in a school classroom that emphasizes the relevance of technology in science education (Ajayi and Ajayi, 2020). Technology integration plays a role in this activity that can encourage students to take part in class, as well as an additional learning source (Ajayi, 2020). Pedagogical strategies are focused on achieving the learning results for students associated with the content of science subjects by using information communication technology. The approach will be attractive to students who are accustomed to a gadget and will dominate the facts of current events that are associated with technology. The techniques are lecturing, simulations, brainstorming, and group activity reproduction.

Facilitating collaborative learning can be achieved through project-based and problem-based scenarios using technology. Project-based science involves innovative methods to explore scientific concepts, such as establishing laboratories, conducting ongoing research, and interacting with researchers. To enhance the use of technology in science classrooms, Ajayi 2020. proposed classroom methodologies that are based on an online

collaborative learning environment. This would allow studying at distances. It also removes the barriers to learning for those engaged in other life activities and yet purposes to study. The benefit of promoting collaborative learning is the development of rich and interactive classroom discussions and sharing of ideas. Various types of collaborative learning can incorporate talk and search move structures in science classrooms, with the involvement of pedagogical orchestration.

The emerging technologies showcase an array of possibilities that might potentially disrupt the existing order of things, of relevance to science education. This is based on a brief review of the educational implications that may be advanced as a result of this rapid technological advancement. 3D printing in an educational context has arguably surpassed the throwaway novelty state, being used effectively in small numbers of schools around the world. There are real hopes that as devices and facilities become more widespread across educational establishments, the interchange of information in science education may change, exploring theories collaboratively in small groups and sharing creations to improve understanding of knowledge and resulting in powerful learning opportunities. In education, effective use of technology tools could enhance knowledge and performance in science and bring about developments for future sustainability.

CONCLUSION AND RECOMMENDATIONS

This article has established that science education should focus on in-depth learning and creativity, as well as student interaction while providing genuine understanding and entertainment. Using those technologies as a resource can change science classes for the better. Educators are to be responsible for maximizing the power of those technologies to find out how they could be used effectively. Technology users should encourage pupils to be in charge of their learning, which frees up educators and provides fresh and innovative ideas for instructing. Full use of technology should be encouraged and enforced in the teaching of science. Technology application-related. learning contributes more effectively in both the classroom and quick memory learners.

Limitation to the Study: There was no limitation to this study. The challenges encountered were resolved and does not affect the study in any form

REFERENCES

1. Adedayo, J. O., & Ajayi, L. F. (2022). Use of google classroom as participation and performance enhancer among Basic Science postgraduates in some Universities in Nigeria. International Journal of Research and Innovation in Social Science (IJRISS) | 6, (7), 233-237. DOI Number: 10.47772/IJRISS
2. Ajayi, P.O. (2020). Influence of WhatsApp Group Learning Platform Undergraduates Study Habit in Basic Science Education in Nigerian Universities. EKSU Journal of Education, 9(2), 70-75
3. Ajayi, P. O., & Ajayi, L. F. (2020) Social Media Learning Platforms (SMLPs) as a performance enhancer among Senior Secondary School science students. Advances in Social Sciences Research Journal, 7 (5) 405 – 411.
4. Alade, H.O. & Ayodele, J. B., (2017). An African based Recommendation System for Improving Web Searching for Science and Technology. The Online Journal of Science and Technology, 7(2), 44-51.
5. Olaniyi, I. T., & Ajayi, P. O**.** (2020). Towards computer-based intervention strategy in learning computer studies in Nigerian secondary schools. IOSR Journal of Humanities and Social Science (IOSR-JHSS), 25 (7) 18- 21