CURRENT STUDIES IN COMPARATIVE EDUCATION, SCIENCE AND TECHNOLOGY, VOLUME 9, NUMBERS 1-2, 2022, PP. 30-42

2022 ISCEST Conference Keynote Presentation

THE NIGERIAN PERSPECTIVE ON TECHNOLOGICAL INTEGRATION BY COMPARATIVE EDUCATION ASSESSMENT

SAMUEL NDUESO JOHN
Nigeria Defence Academy, Kaduna, Nigeria

Abstract

The integration of technology into the education system has come to stay. Across all levels of education in Nigeria, there are elements of technology mixed with day-to-day teaching and learning activities. Education in the connected world of today revolves around the appropriate and innovative use of technology to improve the learning experience of every student. The link between technology and education is a veritable tool for social and economic transformation. Technology is integrated into the education sector to improve the learning experience of students and produce graduates that are better equipped for the evolving marketplace. The challenge is how to measure Nigeria's technology integration progress via her education sector. The progress Nigeria has made in integrating technological advancements across multiple sectors of the economy can be gauged through a comparative study of her education sector with other nations of the world. The goal of this paper is to inform through a process of comparing and contrasting the level of technological integration in the educational system of Nigeria and some other nations of the world. Comparative education in this context is a study of the role technology plays in the education of students in selected school systems from other nations of the world in comparison to what is obtainable in Nigeria.

The comparative assessment is carried out on *curriculum*, *teaching strategies, facilities, technology usage competence, perceptions, policy, and Industrial partnership.* This study would help place education in Nigeria in the right perspective and provide information on the technologies that should be incorporated into the education sector in the long and short term.

Introduction

The 21st century has brought with it sweeping changes that have revolutionized every industry and sector of the world. The revolution has given birth to a whole new set of skill requirements that require every future graduate to use and interact with some form of technology. The world today has reached a stage where the creation of knowledge through the use of technological tools is more valued than the mere transmission of knowledge from the teacher to the student in traditional classrooms. Globally, research into the integration of technology into the learning process of students has increased exponentially. The answers to how technology should be inte-

grated into the Nigerian education system are dynamic and subject to the educational goals of all stakeholders in Nigeria. Education today is revolutionized by very advanced forms of technologies that force organizations and governments to rethink the way students learn and acquire industry-relevant skills. Efforts have been made to internationalize the integration of technology in education and one such effort is the "*World Summit on the Information Society"* convened by the International Telecommunication Union (ITU) to provide a framework for the integration of technology into the education system at every level (Sosa & Manzuoli, 2019).

Technological integration in the context of this discourse is the use of information and communication technology tools such as multimedia, virtual reality, computer vision, simulations, and the Internet to improve the total learning experience of students and sustainably hone the skill of teachers in the use of technology to deliver effective teaching experiences in traditional classrooms and other avenues through which learning can take place Farjon, Smits & Voogt (2019).

Comparative education as the name implies, depends on accurate data, expert opinion, recorded experiences, and constructive criticism to glean insights, provide satisfactory explanations, and inform about scholarship in both the local and global context. Comparative education is borne out of the prevalence of intense competition and collaborations (Powell, 2020). The intensity of competition and collaboration among scholars, universities, and organizations around the world has reached epic proportions. These geometric levels of competition and collaboration are fuelled by a technology-driven global workplace where geographic boundaries are blurred (J. Tondeur, et al., 2019). The world rankings of universities undertaken by various bodies are more efficient due to the increased connectivity in the world (De Wit & Altbach, 2021).

Global ranking of universities based on raw data got from different strata of higher education provides a strong basis for comparative education.

Curriculum

In terms of the "Sustainable Development Goals (SDGs)," technological integration helps foster innovative approaches to teaching, learning, and assessment for lifelong human capital development Baena-Morales, Martinez-Roig & Hernádez-Amorós (2020). The SDGs call for curriculum review to reflect the urgent need to fully integrate technology into education systems in Nigeria and Africa.

The curriculum has been defined as the complete experience of a learner under the direction of a school, including the studies undertaken, remedial support for the challenged, and the flurry of activities (projects, sports, events, etc.) accompanying the learning process (Wang, Chen & Zhu, 2021).

The main areas of concentration in curriculum creation are contents, methods, and assessment. These main areas of curriculum development can serve as a template for effectively integrating technology into the education system in Nigeria (Ogunyemi, 2005). The Nigerian National Policy on Education, which is routinely reviewed outlines the plan for the comprehensive inclusion of technology into Nigeria's education system.

On the aspect of the curriculum, there is a global perspective on the integration of technology into the education system, championed by standardization bodies and shaped by individual disciplines. There is also the flexible perspective driven by innovation and project-based learning (Grimus, 2020). Globally, the criteria used to develop curriculum for technological integration into the education system are quite similar and any differences are usually caused by local educational goals, cultural

preferences, and economic prosperity. In a more specific sense, Nigeria can achieve the level of technological integration that produces a complete graduate that has advanced problem-solving, critical thinking, and social transformation skills.

According to a report by the Guardian Newspaper published on the 1st of October, 2022, there is a need for a total overhauling of the education curriculum in Nigeria to encourage lifelong learning through the engagement of technology. It was submitted that the Nigerian education system is lagging in terms of technological integration in comparison with other nations of the world.

Teaching Strategy

The pedagogical strategy for integrating technology into the Nigerian education system must breed a burning desire for lifelong learning in the Nigerian student. The integration of technology into the education system emphasizes the responsible use of technology in such a way that engenders equity, inclusiveness, and positive social transformations (Emre, 2019).

Technological integration provides a key departure from the teacher-centric model of learning to the student-centric model of learning (Damşa & De Lange, 2019). In technology-driven education systems, students are predominantly self-drivers of the learning process and teachers are to provide sufficient motivation and direction to ensure that students achieve all learning objectives (Wong, Muhammad & Abdullah, 2020).

Technology is used to tailor the learning experiences of students. The integration of technology into the learning process helps to proffer better teaching strategies based on the learners' current level of knowledge. Thus, learning gaps and teaching strategies are simultaneously addressed for the ultimate benefit of the student. Using technology, teachers can create learning contents that are very effective and provide opportunities for networking and collaboration among instructors from around the globe.

Across the world, several models exist for the integration of technology into the learning process at all levels of education. Education regulatory bodies in Nigeria consider all theories of learning, from the classical to the modern ones of the digital age to develop a pedagogical system that effectively integrates educational technology.

Technology integration makes for the possibility of having international standard assessments or examinations that are conducted by international standard bodies. International student assessment bodies like the International Association for the Evaluation of Educational Achievement (IEA) are revolutionizing learning assessment in Europe through the use of technology. Increasingly, nations of the world are beginning to show more interest in the comparative assessment of students' learning progress through standardized evaluations at the international level. Nigeria needs to make adequate preparations to equip schools and students for these international assessments that are being perfected for deployment at any time from now. It is in good knowledge that technology-driven international assessment tests have shocked presumably great citadels of learning after the release of comparative scores. In the United States, technology-driven standardized tests are used to monitor students' achievement of learning outcomes and teaching effectiveness. Denmark uses a technology that enables standardized tests to be administered to students flexibly based on performance in previous tests and latent abilities. The feedback is sent to both teachers and students by the next day. In the United Kingdom, technology is quite integrated into the education system such that parents can follow the academic

progress of students and comment on any area of concern. The technical depth needed to effectively and accurately gauge students' learning progress based on learning outcomes and teaching effectiveness is realized through technology integration.

In developed countries, regular and transparent evaluation and assessment of education systems are responsible for increasing the productivity of citizens in these nations (Eleje, Esomonu, & Ufearo, 2019). The results of these evaluations and assessments in developed economies have consistently emphasized the importance of integrating technology with learning at all levels of education. Research results from these evaluation and assessment bodies are implemented regularly to further improve the learning experience of students. In Nigeria, the body saddled with the responsibility of evaluating and assessing the Nigerian education system vis-s-vis technology integration at all levels is the Nigerian Education Management and Information Systems (EMIS). The EMIS collects learning data from institutions of learning across the nation and provides valuable information that informs the formation of education policies, technology integration inclusive.

Facilities

On the aspect of facilities, as of 2015, 32.4% of the population in developing countries have access to the Internet or use at least one form of information technology device (Kyari, et al., 2018). According to the internetworldstats.com website, about 73% of Nigerians have access to the Internet as of May 25, 2021. In comparison to other nations in Africa and around the world Nigeria has made a monumental leap in providing its populace with Internet access. The growing Internet penetration rate portends a promising future for the integration of technology into the education system in Nigeria. The global trend in classrooms today is to ensure that every student has access to a device with Internet access. The universal language in the world of learning today is "one device with Internet access per learner". Thus, Nigeria needs to prepare to implement this global trend of "one device with internet access per student" across the levels of education where it is mandatory. In Nigeria, technology integration has made headway mostly through the commercially available Internet and the "Bring your own Device (BYOD)" paradigm.

On yet another plane, the present state of infrastructure in many Nigerian primary and secondary schools as well as universities is not encouraging. Many schools in Nigeria have aged or dilapidated amenities and do not have the most basic form of multimedia and computers. The state of infrastructure in Nigerian schools is in an emergency state requiring urgent attention.

The budget for education in Nigeria has remained in the range of six (6%) to seven (7%) percent of the yearly budget. The United Nations Educational, Scientific and Cultural Organization (UNESCO) recommendation for yearly budgetary allocation to education is pegged at between fifteen (15%) to twenty (20%) percent of the national budget.

According to a report in The Cable News on the 8th of May 2021, the vast majority of Nigerian schools do not have electricity, Internet access, and basic computing devices. Current statistics show that the use of technology at the basic level (the primary, junior and secondary) of education in Nigeria is very low and only a few teachers and students can operate computers (Egede & Asabor, 2019). Most of the primary, junior, and senior secondary schools in Nigeria do not have access to the Internet.

On specific technologies like e-learning, Nigeria is still in its infancy along with the majority of other African nations. According to research, the vast majority

of Nigerian students access the Internet to browse for information, communicate, fill out forms, and submit assignments (Bubou & Job, 2021). Very few education programs in Nigeria make use of learning management software that facilitates students' learning anywhere and anytime. The majority of fully online studies in Nigeria are done for diplomas and postgraduate degrees in information technology and business-related disciplines.

A niche advantage of actively integrating technology into the learning process of students is the ease with which students with special learning needs are included in the learning process across all levels of education (Hasselbring & Glaser, 2000). Technology integration improves access to quality education for all categories of persons and provides a viable way to bridge the gap between theory and real-world applications. Feedback, which is an integral part of learning is greatly enhanced by using technology. Teachers and students can reliably get feedback throughout the learning process regardless of the class size, through virtual learning environments provided by learning management solutions.

Great examples of technologies that can be integrated into the Nigerian education system are multimedia devices, simulation tools, educational games, and electronic evaluation rubrics that make it easier to closely monitor and evaluate the performance of students throughout the entire learning process, especially in specific tasks where mastery is more difficult to evaluate using traditional quantitative methods.

According to Horizon report, a world-leading forecaster, the top ten (10) global trends in integrating technology into students' learning process include, mobile learning (m-learning), cloud computing, one-to-one computing, ubiquitous learning, gaming, personalized learning, redefined learning spaces, teacher-generated open content, smart portfolio assessment, and teachers as managers or mentors.

Technology Usage Competence

On the issue of technology usage competence, attention must be paid to developing the Nigerian teacher's ability to effectively use technology to teach, assess, and improve students' learning experience. The level of technological integration into our educational systems such as registration, setting of examination papers, sitting for examinations, checking of results, and the new method of issuing results with WAEC or JAMB influences her productivity.

Research has shown that the effectiveness of technology integration into the Nigerian education system is heavily dependent on the mastery of its use by teachers. Teachers across all levels of Nigeria's education system need to be trained on how to effectively use technology to educate students. Innovative approaches that consider the time needed for teachers to adapt to the culture shock that comes with transitioning from traditional learning processes to teaching with technology are key to improving the rate at which technology is integrated into the Nigerian education system. Nigerian teachers need to take the centre stage in the acquisition of skills that enable the productive use of technology in classrooms. The customary face-to-face teaching of technological pedagogical concepts is insufficient to raise truly competent teachers who can use technology to maximum effect in classrooms.

The COVID-19 epidemic also provided the stimulus to step up the integration of technology into the education system in Nigeria (Falode, Chukwuemeka & Falode, 2022). It was noted by yet another research study, that even students struggled to adapt to the new model of learning through the use of computing devic-

es and the Internet. The difficulty faced by students in the use of electronic devices to learn, informs the need to also educate Nigerian students on the use of technology to enhance learning and retention.

Integrating technology into the education process provides a means to give the student control over the learning process and fosters the lifelong learning mantra. Integrating technology into education greatly improves learning, teaching, information dispersion, education management, and learning data evaluation. Self-paced instructional materials with great content are created with technological tools and made available to students for personal and professional development. The self-paced learning materials are usually accessible from anywhere in the world with the appropriate credentials. The learner can study at more convenient times and work at a self-directed pace. But the immense benefits of integrating technology into the Nigerian education system are reaped on the foundation of a computer-literate populace. Computer literacy is a fundamental requirement for a technologically-driven educational system.

Despite the encouraging acknowledgment of the enormous benefits of education technology in Nigeria, its inclusion level in pedagogical practices is more theoretical than practical (Garba et al., 2013). The high theoretical content of technological inclusion is attributed to inadequate infrastructure and a dearth of teachers who are adequately trained in the use of technology to deliver learning objectives and outcomes. Dwindling funding for education has stymied sincere efforts to integrate technology into the education system in Nigeria.

In a 2019 study based on the Technological Pedagogical Content Knowledge (TPACK), the competence of Nigerian educators in the use of technology to aid teaching and learning was evaluated. The TPACK emerged as a framework to gauge teachers' integration of technology into learning processes in classrooms (Ifinedo, Saarela & Hämäläinen, 2019). Nigeria, in comparison to other African nations, is the largest user of the Internet and has the highest diffusion of mobile devices among young persons.

Pedagogy in this instance is the framework for the acquisition of skills in the use of educational technologies and the ability to decide how technology can facilitate teaching and learning. Thus, as shown in Figure 1, Technological Pedagogical Content Knowledge (TPACK) is the meeting point for pedagogical, content, and technological knowledge.

In comparison to countries like the United Arab Emirates (UAE), Turkey, Shanghai, and Singapore, Nigerian Technological Pedagogical Content Knowledge (TPACK) was influenced strongly by its Technological Pedagogical Knowledge (TPK). The study showed that Content Knowledge (CK) and Pedagogical Content Knowledge (PCK) did not influence TPACK in Nigeria. The Content Knowledge (CK) of teachers was low in comparison to other nations. The reasons given for the low Content Knowledge (CK) of Nigerian teachers were outdated curriculum and lack of motivation due to the absence of regular teacher training. The study submitted that the TPACK score of teachers in Nigeria can be improved through regular hands-on training to improve teachers' TPACK and that the Content Knowledge (CK) of Nigerian teachers can be strengthened through a revision of the existing curricula.

A major recommendation of this study was the inclusion of teachers in the revision of the curricula through active collaboration with school administrators and using the bottom-up approach. Another recommendation was that the regular training of teachers should involve hands-on use of technology in different subject areas for maximum impact.

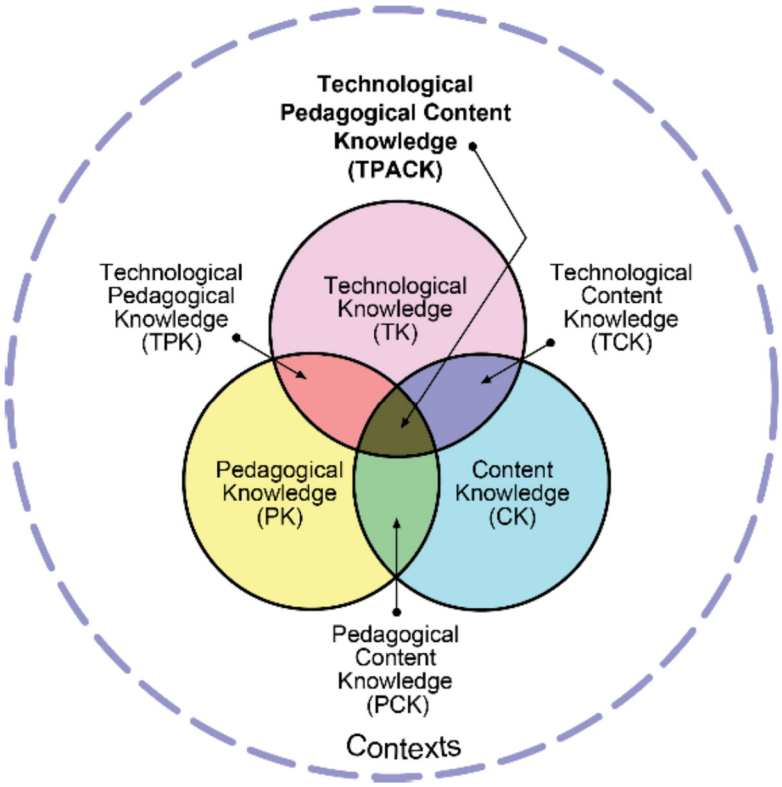

Figure 1: TPACK framework (reproduced by permission of the publisher, © 2012 by tpack.org

To achieve considerable gains in education technology usage across all levels of education in Nigeria, a significant investment also has to be made in the training of teachers. In Edo state, for example, there has been a consistent half-decade up-skilling effort to ensure that all teachers in state-owned schools are competent users of technological tools that improve student learning and make school administration easier. The Edo state government also provided state-owned schools with modern state-of-the-art computing devices to ensure that teachers in the state are empowered to put the regular training received to good use in classrooms.

Edo state dubbed the teacher training program, Teacher Professional Development (TPD) training. The TPD training program teaches the use of technology to improve teaching delivery and simplify school administration to teachers in state-owned schools. In addition to the regular training, the Edo state government instituted a daily quality assurance and mentoring program to ensure compliance with technology integration goals for state-owned schools. In addition to the training and compliance scheme, the Edo state government also ensured the provision of technical support for all deployed education technology across the state.

The Federal Government has also made some efforts of its own to prepare teachers for technology integration. According to a report by the Nigerian Tribune on the 29th of June, 2022, the federal government has trained more than 45,000

teachers on the use of digital tools in the classroom. The report stated that there are plans to open digital learning centres in several schools in the country and provide a learning website for the entire county with over 15,000 education videos covering themes taught in primary and secondary schools.

Perception

On the issue of perception, there is great enthusiasm about the potential for integrating technology into the Nigerian education system. Generally, in Africa, there is great optimism that technology would play a bigger role in the education sector in years to come (Njiku, Maniraho & Mutarutinya, 2019). The reception of the inevitable change in the education sector is generally favourable in Nigeria as well as other African nations. Already, there is widespread usage of information and communication technology equipment across all higher institutions of learning in Nigeria. Powerful factors such as perceived ease of use and the ubiquity of resources influence the attitude of teachers and students toward the active use of technology in the learning process (Oke & Fernandes, 2020). A study confirmed that students' attitude to technological integration is largely influenced by the perceived benefit. The study submitted that Nigerian students can perceive that using technology to learn improves flexibility and content delivery, and are therefore motivated to learn using educational technologies.

In Nigeria, e-examinations are generally accepted as a veritable way to curb examination malpractices and ensure greater accountability and transparency in examination processes. The Joint Admissions and Matriculation Board (JAMB), the National Open University of Nigeria (NOUN) and several private and public universities have adopted one form of e-examination or the other to assess the performance of students. Other forms of technology integration that have gained wide acceptance in the Nigerian education sector include e-applications, e-registrations, and e-admissions.

A research study carried out in 2020 submitted that the majority of teachers and students in Nigeria agree that educational technologies are a veritable tool for inclusiveness, innovation, and completion of learning objectives. Nigeria as a nation recognizes the importance of integrating technology into the educational system. The Nigerian Universities Commission (NUC) and the Council for the Regulation of Engineering in Nigeria (COREN) continue to engage several stakeholders on the best way to integrate technology into the Nigerian educational system. The Students Industrial Work Experience Scheme (SIWES), implemented across all campuses of Nigerian universities was established to help integrate technology into the learning process in Nigeria. Nigerian undergraduate students are sent to the industry to interact with technology in real-time and get hands-on experience in the use of technology to add value to Nigerian society. Recently, the National Information Technology Development Agency (NITDA) rolled out a comprehensive scheme to train 30,000 young Nigerians on the use of Blockchain technology. The programme which kicked off on the 1st of December, 2022 aims to equip young Nigerians with cutting-edge information technology skills to engage competitively in the local and global workplace.

While some universities in Nigeria have rolled out some form of e-learning programmes or the other, the majority of the colleges of education and polytechnics in Nigeria are yet to adopt any form of comprehensive e-learning programmes. According to a 2018 report, Nigeria ranks below South Africa and Egypt in its readiness to actively integrate technology into mainstream education.

The perception is encouraging. Teachers and students alike are willing to learn how to use technology if provided with the opportunity to learn. The encouraging reception of educational technologies is exemplified in the scores of teachers and students that have acquired relevant skills in the use of educational technology with personal funds.

Policy

The issue of technological integration in Africa has been touted as more of an implementation problem than a policy formulation strategy (Barakabitze et al., 2019). The inadequate political will to give priority to Education in Nigeria can be seen in the low budgetary allocation to education for the 2021/2022 national budget. Thus, the policy for entrenching technology into the education system in Nigeria is not the issue but the political will to ensure its implementation across the nation. In comparison with other African nations, policy continuity is the major issue. The policies for integrating technology with education in Africa are adversely affected by political instability. Every change of government in Africa usually spells doom for ongoing policies across several ministries and the policy on technological integration is not exempted.

The success of technology integration into the education landscape of Nigeria depends heavily on political will. Political will encompasses government stability, ministerial autonomy, continuity, regular reviews, and comprehensive evaluation. As the digital divide between developed and developing nations closes, all nations of the world have local policies for the integration of technology into mainstream education processes. The Nigerian National Policy for Information Technology, implemented by the National Information Technology Development Agency (NITDA) published its last revised version of its education technology integration policy in May 2019.

Industrial Partnership

On the aspect of the industrial partnership, the integration of technology into the education system is heavily driven by the private sector in developed nations of the world. This high level of involvement by the private sector in developed nations has fostered learning environments with an emphasis on collaborative work, key technological competencies, and cooperative learning through sustainable industry-academia relationships (Nsanzumuhire & Groot, 2020). Nigerian institutions can leverage the success of the technology integration process of other nations through networking and collaborations. Great collaborations, networking, and partnerships with the industry usually make equipment and facilities to boost the integration of technology into the education system easy to acquire. Industrial partnerships inform the willingness to borrow ideas, merge visions, and collaborate with private and public organizations to innovatively integrate technology into the Nigerian education system (Ankrah & Omar, 2015).

Internationally, investments in education technology are increasing drastically. According to Metaari, a US-based research institute, investments in educational technologies have reached an epic $16.3 billion. Augmented Reality (AR), Cognitive Science, and Artificial Intelligence (AI) are some of the aspects of education technology that have attracted the most spending.

In comparison with other nations, significant investments have been made to integrate technology into education. In Asia, Thailand and the Philippines stand

out. In Africa, Egypt and South Africa are leading investors in education technologies. In Nigeria, we have education technology companies like *uLesson*, *Gradely*, and P*repclass* that are blazing the trail in the exploration of technology for improving the learning experience of students.

Recommendations

In the short term, government and other stakeholders should invest strategically in upcoming and established education technology companies in Nigeria to bridge the education technology gap in Nigeria. The Nigerian government should sustainably invest heavily in the acquisition of telecommunication and computing devices for all schools as a short-term effort to integrate technology into the Nigerian education system.

In the long term, the Nigerian government should set up a grading system that would help monitor, intervene, and ensure compliance with the minimum standard in technology integration across all levels of education in Nigeria. As a means to remedy the dire situation of educational technology integration in Nigeria, the government has to embark on a comprehensive data collection journey that would provide the needed information to make an informed decision and strategize on how to make education technology integration a sustainable legacy. Data should be collated at all levels of government for validation, analysis, and planning.

Integrating IT into any nation's education curricula is capital intensive. As the Nigerian pidgin English saying goes; "*beta soup na moni killam o..".* Considering other contending national developmental imperatives, Government alone cannot fund this integration adequately. Furthermore, for such integration to be effective, the energy and telecommunications infrastructures must be expanded, modernized, and made reliable. This paper has established where we are lacking, hence the state holders will most certainly be interested in well-articulated recommended solutions such as:

i. TETFUND and NITDA should be made to provide more financial resources and logistics for IT integration;
ii. Universities should be granted full autonomy within clearly defined national boundaries and be allowed to charge tuition fees;
iii. Universities should explore innovative ways of increasing their IGRs through collaborations with industries, international organisations, productive ventures, etc
iv. Government should vigorously seek and achieve public-private partnerships to expand and modernize the energy and telecommunications infrastructures.

Conclusion

It has been stressed that technology integration should be seen in the education sector as an agent for solving teaching and assessment challenges, improving students' learning, and enhancing the productivity of teachers. The full spectrum of technology integration will give the Nigerian education sector the impetus to be globally competitive by comparison with other nations of the world.

Teachers should be motivated to actively use technology to improve students' comprehension and learning through proactive engagement with all stakeholders that puts the acquisition and mastery of relevant skills within easy reach. Only highly motivated and skilled teachers can put the use of technology to effective

use in the learning process. Adequate provision must be made to regularly train academic staff and cover all existing technology usage competence and skill gaps in the Nigerian education system. Standardized training modules on learning management systems (LMS) should be created and used to train teachers.

The Nigerian education sector must actively integrate technology into all relevant levels of education and properly define the scope of technology integration that is needed to make the complete graduate that can compete favourably in the workplace. The technology integration curriculum must be regularly reviewed, monitored, and benchmarked. In Nigeria today, there is the challenge of inadequate skilled personnel to train teachers on the use of technology to improve students' learning experience, high cost of equipment, bottlenecks/bureaucracy, unstable power supply, and telecommunication coverage gaps.

This comparative study placed education in Nigeria in the right perspective and provided information on the technologies that should be incorporated into the education sector in the long and short term. Nigeria must be able to continuously improve its use of technology in educating its teeming young population whose orientation and view about learning have radically been affected by recent innovations in technology. Regulatory bodies must make the necessary changes to the curriculum to ensure that technology becomes an integral part of the Nigerian education sector and that by comparison with its peers in other parts of the world, does not fare worse.

Correspondence
Samuel Ndueso John
Nigeria Defence Academy
Kaduna, Nigeria
Email: samuel.john@nda.edu.ng

References

Ankrah, S. &. Omar, A. T. (2015). "Universities–industry collaboration: A systematic review," *Scand. J. Manag.*, vol. 31, no. 3, pp. 387–408.

Baena-Morales, S. Martinez-Roig, R. & Hernádez-Amorós, M. J. (2020). "Sustainability and educational technology—A description of the teaching self-concept," *Sustainability*, vol. 12, no. 24, p. 10309.

Barakabitze, A. A. *et al.*, "Transforming African education systems in science, technology, engineering, and mathematics (STEM) using ICTs: Challenges and opportunities," *Educ. Res. Int.*, vol. 2019, 2019.

Bubou, G. & Job, G. (2021). "Benefits, challenges and prospects of integrating E-Learning into Nigerian tertiary institutions: A mini review," *Int. J. Educ. Dev. Using Inf. Commun. Technol.*, vol. 17, no. 3, pp. 6–18.

Damșa, C. & De Lange, T. (2019). "Student-centred learning environments in higher education: From conceptualization to design," *Uniped*, vol. 42, no. 1, pp. 9–26.

De Wit, H., & Altbach, P. G. (2021). Internationalization in Higher Education: Global Trends and Recommendations for Its Future. *Policy Reviews in Higher Education*, 5, 28–46. https://doi.org/10.1080/23322969.2020.1820898

Egede, B. A. J. & Asabor, B. M. (2019). "Integration Of Technology In The Training Of Basic Education Teachers In Nigeria: Issues, Challenges And Prospects.," *ADECT 2019 Proc*.

Eleje, L. I., Esomonu, N. P-M. & Ufearo, F. N. (2019). "Trends in information and communication technology and learning assessment: The application and implication," *Int. Educ. Appl. Res. J.*, vol. 3, no. 11, pp. 1–6.

Emre, D. (2019). "Prospective teachers' perceptions of barriers to technology integration in education," *Contemp. Educ. Technol.*, vol. 10, no. 4, pp. 381–398.

Falode, O. C., Chukwuemeka, E. J. & Falode, M. E. (2022) "COVID-19 Pandemic: A Catalyst to Technology Integration in Teaching for Sustainable Science, Technical and Vocational Education in Nigeria," *Eur. J. Interact. Multimed. Educ.*, vol. 3, no. 1, p. e02208.

Farjon, D., Smits, A. & Voogt, J. (2019). "Technology integration of pre-service teachers explained by attitudes and beliefs, competency, access, and experience," *Comput. Educ.*, vol. 130, pp. 81–93.

Garba, S. A., Singh, T. K. R., Yusuf, N. B. M. & Ziden, A. A. (2013). "An Overview of ICT Integration in Nigerian Colleges of Education and the Implications on Social Studies Pre-Service Teacher Training Programme: A Review of the Literature," *J. Educ. Learn.*, vol. 7, no. 1, pp. 35–42.

Grimus, M. (2020). "Emerging technologies: Impacting learning, pedagogy and curriculum development," *Emerg. Technol. Pedagog. Curric.*, pp. 127–151.

Hasselbring T. S. & Glaser, C. H. W. (2000). "Use of computer technology to help students with special needs," *Futur. Child.*, pp. 102–122.

Ifinedo, E., Saarela, M. & Hämäläinen, T. (2019). "Analysing the Nigerian Teacher's Readiness for Technology Integration.," *Int. J. Educ. Dev. Using Inf. Commun. Technol.*, vol. 15, no. 3, pp. 34–52.

J. Tondeur, R., Scherer, E., Baran, F. S., Valtonen, T. & Sointu, E. (2019). "Teacher educators as gatekeepers: Preparing the next generation of teachers for technology integration in education," *Br. J. Educ. Technol.*, vol. 50,no. 3, pp. 1189–1209.

Kyari, S. S., Adiuku-Brown, M. E., Abechi, H. P. & Adelakun, R. T. (2018). "E-learning in tertiary education in Nigeria: where do we stand?," *Europe*, vol. 348, pp. 24–26.

Njiku, J., Maniraho, J. F. & Mutarutinya, V. (2019). "Understanding teachers' attitude towards computer technology integration in education: A review of literature," *Educ. Inf. Technol.*, vol. 24, no. 5, pp. 3041–3052.

Nsanzumuhire, S. U. & W. Groot, (2020). "Context perspective on University-Industry Collaboration processes: A systematic review of literature," *J. Clean. Prod.*, vol. 258, p. 120861.

Oke, A. & Fernandes, F. A. P. (2020). "Innovations in teaching and learning: Exploring the perceptions of the education sector on the 4th industrial revolution (4IR)," *J. Open Innov. Technol. Mark. Complex.*, vol. 6, no. 2, p. 31.

Ogunyemi, B. (2005). "Mainstreaming Sustainable Development into African School Curricula: Issues for Nigeria.," *Curr. Issues Comp. Educ.*, vol. 7, no. 2, pp. 94–103.

Powell, J. J. W. (2020). "Comparative education in an age of competition and collaboration," *Comp. Educ.*, vol. 56, no. 1, pp. 57–78.

Sosa, O. G. & Manzuoli, C. H. (2019). "Models for the pedagogical integration of information and communication technologies: a literature review," *Ens. Avaliação e Políticas Públicas em Educ.*, vol. 27, pp. 129–156.

Wang, X., Chen, Y. & Zhu, W. (2021). "A survey on curriculum learning," *IEEE Trans. Pattern Anal. Mach. Intell.*

Wong, K.-T., Muhammad, M. & Abdullah, N. (2020). "Exploring the drivers of intention to use interactive whiteboards among Malaysia university students: Does technology self-efficacy matter?," *Int. J. Emerg. Technol. Learn.*, vol. 15, no. 1, pp. 163–175.