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REVOLUTIONIZING CLASSROOMS: THE INFLUENCE OF TECHNOLOGICAL ADVANCEMENT IN THE TEACHING AND LEARNING PROCESS IN SECONDARY SCHOOLS

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Abstract
This paper examines the influence of technological advancement in the teaching and learning process in secondary schools in Okpokwu and Ogbadibo Education Areas of Benue State. Three research questions guided the study. The study adopts ex-post facto research design. The population of the study comprised 2,621and 936 teachers. The study employed Cohen, Mannion and Morrison's criterion for choosing a sample size at 95% confidence level and 5% confidence interval to determine the sample size of 320 students from the population. The sample of 320 students were then drawn using multistage sampling procedure, the students' teachers from the 20 schools sampled which amounted to 270 teachers was used as the sample for teachers. Two instruments titled Influence of Technological Advancement on Secondary Schools Students Learning Questionnaire (ITASSSLQ) and Influence of Technological Advancement on Teachers' Instruction Questionnaire (ITATIQ) were used for data collection in this study. The instruments were face validated by three experts from Research, Measurement and Evaluation Unit of the Department of Science Education, Faculty of Education, University of Nigeria, Nsukka. Cronbatch alpha reliability was used to estimate the reliability of the instruments and an overall reliability index of 0.85 was obtained for ITASSSLQ and 0.78 for ITATIQ respectively. Data collected through on-the spot administration and retrieval were analysed using mean and standard deviation. The results revealed among other issues that technological advancement in the teaching and learning process have a significant positive influence on secondary school students' learning and teachers' instruction. One of the recommendations of the study was that schools and educational institutions should prioritize on-going training for teachers to effectively integrate technology into their teaching practices.

Keywords: Revolutionizing classrooms, innovative technologies, educational technology

Introduction

Revolutionizing classrooms has become a defining feature of 21st-century education. Across the globe, traditional classroom settings once dominated by chalkboards, paper textbooks and passive instruction are undergoing rapid transformation. This revolution is fuelled by the integration of educational technology and continuous technological advancement, which are reshaping the way teachers teach and students learn. A revolutionized classroom refers to the systematic transformation of teaching and learning environment through the adoption and effective use of digital tools, platforms and methodologies. This transformation is characterized by measurable shifts in instructional practices, learners' engagement and educational outcomes. Modern classrooms now harness interactive simulations, online resources, real-time data analysis and even artificial intelligence to create more dynamic, engaging and inclusive learning environments. As Yildirim and Sensoy (2018) explain, the integration of technology into teaching and learning has become inevitable in light of global advancements in information and communication technologies (ICT). Hence, the systematic

use of technological tools and platforms to improve educational outcomes has emerged as a critical driver of this transformation.

Educational technology is the use of technological tools, platforms and methodologies to improve the teaching and learning process. Stosic (2015) defines educational technology as an organized and systematic process that applies modern technologies to enhance the quality of education, while the Top Hat Glossary (2025) describes it as software that supports teaching and learning in virtual environments. These tools are not only changing instructional delivery but also addressing the evolving demands of 21st-century learners. By integrating disciplines such as computer science, education, psychology and artificial intelligence, educational technology supports personalized learning, improves access to resources and enhances classroom interaction. According to Ghory and Ghafory (2021), the widespread adoption of digital technologies has significantly altered both students' learning habits and teachers' instructional strategies, with a resulting positive impact on educational outcomes. The transformation of modern classrooms is being propelled by the continuous integration of advanced educational technologies, which extend beyond supporting instruction to fundamentally reshaping how teaching and learning occur. Key innovations like Learning Management Systems (LMSs), online learning platforms, interactive whiteboards, educational apps, virtual and augmented reality (VR/AR) and artificial intelligence (AI) serve as the backbone of this digital shift. LMSs such as Moodle, Canvas and Google Classroom centralize course delivery and communication, allowing both teachers and students to interact with content in a flexible and organized manner (Education Horizon, 2025). E-learning platforms like Coursera, Udemy, edX, LinkedIn Learning and Khan Academy further expand access to education by offering self-paced, skill-based and academic courses through digital videos, virtual documents and interactive features, making learning more learner-cantered and accessible globally (LearnWorlds, 2025; Corporate Finance Institute, 2025).

Other tools like interactive whiteboards and smartboards enhance engagement by merging traditional instruction with digital interactivity. These boards support dynamic presentations, multimedia content and real-time annotations, enabling tactile and collaborative experiences that accommodate multiple learning styles (GFleech, 2025). Educational apps and software on the other hand ranging from tutorials and simulations to assessment tools provide personalized and flexible learning opportunities across various devices, making teaching more efficient and learning more accessible (Savvycom Software, 2025). Immersive technologies like VR and AR deepen conceptual understanding by simulating 3D environments or overlaying digital content on the physical world, thus fostering experiential learning (Essien & Okon, 2022). Finally, AI-powered tools such as ScribeAI, Grammarly, Quizlet, Edmodo and DreamBox offer intelligent support for tasks like note-taking, personalized feedback and performance analytics. Popenici and Kerr (2017) explained that while AI may not replace teachers, it significantly augments instructional delivery and decision-making in real-time. Hence, these technologies are not merely enhancing the classroom they are revolutionizing it. Evidence from literature has shown that technological advancement in the teaching and learning process may have influenced both students and teachers. For instance, a study conducted by Yildrim and Sensoy (2018) to examine the effect of science teaching enriched with technological practices on attitude level of secondary school students revealed that attitude level of students were significantly increased and this increased were retained even after three months. Asad, Husain, Wadho, Khand and Churi (2020) in their study on integration of e-learning technologies for

interactive teaching and learning process revealed that the level of interest towards the integration of ICTS and e-learning in science and social science courses increased among students. The result also shows that the use of ICTs and e-learning materials, help students to learn effectively which could also facilitate teachers for their teaching process in this modern era of technology. Furthermore Sanjida (2021) assessed the impact of technological advancement on the educational sector of Bangladesh; the study revealed among other issues that modern technology enables educators to promote teaching methods which enhances the innovation in the system of education. Sanjida (2021) also noted that advancement in technology ensures the presence of open education resources by which teachers are able to access enriched research studies.

Based on the above result, Sanjida further noted that the concept of blended learning which is a combination of both online and offline classroom is also introduced with the help of technological advancement. Rajar and Nagasubramani (2018) in their study on the impact of technology in education found out that technological advancement like digital cameras, projectors, mind training software, computers, power point presentations, 3D virtualization tools enhances teaching and learning and have become great sources for teachers to help students grasp concepts. This technological advancement could go a long way in widening educational access to student. On widening educational access to students from different socio-economic background, technological advancement in education may have made education accessible to students from different socio-economic background and location through online learning platforms thereby creating equal learning opportunities. UNESCO (2023) added that technology expands educational access for diverse socioeconomic backgrounds by offering affordable online learning platforms, accessible digital resources, and personalized learning experiences, overcoming geographical and time constraints, and providing opportunities for remote and flexible education. Deepa, Sujatha and Mohan (2022) in their study on unsung voices of technology in school education-findings using the constructivist grounded theory approach revealed that ICT have enabled access to quality education in remote areas irrespective of socio-economic background, that children from underprivileged backgrounds can learn effectively using technology if provided with adequate infrastructure such as devices and internet connectivity. Hence, the wide spread availability of mobile devices and internet services may open up new opportunities for marginalized communities, offering the ample opportunity to access educational resources they were previously inaccessible.

In line with the promising benefits of technology in education, there are growing concerns regarding the effective and ethical use of technology in the classroom. Timmis, Broadfoot, Sutherland and Oldfield (2015) cautioned that while advancement in technology offers numerous opportunities for innovation in education, there are risks and challenges associated with the use of technology in education. Hence, there should be room for ethical consideration over social exclusion and new form of digital dividedness. One of the primary concerns is the potential for widening the digital divide. While some schools are equipped with the latest technological resources, others, particularly in underfunded areas and remote areas struggle to provide even basic access to digital tools. This disparity could further exacerbate educational inequalities, leaving students from disadvantaged backgrounds at a distinct disadvantage. Additionally, the shift towards technology-driven education raises questions about the adequacy of teacher training and professional development. Many teachers may feel overwhelmed by the fast-paced evolution of educational technologies and may lack the necessary skills to effectively integrate them into their teaching practices. In

order to achieve revolutionized classrooms for students and teachers, there is need for active engagement of students and teachers in this transformative process. This calls for more research on the need to examine the influence of technological advancement in the teaching and learning process to keep educators and stakeholders in education better informed.

Statement of the problem

Despite the growing proliferation and adoption of educational technologies such as Learning Management Systems (LMS), online learning platforms, interactive whiteboards, virtual and augmented reality and artificial intelligence, their full potential to revolutionize classroom instruction remains unevenly realized, particularly in developing countries like Nigeria. While these tools are lauded for enhancing access, engagement and personalization, many educational institutions continue to struggle with effective integration, teacher preparedness, pedagogical adaptation and infrastructure limitations. Moreover, existing literature often focuses on the availability and features of these technologies rather than critically evaluating their impact on actual teaching and learning outcomes, especially in relation to how they transform classroom dynamics, student engagement or pedagogical models. This creates a gap in understanding the real-world implications of technological advancement in education not just as tools, but as change agents capable of reshaping educational delivery. It is against this backdrop that this study examines the influence of technological advancement in the teaching and learning process in secondary schools.

Objective of the study

The objective of the study is to:

1. determine the influence of technological advancement on secondary school students' learning.
2. determine the influence of technological advancement on secondary school teachers' instruction.
3. determine how technological advancement expands educational access to students from different socio-economic background.

Research questions

The following research question was posed to give direction to the study

1. What is the influence of technological advancement on secondary school students' learning?
2. What is the influence of technological advancement on secondary school teachers' instruction?
3. How is technological advancement expanding educational access to students from different socio-economic background?

Methods

The researchers adopted ex-post facto research design in this study. Ex-post facto research design also known as causal-comparative research, is a type of research design where the researcher examines the relationship between an independent variable and a dependent variable after the event has already occurred. According to Nworgu (2018), in an ex-post facto design the researcher has no control over the variables of interest and therefore cannot manipulate them. This study adopts this design because the study sought to find out the influence of technological advancement in the teaching and learning process in secondary schools. The study was carried out in Ogbadibo and Otukpo Education Area of Benue State, Nigeria. The population of the study comprised all the 2,621 SS II students and 936 teachers in the education areas for the 2023/2024 academic session. A sample of 320 SSII student

were determine using the criterion proposed by Cohen, Mannion and Morrison's (2018, P.206) for choosing a sample size at 95% confidence level and 5% confidence interval. Multistage sampling procedure was employed by the researchers in drawing the sample. In the first stage, proportionate stratified simple random sampling technique was used to draw 20 schools from Ogbadibo and Otukpo area education zones of Benue State. At the second stage, proportionate stratified simple random sampling technique was also used to draw the sample of 320 students from the 20 schools sampled from the two area education zones. Proportionate stratified random sampling was used because it ensures that the sample size of each stratum is proportional to it share in the overall population. The students' teachers from the 20 schools which amounted to 270 teachers for all the subjects offered were used as sample for this study. Two instruments titled Influence of Technological Advancement on Secondary Schools Students Learning Questionnaire (ITASSSLQ) and Influence of Technological Advancement on Teachers' Instruction Questionnaire (ITATIQ) were the instrument for data collection for this study. The instruments were divided into two sections; section A is on instruction. Section B contains 10 items each. The items were measured on a four point rating scale of Strongly Agree (SA) 4 points, Agree (A) 3 points, Disagree (D) 2 points and Strongly Disagree (SD) 1 point to elicit information from students and teachers on the influence of technological advancement in the teaching and learning process in secondary schools. The instruments were given facial validation by three experts from Research, Measurement and Evaluation Unit of the Department of Science Education, University of Nigeria, Nsukka, after modifications based on the suggestions of the experts, the final instruments were produced. To ensure the internal consistency of the instruments, the instruments were trial tested with 50 students and 30 teachers in Okpokwu Education Area of Benue state which were not part of the study but shares similar characteristics in terms of curriculum, cultural background and socio-economic and environmental context with the students and teachers in the areas under study. Cronbatch alpha reliability method was used in estimating the reliability and an overall reliability index of 0.85 was obtained for the ITASSSLQ and 0.78 for the ITATIQ. On the spot administration and retrieval was the method employed in administering the instruments to students and teachers in their respective schools. The data collected from the respondents were analysed using mean and standard deviation. The bench mark for the interpretation was set at 2.5 and above.

Results

Research question one: What is the influence of technological advancement on secondary schools students' learning?

Table1: Mean and standard deviation of the influence of technological advancement on secondary schools Students' learning

S/N	Item Statement	N	Mean	Std. Deviation	Remark
1	Technology has improved my ability to complete my school assignment more efficiently.	320	3.19	0.74	Agree
2	I find it easier to understand complex subject with the help of educational technology like educational software and apps, website and online courses.	320	2.98	0.99	Agree
3	Access to the internet has positively influence my performance.	320	3.46	0.68	Agree
4	The use of technology in secondary schools has made	320	2.83	0.77	Agree

	learning more engaging and enjoyable				
5	I often find myself distracted by the use of technology during school session.	320	2.18	0.85	Disagree
6	Technology has helped me to develop important skills that will be useful in my future career.	320	2.51	0.96	Agree
7	Technology is a useful tool for collaboration among classmates such as group project and group discussions.	320	2.76	1.04	Agree
8	Technology has improved my access to learning materials that were previously unavailable to me.	320	2.65	0.92	Agree
9	The use of digital devices in the classroom has led to a decrease in face-to-face communication and social interaction among students.	320	3.09	0.73	Agree
10	Over-reliance on technology has made me less confident in performing tasks without digital tools.	320	2.02	0.74	Disagree
	Grand Mean	**320**	**2.76**	**0.34**	**Agree**

Table 1 above, in order to answer research question one, the scores from the responses of the respondents on the influence of technological advancement on secondary schools students learning were analysed. The result showed grand mean of 2.76 with a standard deviation of 0.34, which is above the 2.5 set as bench mark. This shows that technological advancement influences secondary school students learning.

Research question two: What is the influence of technological advancement on teachers instruction?

Table2: Mean and standard deviation of the influence of technological advancement on Teachers instruction in secondary schools

S/N	Item Statement	N	Mean	Std. Deviation	Remarks
1	Technology has made it easier for me to deliver lessons more effectively.	270	3.18	0.77	Agree
2	The use of digital tools (e.g., smartboards, educational apps) has improved student engagement in my classes.	270	3.16	0.92	Agree
3	I feel more confident in incorporating technology into my teaching methods compared to traditional methods.	270	3.39	0.70	Agree
4	Technology has made it easier for me to differentiate instruction to meet the diverse needs of my students.	270	2.85	0.77	Agree
5	Online teaching platforms and resources have increased my ability to communicate effectively with students outside of class.	270	3.35	0.56	Agree
6	I believe that the integration of technology in education has increased my workload and stress levels.	270	2.50	0.92	Agree

7	Technology has helped me provide more personalized feedback to my students on assignments and assessments.	270	2.87	1.02	Agree
8	The use of technology has improved my ability to track student progress and performance more accurately.	270	2.71	0.91	Agree
9	I feel that students are more distracted by technology (e.g., smartphones, social media) during lessons.	270	2.56	0.75	Agree
10.	Technology has helped me enhance my professional development through online training and resources	270	2.90	0.80	Agree
	Grad Mean	**270**	**2.89**	**0.30**	**Agree**

Table 2 above, in order to answer research question two, the scores from the responses of the respondents on the influence of technological advancement on teachers instructions in secondary schools were analysed. The result showed grand mean of 2.89 with a standard deviation of 0.30, which is above the 2.5 set as bench mark. This shows that technological advancement influences teachers' instruction in secondary schools.

Research Question three: How is technological advancement expanding access to students from different socio-economic background?

Table3: Mean and standard deviation of how technological advancement is expanding educational access to students from different socio-economic background

S/N	Item Statement	N	Mean	Std. Deviation	Remarks
1	Technology has made education more accessible to students from lower socio-economic background.	320	3.17	0.76	Agree
2	Online learning platforms provide equal learning opportunities for students, regardless of their socio-economic status.	320	3.48	0.56	Agree
3	The availability of free or low-cost educational resources (e.g., online courses, e-books) has helped bridge the educational gap between students from different socio-economic groups.	320	3.50	0.68	Agree
4	Students from disadvantaged socio-economic backgrounds benefit more from educational technology than from traditional classroom settings.	320	2.82	0.77	Agree
5	Technological advancements like mobile phones and internet access have improved educational opportunities for students in rural or remote areas.	320	3.18	0.49	Agree
6	Technology enables students from lower-income families to access quality	320	2.74	0.45	Agree

	education materials that they would not have access to in traditional settings.				
7	Despite advancements in technology, students from higher socio-economic backgrounds still have an advantage in accessing educational resources.	320	2.76	0.99	Agree
8	The introduction of technology in education has led to increased opportunities for students from marginalized socio-economic backgrounds to participate in global education networks**.**	320	2.68	0.91	Agree
9	Educational technology has contributed to reducing the impact of socio-economic status on students' academic performance.	320	3.03	0.66	Agree
10	While technology has expanded educational access, the digital divide still exists, limiting full participation for students from lower socio-economic backgrounds	320	2.86	0.64	Agree
	Grand Mean	**320**	**3.01**	**0.25**	**Agree**

Table 3 above, in order to answer research question three, the scores from the responses of the respondents on how technological advancement expands education access to students from different socio-economic background were analysed. The result showed grand mean of 3.01 with a standard deviation of 0.25, which is above the 2.5 set as bench mark. This shows that technological advancement expands education access to students from different socio-economic background.

Discussion

The finding of the study revealed that technological advancement influences secondary school students learning. This finding is in agreement to the findings of Yildrim and Sensoy (2018) who revealed from their study that attitude level of science students were significantly increased after enriching their classroom instruction with technological practices and this increased were retained even after three months. The study also add credence to the work of Asad *et al.* (2020) who revealed in their study that the level of interest toward science and social science courses increased among students after the integration of ICT and e-learning technology in their classroom instruction. The finding of the study also revealed that technological advancement influences teachers instruction in secondary schools. This result strengthens the findings of Rajar and Nagasubramani (2018) who found out that technological advancement like digital cameras, projectors, mind training software, computers, power point presentations, 3D virtualization tools enhances teaching and learning and have become great sources for teachers to help students grasp concepts. The findings also corroborates with that of Sanjida (2021) which revealed that modern technology enables educators to promote teaching methods which enhances the innovation in the system of education and also ensures the presence of open education resources by which teachers are able to access enriched research studies.

The finding of the study further revealed that advancement in technology is expanding access to education to students from different socio-economic background. This result lend support to UNESCO (2023) GEM-report which added that technology expands educational access for diverse socio-economic backgrounds by offering affordable online learning platforms, accessible digital resources and personalized learning experiences, overcoming geographical and time constraints and providing opportunities for remote and flexible education. The result also agrees with Deepa, Sujatha and Mohan (2022) who revealed that ICT have enabled access to quality education in remote areas irrespective of socio-economic background, that children from underprivileged backgrounds can learn effectively using technology if provided with adequate infrastructure such as devices and internet connectivity.

Conclusion

Based on the findings of the study, the researchers concluded that technological advancement influences students learning, teachers instruction and expands education access to students from different socio-economic background overcome these barriers and ensure that the benefits of technology in education reach everyone, regardless of their socio-economic background.

Recommendation

Based on these findings, the following recommendations were made:

1. Schools and educational institutions should prioritize on-going training for teachers to effectively integrate technology into their teaching practices. This includes offering workshops, seminars and courses on using digital tools, e-learning platforms and emerging technologies like AI, VR, AR and gamification etc.
2. Governments and educational institutions should invest in providing access to affordable and reliable technological devices, such as laptops, tablets, and internet connectivity, to all students, especially those from disadvantaged socio-economic backgrounds.
3. Students should be trained on how to use this various technology to enhance their learning.

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