

THE RISE OF EDTECH IN NIGERIAN EDUCATION: REVOLUTIONIZING TEACHING AND LEARNING

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ABSTRACT

This study analyzes the burgeoning landscape of educational technology (EdTech) in Nigerian education, where technology-driven innovations are bringing transformative shifts in the teaching and learning paradigm. The first section of this study underscores the pivotal role of EdTech in revolutionizing education and its potential to address the challenges prevalent in the Nigerian context. Traditional education strengths and limitations are examined, setting the stage for profound changes brought about by EdTech. This study explores the multifaceted role of EdTech, highlighting its capacity to provide access to quality educational resources, facilitate personalized learning experiences, and empower educators with novel pedagogical tools. Importantly, it navigates the nuanced landscape of challenges, including the digital divide and ethical concerns that accompany technological transformation in Nigeria. As the contour of teaching and learning evolves, this study analyzes the evolving roles of educators, the engagement of students, and the cultivation of essential skills to be relevant in the digital era.

KEYWORDS: Nigerian education, education technology (EdTech), artificial intelligence

INTRODUCTION

The educational landscape in Nigeria is undergoing a major transformation and is driven by the convergence of technology, artificial intelligence (AI), and innovative pedagogical approaches. With technology becoming an integral part of modern life, its incorporation into education holds the potential to reshape the way knowledge is imparted (Raja et al, 2018). In recent years, the rapid advancement of technology has brought about a revolution in various sectors, and education is no exception. The significance of incorporating technology and AI in the Nigerian educational landscape cannot be overstated. In a study by Alonge (2016) Nigeria with a diverse society stands to gain from the adoption of education technology (EdTech). From enhancing access to quality educational resources to providing personalized learning experiences for all students. Technology and AI have the ability to bridge educational gaps and elevate the overall learning ecosystems.

Beyond the well-recognized value of AI, the broader umbrella of EdTech encompasses a myriad of tools that are primed to propel the nation's education system into the digital age. These tools include online learning platforms, interactive textbooks, and virtual reality simulations. In an era where information and communication technologies are reshaping global industries, education stands as a fertile ground for technological intervention. The adoption of EdTech promises to address the perennial challenges faced by the Nigerian educational system. As the country grapples with access disparities and varying levels of educational quality, the infusion of technology emerges as a potential equalizer. This aligns with the objectives of this study which aims to explore how EdTech can revolutionize teaching and learning to bridge their gaps.

As technology penetrates deeper into Nigerian society, the traditional education model's strengths and limitations are brought into sharper focus (Bubou, 2021). The conventional one-size-fits-all approach often struggles to cater to the diverse learning needs of Nigerian students, as Nigerian society is one with diversity in cultural beliefs and other areas. A traditional classroom may not be able to accommodate the needs of students with disabilities, or it may not be able to provide the level of individualized attention that some students need. Thus, this study sets the stage for an in-depth exploration of how EdTech can cater to the diverse learning needs of Nigerian students.

The adoption of EdTech tools offers not only personalized learning pathways but also paves the way for fostering essential skills required for success in the digital era. Skills such as critical thinking, problem-solving, digital literacy, and collaboration are indispensable for navigating the complexities of the modern world (UNESCO, 2019). EdTech creates an ecosystem where students are not just recipients of knowledge but active participants in their learning journey. This paradigm shift aligns with the objectives of this study, seeking to uncover how EdTech facilitates the cultivation of these vital 21st-century skills and empowers students to become adaptable, resourceful, and technologically fluent global citizens.

Furthermore, the integration of technology and AI in Nigerian education is not solely about enhancing student experiences. Educators, too, are presented with transformative opportunities. Traditional teaching methods are evolving to accommodate innovative pedagogical approaches that leverage EdTech to engage students more effectively. Educators are transitioning from the role of knowledge providers to that of facilitators, guiding students through discovery and problem-solving. This change in the educator's role signifies a shift towards student-centered learning, a shift that forms a cornerstone of this study's investigation.

COMPARISON OF THE TRADITIONAL EDUCATION IN NIGERIA WITH THE EDUCATIONAL TECHNOLOGY ERA

As the landscape of Nigerian education undergoes a digital transformation driven by the rise of educational technology (EdTech), it is essential to reflect on the traditional education system that has shaped the nation's learning environment. Before the integration of technology, education in Nigeria was primarily imparted through oral traditions and communal practices (Onwuatuegwu, 2023). Elders and community leaders held the role of custodians of knowledge, passing down wisdom, values, and skills from one generation to another. This approach allowed a strong sense of community and interconnectedness, resonating with the core cultural values of Nigeria.

One of the strengths of the traditional education system in Nigeria was its emphasis on character development and holistic education. Education extended beyond the acquisition of academic knowledge; it also encompassed the nurturing of virtues and values essential for contributing positively to Nigerian society. Moral teachings were intertwined with practical skills, ensuring that individuals not only possessed knowledge but also understood their responsibilities within the community (Umar et al., 2013). This well-rounded approach to education contributed to the development of socially responsible citizens. The aim of education in an indigenous or traditional setting was acquisition, development of skills and molding of character which was necessary for survival in the society (Okpara, 2022). This is an aspect that aligns with the aspirations of modern educational goals.

While the traditional education system had commendable aspects, it also had limitations that the emergence of EdTech seeks to address. The system was often exclusive, favoring certain segments of society based on social status, gender, and regional affiliations. This led to educational disparities, where marginalized groups faced barriers to accessing quality learning opportunities. Additionally, the lack of a standardized curriculum and assessment mechanisms made it challenging to ensure consistent learning outcomes across different communities.

Addressing these limitations requires acknowledging the need for adaptation and evolution. Modern challenges necessitate a shift towards a more inclusive and standardized education system. While the traditional approach honored local knowledge and community values, the integration of modern pedagogical methods could enhance learning experiences and foster critical thinking skills. By blending the strengths of traditional education with contemporary methodologies, Nigeria's education system could strike a balance between heritage and progress. Also, recognizing the gender disparities that characterize traditional education is crucial for a more equitable future. Historically, gender roles often limited

educational opportunities for girls and women. The transformation of the education landscape demands a commitment to gender equality, ensuring that all individuals have access to quality education regardless of their gender identity.

THE ADVENT OF TECHNOLOGY AND AI IN NIGERIAN EDUCATION

The Era of Visuals: The integration of technology and artificial intelligence (AI) into Nigerian education marks a significant turning point in the nation's approach to teaching and learning. Educational technology in itself started in Nigeria in the early 20th century which began with the visual era (Ogbonnia, 2017). This era marks the use of simple teaching aids like apparatuses including charts, maps, and models, and the preparation of lesson notes. The emphasis was on creating low-cost teaching aids, particularly in Teacher Training Colleges. This initial step laid the foundation for the subsequent evolution of educational technology in Nigeria.

The Era of Radio Media and Beyond: Building on the visual era, Nigeria progressed into the era of radio media in education from the early 1940s to the 1950s (Udomisor, 2013). This marked the introduction of communication media, with the construction of a Radio Receiving Station in Lagos in 1932. The era of radio media brought the notion of educational broadcasting to the forefront, expanding the reach of learning materials and resources. The focus of this period was largely on teacher training, utilizing audio-visual resources to enhance instructional practices.

Advancements and Partnerships: The momentum gained through the era of radio media paved the way for further advancements. Initiatives such as the projects sponsored by the United Nations Educational Scientific Cultural Organization (UNESCO) in 1962 at the Institutes of Education, University of Ibadan, played a pivotal role in EdTech (Ogwu et al, 2023). The establishment of an audio-visual unit within the Institute introduced new methods and techniques, leading to the integration of programmed learning methods. Additionally, computer science emerged as a fundamental discipline in education, gradually transforming the learning landscape.

Robotics and AI: The catalysts of innovations. The journey toward technology-driven education took a leap forward with the introduction of robotics and AI. In 2015, a Nigerian student, Bobai Ephraim Kato, created an artificial intelligence robot capable of solving puzzles. This accomplishment demonstrated the potential of AI in enhancing problem-solving skills and critical thinking. Subsequently, other initiatives, like the development of remote labs at Obafemi Awolowo University, showcased the potential of technology in revolutionizing practical learning experiences.

The integration of technology and AI has brought forth a multitude of benefits to Nigerian education. Students now have access to a diverse range of educational resources, breaking down geographical barriers and fostering self-directed learning. Educators are empowered with tools that enable personalized instruction, data-driven insights, and interactive engagement. Moreover, technology has bridged borders, enabling Nigerian students and teachers to collaborate with peers globally and engage in cross-cultural learning experiences.

While technology has made remarkable strides, challenges remain. The digital divide persists, preventing some students from fully accessing the benefits of technology-driven education. Furthermore, ensuring that educators are equipped with the necessary skills to harness the full potential of technology remains an ongoing challenge. In this journey, it is imperative to prioritize equity, ensuring that every student, regardless of their background, has equal access to quality education enhanced by technology.

The advent of technology and AI in Nigerian education heralds a promising future where education transcends traditional boundaries (Cleopas, 2023). The fusion of tradition and innovation has the potential to create holistic learning environments that cater to diverse learning needs. As Nigeria navigates this

transformation, it must strike a balance between embracing technology and preserving the human touch that defines effective pedagogy. Equipping educators and students with the necessary technological tools and addressing challenges of accessibility, Nigeria can usher in an era of education that prepares students for the challenges and opportunities of the digital age.

NEW PHILOSOPHY AND PEDAGOGICAL APPROACHES

The infusion of educational technology and artificial intelligence (AI) is birthing a new philosophy that redefines pedagogical approaches (Ayanwale, 2022). This evolution goes beyond a mere adoption of tools; it encapsulates a profound shift towards student-centered learning, heralding a transformative era that respects individuality, nurtures skills for the digital age, and bridges gaps of inclusivity. As Nigeria stands at the crossroads of tradition and innovation, the amalgamation of these philosophical underpinnings with advanced technology has the potential to revolutionize education as we know it.

The contemporary education landscape acknowledges that students are more than passive recipients of knowledge. They are active participants in their learning journey, each possessing unique strengths, weaknesses, and learning styles. EdTech acts as a catalyst that will facilitate the transition from teacher-centric to student-centered learning. In this paradigm, students engage in exploratory learning, where technology serves as a facilitator for in-depth understanding. Adaptive learning platforms tailor content and assessments to individual needs, enabling learners to progress at their own pace while addressing gaps in understanding. This approach not only gives students a sense of ownership but also nurtures critical thinking as students grapple with challenges tailored to their developmental stage.

Also, the concept of flipped classrooms aligns seamlessly with Nigeria's diverse cultural beliefs and learning needs. In this model, traditional lecture-based learning is reimaged. Badmus's (2021) study showed that students' access to content outside the classroom, enabled in-class time to be dedicated to interactive activities, discussions, and problem-solving. The integration of EdTech democratizes access to pre-class content, making it more equitable and overcoming barriers associated with physical access to learning resources. Students are no longer passive receptors but active contributors, collaborating and engaging in higher-order thinking within the classroom's dynamic environment.

EdTech's potential extends to the creation of personalized learning pathways tailored to individual students. AI algorithms analyze students' learning patterns and preferences, suggesting content and activities that cater to their needs (Bajaj, 2018). In a country as diverse as Nigeria, where cultural backgrounds and learning styles vary widely, this approach empowers educators to cater to every student's unique requirements. By addressing the varying paces of learners and accommodating different intelligences, personalized learning bridges gaps and fosters a deeper sense of mastery and confidence.

Nigeria's cultural mosaic is mirrored in its educational landscape. EdTech dissolves geographical barriers, enabling students to collaborate across regions, cultures, and even nations. Virtual platforms facilitate real-time global interactions, broadening horizons and promoting cross-cultural understanding. Collaborative projects and peer assessments encourage teamwork, communication, and negotiation skills, equipping students to navigate an interconnected world. This approach cultivates a sense of belonging to a larger global community, transcending borders and nurturing empathy.

The Nigerian workforce of the future demands skills that transcend rote memorization. EdTech champions the cultivation of 21st-century skills, ensuring graduates are well-equipped for a world driven by innovation and technological fluency (Akinbode et al, 2020). Students engage in activities that develop critical thinking, problem-solving, and digital literacy. Collaborative projects foster communication skills and the ability to work in diverse teams. As the Fourth Industrial Revolution gathers pace, the education system equipped with EdTech serves as a foundation for creating adaptable, resilient, and globally aware citizens.

Furthermore, educators stand on the threshold of transformation. They are no longer mere disseminators of knowledge, they assume the role of facilitators, guiding students through the maze of information. EdTech equips educators with dynamic tools that adapt to diverse learning styles and needs. As guardians of the learning journey, educators shift from knowledge providers to mentors who foster critical thinking, creativity, and inquiry-based learning. Professional development initiatives empower teachers to embrace technology, ensuring a seamless blend of tradition and innovation.

EdTech empowers students as architects of their learning path. Self-regulated learning, enriched by technology, enables students to set goals, monitor progress, and reflect on their learning journey. This approach nurtures intrinsic motivation, autonomy, and metacognition, equipping students with lifelong learning skills. In a world characterized by rapid change, the ability to learn independently becomes a hallmark of success. In Nigeria's journey towards EdTech integration, ethical considerations form a critical foundation. As digital platforms become extensions of the classroom, ensuring data privacy, security, and responsible use of technology is paramount. Educators and policymakers must navigate the fine line between enabling technological advancement and safeguarding the rights and well-being of students.

TECHNOLOGICAL INFRASTRUCTURE AND ACCESS IN NIGERIA

Access to technology is a pivotal determinant of the success of educational technology (EdTech) integration in Nigeria. The country's diverse geographical landscape and varying levels of technological development have contributed to a digital divide that presents challenges and opportunities for education. Nigeria's technological landscape is characterized by disparities, with urban areas enjoying relatively better access to technology compared to rural regions. While urban centers benefit from better internet connectivity and technology resources, rural and remote schools often lack access to basic technological amenities (Sanusi et al, 2019). Outdated infrastructure, inadequate network coverage, and unreliable electricity supply further exacerbate these disparities. This digital divide manifests as a barrier that prevents some students from benefiting fully from the potential of EdTech.

Efforts to bridge the digital divide in Nigerian education encompass a multifaceted approach, necessitating robust collaboration between governmental bodies, private enterprises, and educational institutions. One of the instrumental initiatives leading this charge is the National Information Technology Development Agency (NITDA), which has taken a proactive stance in enhancing digital literacy and connectivity across underserved regions (Arikpo et al, 2009). Through targeted and impactful programs focused on comprehensive digital skills training, NITDA is dedicated to equipping both students and educators with the proficiencies needed to harness technology effectively (Yushau, 2020). This strategic endeavor not only emphasizes the acquisition of essential digital competencies but also underscores the agency's commitment to fostering a generation capable of critical thinking, problem-solving, and meaningful collaboration in an increasingly digital world.

Public-private partnerships have emerged as pivotal drivers in the ongoing efforts to bridge the digital divide. The synergistic collaborations between technology corporations and educational establishments have yielded significant outcomes, exemplified by the creation of complimentary Wi-Fi zones strategically positioned in specific regions. These accessible connectivity hubs have not only granted students the means to tap into online educational reservoirs but have also opened avenues for further research and exploration. Concomitantly, visionary programs such as the "Smart Nigeria Digital Access Plan" are charting the course towards improved broadband infrastructure diffusion in remote and previously underserved locales. This ambitious endeavor, designed to bolster connectivity foundations, holds the promise of revolutionizing accessibility and empowering technology-driven education, and enabling a more inclusive learning landscape tailored to the demands of the digital age.

Ensuring equitable access to technology in education involves addressing not only connectivity but also device availability and digital literacy. Initiatives like the Universal Basic Education Commission (UBEC)'s projects to integrate technology into primary and secondary education, including providing schools with hardware and software resources, are steps in the right direction. The Open Educational Resources (OER) movement is also commendable strides, as it democratizes learning by ushering in a world of freely accessible educational content online (Ememe, 2019). This pioneering endeavor dismantles traditional barriers to learning materials, charting a course toward a more inclusive and enlightened educational landscape.

Bridging the digital divide in Nigerian education requires sustained efforts and a holistic approach. To create a comprehensive ecosystem of equitable access, investments in expanding broadband infrastructure must be paired with digital literacy programs that empower students and educators to effectively use technology. Moreover, special attention should be given to economically disadvantaged areas and vulnerable populations to ensure that the benefits of EdTech are accessible to all.

IMPACTS OF EDUCATION TECHNOLOGY AND AI ON TEACHING AND LEARNING IN NIGERIA

The introduction of education technology (EdTech) and artificial intelligence (AI) in Nigerian schools has had significant impacts on learners and educators since its inception. The traditional image of a teacher standing at the front of a classroom, delivering lectures to passive students, is undergoing a profound transformation. Technology has elevated teachers from mere conveyors of information to orchestrators of engaging and interactive learning experiences. With the aid of educational technology, teachers can seamlessly incorporate multimedia content, virtual simulations, and online resources to augment their lessons. This shift empowers educators to design lessons that cater to diverse learning styles, fostering a deeper understanding of the subject matter and promoting active participation among all students.

The conventional paradigm of students as passive recipients of knowledge has given way to a more dynamic and participatory learning environment. The infusion of technology and AI has invigorated student engagement by providing interactive platforms that resonate with digital natives. Whether through virtual reality experiences, collaborative online projects, or interactive e-learning platforms, students are no longer constrained by the limits of traditional instruction. Instead, they navigate through a rich tapestry of multimedia content that appeals to their inherent curiosity and enables them to take ownership of their learning journey (Onyema, 2019).

One of the most remarkable impacts of this technological integration is the development of 21st-century skills. The modern world demands competencies such as critical thinking, problem-solving, communication, and digital literacy (Kitching, 2015). Technology-infused classrooms serve as incubators for nurturing these skills. Students are encouraged to think critically as they navigate complex digital landscapes, evaluate information sources, and solve real-world problems using technology-driven tools. Collaborative projects, facilitated by EdTech, cultivate effective communication and teamwork, simulating the collaborative nature of today's global workforce.

Parallel with these changes, the role of the teacher has evolved into that of a facilitator and mentor. Educators guide students through the maze of information available, helping them develop the skills to sift through vast quantities of data and discern reliable sources. Teachers encourage curiosity, guide inquiry, and foster a growth mindset that views challenges as opportunities for learning. This shift aligns with global pedagogical trends that prioritize student-centered learning and the development of lifelong learning skills.

Furthermore, the integration of AI into education has enabled educators to personalize learning experiences to cater to the individual needs and learning styles of students. AI-powered adaptive learning

platforms analyze student performance data and provide personalized content recommendations and assessments. This technology-driven personalization not only enhances learning outcomes but also encourages students to take charge of their learning journey by setting goals and tracking progress.

ETHICAL CONSIDERATIONS AND CHALLENGES

The integration of technology and artificial intelligence (AI) in Nigerian education brings with it a host of ethical considerations and potential challenges that merit careful consideration. Issues relating to privacy, data security, digital literacy, and cultural implications emerge as focal points of concern. In the area of privacy, the digital era underscores the need to safeguard sensitive student data against unauthorized access and potential misuse. The introduction of EdTech and AI necessitates a delicate equilibrium between utilizing student data to enrich learning experiences and preserving individual privacy. This balance calls for stringent data protection measures, transparent consent protocols, and clearly defined policies to ensure that student information remains confidential and is used exclusively for educational purposes.

Data security emerges as another pressing concern in the age of digital education. As students engage with online platforms, their personal and academic data could become susceptible to cyber threats (Richardson, 2020). Mitigating data breaches demands robust cybersecurity strategies, periodic audits, and the fostering of a culture that is vigilant about cybersecurity among both students and educators. Adhering to industry best practices in implementing technological solutions is instrumental in minimizing risks.

Moreover, the digital era accentuates the importance of digital literacy as technology and AI take center stage in education. The integration of EdTech and AI necessitates that both students and educators possess the capacity to navigate digital platforms discerningly, responsibly, and ethically. Empowering these cohorts with the skills to distinguish credible sources, comprehend the implications of algorithms, and interpret data results is vital to fostering a technologically adept educational community.

Cultural implications also loom as a multifaceted challenge. Given Nigeria's rich cultural diversity, considerations arise as to how technology-led education aligns with various cultural norms, values, and beliefs. Striving for cultural sensitivity entails making the benefits of EdTech and AI universally accessible across cultural backgrounds, with technology not inadvertently sidelining any group. In this pursuit, digital resources and platforms should be designed inclusively, allowing students to engage with content that resonates with their identities.

Furthermore, the integration of technology and AI in Nigerian education intersects with economic disparities. While EdTech holds the promise of narrowing educational gaps, the digital divide could inadvertently exacerbate existing socio-economic inequalities. Addressing this challenge mandates targeted interventions to ensure that underprivileged communities have equitable access to technology and digital resources essential for effective learning. Collaborative efforts between government entities, private enterprises, and educational institutions are paramount in addressing this issue.

CONCLUSION

The integration of educational technology (EdTech) in Nigerian education has brought about a transformative shift in teaching and learning paradigms. This study analyzed the multifaceted impact of EdTech, demonstrating its potential to revolutionize education in Nigeria. The integration of technology has enabled personalized learning experiences that cater to diverse learning needs, building essential 21st-century skills for success in the digital era. Educators have evolved from knowledge providers to facilitators, guiding students through interactive and collaborative learning journeys. The evolution of pedagogical approaches, the challenges of technological infrastructure and access, and the ethical considerations surrounding data privacy and digital literacy have been critically examined. This study

underscores the importance of bridging the digital divide and ensuring equitable access to technology for all students. As Nigeria stands at the crossroads of tradition and innovation, embracing technology while preserving cultural values, ethical considerations, and inclusivity will be crucial. The fusion of education technology and AI offers a promising future that equips students with the skills and mindset needed to thrive in a dynamically evolving global landscape. Through strategic collaborations, investments, and a commitment to holistic education, Nigeria has the potential to harness the full potential of EdTech and AI to prepare its citizens for the challenges and opportunities of the digital age.

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