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Revolutionizing Teachers Education through Technology in Nigerian Colleges of Education: Challenges and Way Forward

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Abstract

The integration of technology into teacher education in Nigerian Colleges of Education has the potential to transform the landscape of pedagogical training, yet it is not without its challenges. As educational institutions strive to incorporate digital tools and innovative methodologies, they often encounter obstacles such as inadequate infrastructure, resistance to change among schools, and the need for comprehensive training programmes. It was against this background that the study explored revolutionizing teacher education through technology in Nigerian Colleges of Education: Challenges and Way forward. The study highlighted challenges that can hinder the effective implementation of technology in teacher education in Nigerian Colleges of Education leading to inadequate funding, insufficient infrastructure and lack of quality of training. The study suggested that government and administration of teacher preparation programmes should provide sufficient funding to acquire the necessary instructional facilities by educational institutions in both number and quality and it was essential to develop strategic framework that prioritise the professional development of teachers in the use of technology. This includes not only equipping teachers with the necessary technical skills but also fostering a mindset that embraces innovation and lifelong learning, collaborative partnership between educational institutions and technology organisations to facilitate the creation of tailored resources training programmes that meet the specific needs of teachers and incorporating feedback for teachers into the design of technological tools which can ensure that resources are user-friendly and effective in enhancing teaching practices.

Keyword: Revolutionising, Teacher education, technology, colleges of education, challenges

Introduction

The swift progression of technology has significantly altered nearly every facet of human existence, including the field of education. Worldwide, digital technologies have transformed teaching and learning by enhancing access to educational materials, improving instructional

delivery, and promoting innovative teaching methods. In the realm of teacher education, technology is essential in preparing future educators with the knowledge, digital skills, and instructional capabilities necessary to address the requirements of twenty-first-century classrooms. As educational systems increasingly adopt digital transformation, institutions responsible for training teachers must modify their curricula, teaching strategies, and learning environments to ensure that graduates can effectively incorporate technology into classroom instruction(Global Education Monitoring Report Team, 2023; UNESCO, 2018).

In Nigeria, Colleges of Education are the primary institutions tasked with training qualified teachers for the country's basic education sector. These institutions are expected to produce skilled, innovative, and technologically adept educators who can contribute to national development and enhance learning outcomes. However, despite the growing acknowledgment of technology as a vital element of teacher education, numerous Nigerian Colleges of Education continue to encounter significant obstacles to its effective integration. Challenges such as inadequate technological infrastructure, unreliable electricity supply, limited internet access, insufficient funding, low digital literacy among teacher educators and students, resistance to change, and inconsistent policy implementation have impeded the achievement of technology-driven teacher education(UNESCO-UNEVOC, 2022).

The urgency to transform teacher education through technology has intensified in light of global educational disruptions, particularly the COVID-19 pandemic, which revealed the shortcomings of traditional teaching methods and underscored the significance of digital learning platforms. Integrating educational technologies into teacher preparation programmes not only enhances teaching effectiveness but also promotes collaborative learning, critical thinking, creativity, and lifelong learning skills among future teachers(Global Education Monitoring Report Team, 2023; UNESCO, 2018).This paper examines the role of technology in transforming teacher education in Nigerian Colleges of Education by exploring the major challenges affecting its implementation and identifying practical strategies for overcoming these obstacles. It proposes sustainable approaches, including increased investment in digital infrastructure, continuous professional development for teacher educators, supportive government policies, curriculum reforms, and stronger institutional partnerships, as pathways toward creating a technologically responsive teacher education system capable of meeting contemporary educational needs and contributing to national development.

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Teacher Education in Nigeria

Teacher education in Nigeria centres around the quality of education imparted to the citizenry and its relevance to individual in particular and the country at large. This is why attention is increasingly focused on the quality of existing teachers while emphasis is also laid on potential teachers. This is so because nothing can be as important to learning as the quality of inputs provided by the government and other stakeholders. The importance of Colleges of Education (formerly known as Advanced Teachers' Training College) in nation building cannot be over emphasised due to the fact that these institutions are saddled with the responsibility of producing qualified and competent teachers for basic schools in Nigeria(National Commission for Colleges of Education [NCCE], 2020).

The concept of teacher education in Nigeria encompasses a multifaceted approach aimed at equipping teachers with the necessary skills, knowledge, and competencies to effectively facilitate learning in diverse classroom environments. This educational framework is rooted in the recognition of teachers as pivotal agents of change within the society, tasked with not only imparting knowledge but also fostering critical, and moral values among students (Olugbenro & Olurotimi, 2023). The Nigerian government, through various policies and initiatives, has sought to enhance the quality of teacher education by establishing standards that align with global best practices, thereby ensuring that teachers are adequately prepared to meet the challenges of modern education (Sinclair, 2018).

In Nigeria, teacher education is primarily delivered through a combination of colleges of education, and specialized training institutions. These entities offer a range of programmes, from diploma courses to degree programmes, aimed at developing both pre-service and in-service teachers (Sholadoye, 2020). The curriculum is designed to cover essential areas such as pedagogy, subject matter expertise, and classroom management, while also incorporating practical teaching experiences through internships and teaching practice. This comprehensive approach is intended to bridge the gap between theoretical knowledge and practical application, ensuring that teachers are not only knowledgeable but also capable of implementing effective teaching strategies in their classrooms (Udim et al., 2018).

According to Ogar & Aniefiok (2021), teacher education prepares educators to meet the changing demands of the profession and the needs of their communities. Both pre-service and

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in-service training (sometimes called "on-the-job" training) are considered part of this category. Therefore, teacher preparation stands out among the many facets of official and informal education systems. It is impossible to overstate the value of exemplary educators and quality teacher preparation. No nation's educational system can excel beyond the caliber of its educators, as stated in Nigeria's National Policy on Education (FRN, 2014) by (Yaro, 2022). Teaching refers to the fundamental activities that educators must carry out to facilitate student learning. These include both in-class and extracurricular activities like facilitating discussions about problems and their solutions, checking students' answers, going over material for a science test, observing and rating students' oral reading, offering an explanation of a poem's interpretation, interacting with parents, reviewing student papers, organizing, and establishing and upholding a clean, safe, and encouraging learning environment.

The goals of teacher education in Nigeria are:

i) Produce highly motivated, conscientious, and efficient classroom teachers for all levels of our educational system;

ii) Encourage further the spirit of inquiry and creativity in teachers;

iii) Facilitate teachers' integration into community and societal life and strengthen their dedication to national goals;

iv) To give educators intellectual and professional foundations appropriate for their work and to enable them to adjust to any changing circumstances, both domestically and internationally;

v) To strengthen educators' dedication to the teaching profession; and

vi) To develop skilled and competent educators who motivate students to learn.

Integration of technology in Nigerian Colleges of Education

Technology education in Nigeria aims to equip learners with practical skills, digital literacy, and scientific knowledge to drive innovation, self-reliance, and national development. It focuses on building infrastructure, teacher capacity, equitable access, and preparing students for effective participation in the modern workforce.

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The integration of technology in Nigerian Colleges of Education has become a pivotal aspect of modernizing the educational landscape. As these institutions strive to enhance the quality of teacher training, the incorporation of digital tools and resources is essential. This shift not only facilitates access to a wealth of information but also promotes interactive learning environments that engage students more effectively. By utilising technology, teachers can implement innovative teaching methods that cater to diverse learning style, thereby improving student outcomes and preparing future teachers for the demands of a rapidly evolving educational system (Caladine, 2018).

The adoption of technology in these Colleges is instrumental in bridging the gap between theoretical knowledge and practical application. Through the use of stimulation software, online platforms, and educational apps, students can gain hands-on experience that is crucial for their professional development. This practical exposure is particularly important in fields such as sciences and mathematics, where technology can enhance understanding through visualisations and real-time data analysis. Additionally, the ability to collaborate with peers and teachers across different regions through digital communication tools fosters a sense of community and shared learning, which is vital for the growth of aspiring teachers (Smart, 2020).

The successful implementation of technology in Nigerian Colleges of Education is not without its challenges. Issues such as inadequate infrastructure, limited access to reliable internet, and a lack of training for teachers can hinder the effective use of technological resources. To overcome these obstacles, it is essential for stakeholders, including government bodies, educational institutions, and private sector partners, to invest in the necessary infrastructure and professional development programmes. By addressing these challenges, Nigerian Colleges of Education can fully harness the potential of technology, ultimately leading to a more effective and responsive teacher training system that meets the needs of the 21st century (Udim et al., 2018)

Challenges Confronting Teachers' Education through Technology in Nigerian Colleges of Education

i. **Insufficient Funding**

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One of the biggest obstacles to the successful incorporation of technology into teacher preparation programs in Nigerian colleges of education is a lack of money. Sustained investment in digital infrastructure, such as computers, multimedia labs, high-speed internet access, learning management systems, software licenses, interactive whiteboards, and dependable energy, is necessary for technology-driven teacher education. However, many Colleges of Education find it challenging to purchase, maintain, and improve these facilities due to Nigeria's continued lack of funding for education (Federal Republic of Nigeria [FRN], 2014; UNESCO, 2023).

The majority of public colleges of education rely mostly on government funding, which is frequently insufficient to meet their operational and developmental demands. As a result, many institutions use antiquated computer labs, insufficient and inadequate internet bandwidth, obsolete instructional technologies, and poorly equipped digital libraries. The shortage of financial resources also limits investments in maintenance, resulting in frequent breakdowns of ICT facilities and underutilization of available technologies.

Inadequate financial resources have a major impact on the availability and use of ICT facilities for teaching and learning, according to empirical data from Nigerian teacher education schools. Due in large part to insufficient finance and subpar infrastructure, Karofi (2024) noted that many colleges of education in Northeastern Nigeria lacked the technological readiness necessary for the successful integration of smart technology. Similar to this, Adebimpe (2025) contended that Nigeria's economic difficulties have had a detrimental impact on educational technology investments, which has limited the efficacy of technology integration in teacher education programs. These results imply that significant technological change in teacher education will be challenging to accomplish unless government financing is significantly boosted and supplemented by collaborations with the commercial sector, donor organizations, and alumni associations.

ii. Ineffective Implementation of Teacher Education Programme

Nigeria has created a number of educational policies, such as the National Policy on Education and the Minimum Standards for Colleges of Education, to encourage ICT integration and enhance teacher preparation. Inadequate planning, poor coordination, insufficient monitoring, limited institutional capacity, and inconsistent political commitment

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all contribute to the deficient execution of these policy measures (FRN, 2014; National Commission for Colleges of Education,2020).

The gap between institutional realities and policy provisions is one of the main implementation challenges. Despite the inclusion of ICT courses in teacher preparation programs, instruction in many colleges of education is still primarily theoretical due to a lack of resources for hands-on learning.

As a result, a large number of pre-service teachers graduate with little experience using digital tools in the classroom. This diminishes their trust in utilizing educational tools in classrooms and makes them less equipped for learning situations that are heavily reliant on technology.

Another concern is the inconsistent application of technology policies among institutions. While some colleges of education have embraced digital assessment tools, virtual classrooms, and learning management systems, many still primarily rely on traditional face-to-face teaching techniques. These gaps are largely caused by institutional variances in personnel capacity, infrastructure, money, and leadership.

Technology integration is impacted by institutional support, technological expertise, and organizational preparedness, according to research done among Nigerian teacher educators. The degree of ICT integration in teacher education programs is largely determined by teachers' technological expertise and institutional circumstances, according to research by Tondeur and colleagues. This suggests that policy implementation should go beyond curriculum design to include institutional capacity building and ongoing support for teacher educators (Tondeur et al., 2020).

Moreover, execution is weakened by insufficient oversight and quality control systems. It is challenging to determine whether Colleges of Education successfully adopt technology-enhanced teaching methods or adhere to national ICT standards because monitoring and assessment procedures are frequently erratic.

Effective implementation therefore requires stronger institutional leadership, adequate funding, periodic curriculum review, robust monitoring systems, and greater collaboration among government agencies, regulatory bodies, and teacher education institutions.

iii. Inadequate Training

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The effective incorporation of technology into teacher education is significantly influenced by the digital proficiency of teacher educators. Regrettably, insufficient professional training continues to pose a significant obstacle in Nigerian Colleges of Education. Numerous lecturers have a restricted understanding of new educational technologies and have not undergone adequate training in technology-enhanced teaching methods, leading to a persistent dependence on conventional lecture techniques.

Integrating technology involves more than just the ability to use computers; it necessitates that educators merge their technological expertise with pedagogical and content knowledge in ways that enhance teaching effectiveness. Nevertheless, the availability of ongoing professional development in ICT is constrained in many Colleges of Education due to inadequate funding, lack of institutional support, and limited access to specialized training programs.

A comprehensive study involving Nigerian teacher educators revealed that the most significant factors predicting effective technology integration are technological knowledge and teachers' proficiency in incorporating ICT into their teaching methods. The findings indicated that ongoing professional development is crucial for enhancing teachers' confidence, digital skills, and the application of educational technologies in the classroom (Tondeur et al., 2020).

Recent research conducted in Nigeria has yielded comparable results. Karofi (2024) noted that the lack of digital literacy among lecturers severely hinders the implementation of smart technologies in Colleges of Education, while Adebimpe (2025) pointed out that insufficient ICT training is a major obstacle to technology-enhanced teacher education.This issue also impacts pre-service teachers, many of whom are exposed to only basic computer literacy training with few chances to engage in technology-enhanced lesson planning, online assessments, virtual collaboration, or the utilization of digital instructional materials. As a result, graduates frequently enter the teaching field lacking the necessary skills for modern classrooms.

To tackle this issue, Colleges of Education should establish regular professional development initiatives, which may include workshops, certification programs, mentoring, webinars, and collaborative learning communities. Collaborations with technology firms, universities, and

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international organizations can further enhance the ongoing development of digital skills among teacher educators and student teachers. UNESCO (2023) also highlights that effective technology integration relies not only on access to digital tools but also on continuous investment in building teacher capacity and professional development.

Ways Forward for Revolutionising Teacher Education Through Technology in Nigerian Colleges of Education

The successful integration of technology into teacher education in Nigerian Colleges of Education requires a comprehensive and collaborative approach involving government, institutional administrators, regulatory agencies, development partners, and the private sector. The following strategies can help address the identified challenges.

i. Enhanced Funding and Investment in ICT Infrastructure

Sufficient funding is crucial for the effective integration of technology into teacher education. The Federal Government, state authorities, and institutional management should augment budget allocations to Colleges of Education to facilitate the acquisition of contemporary ICT resources, such as computers, smart classrooms, multimedia labs, dependable internet services, digital libraries, and learning management systems. Continuous funding must also be allocated for the upkeep and enhancement of technological infrastructure to guarantee its sustainability.

Moreover, Colleges of Education should broaden their funding avenues by forming partnerships with private entities, alumni groups, international development organizations, and technology firms through Public-Private Partnerships (PPPs). These collaborations can offer financial assistance, equipment contributions, technical know-how, and opportunities for capacity building (UNESCO, 2023).

ii. Enhancing Policy Implementation and Institutional Leadership

Current policies regarding ICT integration and teacher education should be executed with greater efficacy. Government bodies, such as the National Commission for Colleges of Education (NCCE), should bolster monitoring, supervision, and quality assurance processes to ensure that Colleges of Education adhere to national standards for technology integration.

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Continuous professional development enables lecturers to remain current with technological innovations and increases their confidence in integrating ICT into classroom instruction. According to Tondeur et al. (2020), teachers' technological knowledge and pedagogical competence are among the strongest predictors of successful technology integration in education.

iii. Enhancement of ICT Infrastructure and Internet Connectivity

A dependable ICT infrastructure is crucial for the advancement of technology-driven teacher education. Educational institutions should allocate resources towards high-speed broadband internet, state-of-the-art computer labs, comprehensive campus wireless networks, multimedia teaching resources, and cloud-based educational platforms. Furthermore, it is imperative to ensure a consistent power supply through alternative energy solutions such as solar energy systems, inverters, and backup generators to reduce interruptions during educational activities.

The government should also partner with telecommunications providers to offer cost-effective broadband services to educational institutions, educators, and students. Enhanced internet connectivity will support online learning, virtual collaboration, digital research, and access to worldwide educational resources (UNESCO, 2023).

iv. Curriculum Reform and Integration of Digital Skills

The curricula for teacher education must be updated to include digital literacy, educational technology, artificial intelligence, data literacy, online teaching methods, digital content creation, cybersecurity awareness, and technology-enhanced assessment. Instead of confining ICT training to separate computer courses, digital skills should be woven into all subject areas, enabling pre-service teachers to gain hands-on experience in utilizing technology for teaching various subjects.

Curriculum reform should also encourage learner-centered teaching methods, project-based learning, collaborative learning, and problem-solving tasks that foster effective technology integration in classroom practices (OECD, 2023).

v. Enhancing Collaboration and Partnerships

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Partnerships between Colleges of Education, universities, technology firms, professional associations, non-governmental organizations, and international agencies should be reinforced to promote knowledge exchange and resource sharing. Collaborative efforts can aid in staff development, curriculum innovation, educational research, technology transfer, and the creation of innovation hubs within Colleges of Education.

International organizations such as UNESCO and UNICEF can offer technical support and capacity-building programs to enhance digital transformation in teacher education.

vi. Advancing Digital Literacy Among Pre-service Teachers

Digital competence ought to be established as a fundamental graduate attribute for all student teachers. Colleges of Education should offer practical experiences for pre-service teachers to engage with educational technologies during teaching practice, lesson planning, classroom simulations, digital content creation, online assessments, and collaborative learning activities.

Ensuring that students have ongoing access to digital learning platforms and educational software will boost their confidence and equip them to effectively incorporate technology into their future classrooms.

vii. Ongoing Monitoring, Evaluation, and Research

Regular monitoring and evaluation are essential to gauge the effectiveness of technology integration initiatives. Institutions should define clear performance indicators to measure ICT utilization, digital competence, student learning outcomes, and institutional readiness.

Moreover, Colleges of Education should promote research on educational technology to identify emerging challenges, assess intervention strategies, and produce evidence-based recommendations for policy and practice. Research outcomes should guide institutional decision-making and inform future investments in educational technology.

Conclusion

The integration of technology in teacher education within Nigerian Colleges of Education presents a transformative opportunity to enhance pedagogical practices and improve educational outcomes. As the global landscape shifts towards digital learning environments,

it becomes imperative for these institutions to embrace innovative technological tools that can facilitate interactive learning and foster critical thinking among future teachers. However, the implementation of such technologies is not without its challenges. Issues such as inadequate funding, insufficient infrastructure, lack of qualified training, inadequate infrastructure, limited access to reliable internet, and insufficient training for teacher on the effective use of digital resources hinder the potential benefits that technology can offer in teacher education. The cultural and institutional resistance to change poses significant barriers to the successful integration of technology in Nigerian Colleges of Education. Many teachers may be accustomed to traditional teaching methods and may lack the motivation or skills to adapt to new technological approaches. This resistance can be exacerbated by a lack of institutional support and resources, which are essentially fostering an environment conducive to technological adoption. To overcome these challenges, it is crucial for stakeholders, including government bodies, educational institutions, and private sector partners, to collaborate in developing comprehensive strategies that address both the infrastructural and pedagogical needs of teacher education programmes.

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