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ZUBA INTERNATIONAL JOURNAL OF ARTS AND SOCIAL SCIENCES (ZUASS) is a peer-reviewed publication dedicated to advancing scholary discourse and research in the fields of Arts, Humanities and Social Sciences. It provides a platform for academic, educators and researchers to share innovative-ideas, empirical findings and theoretical perspectives that contribute to knowledge development and national transformation.

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Editorial

Social sciences have always been the cornerstone of understanding society, governance, and human interaction. Yet, in the 21st century, the methods of teaching these vital subjects must evolve to reflect the world our students inhabit. The traditional model of lecture, textbook, and test is no longer adequate to prepare students for the complexities of a globally connected, digitally driven age. The integration of digital technology is no longer a luxury but a fundamental necessity for effective social sciences education. The application of these technologies transforms the classroom from a passive listening post into a dynamic laboratory for inquiry. Consider the stark difference between reading about ancient Egypt and virtually exploring a 3D reconstruction of the Giza plateau. Imagine the deeper understanding gained from using data visualization software to track global migration patterns in real-time, rather than just viewing a static map in a book. These tools do more than engage; they make abstract concepts tangible. Students are no longer mere recipients of historical facts or economic theories; they become active participants, historians analysing digital archives, geographers interpreting GIS data, and economists modelling policy outcomes.

Furthermore, in an era defined by information overload and the rampant spread of misinformation, the social sciences classroom has a new, critical mandate: to foster digital literacy and critical thinking. Digital tools provide the perfect platform for this essential task. Educators can use current events, social media trends, and online news sources as primary texts for lessons on source verification, bias detection, and persuasive rhetoric. By learning to deconstruct a viral political video or analyse the data behind a news graphic, students develop the scepticism and analytical skills required to be informed and responsible citizens.

Of course, this digital integration is not without its challenges. The digital divide, concerns over screen time, and the need for effective teacher training are real hurdles that must be addressed. The goal is not to replace foundational knowledge or the invaluable role of the teacher, but to enhance them. The most effective approach is purposeful integration, using technology not for its own sake, but to serve specific learning objectives. The teacher remains the guide, curating resources and facilitating learning, while technology acts as the powerful tool that unlocks deeper exploration.

The thoughtful application of digital technologies in social sciences education is pivotal for creating a generation of engaged, critical, and empathetic citizens. It moves learning beyond rote memorization and into the realm of authentic experience and analysis. As educators, our responsibility is to provide our students with the compass they need to navigate the past, understand the present, and shape the future. That compass, today, is undoubtedly digital.

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REIMAGINING EDUCATION – HARNESSING EMERGING TECHNOLOGIES TO PREPARE LEARNERS FOR THE FUTURE

Professor Samuel Ndueso John
Nigerian Defence Academy, Kaduna.

Introduction: The Urgency of Future-Proof Education

Education has always been the foundation of progress, but today, it faces an unprecedented challenge: how to prepare learners for a future we can barely predict. The rapid advancement of automation, artificial intelligence, and digital transformation is reshaping industries, disrupting traditional career paths, and redefining the skills required to succeed. If our education systems do not evolve to meet these new realities, we risk leaving generations of students ill-equipped for the demands of tomorrow's workforce. This paper argues that emerging technologies, when strategically integrated into education, can future-proof learning by fostering adaptability, inclusivity, and lifelong skill development. Future-proof education means creating a learning environment that remains relevant despite rapid technological advancements. It involves shifting away from rigid, one-size-fits-all models designed for the industrial age and embracing dynamic, technology-enhanced approaches that cultivate critical thinking, creativity, and problem-solving skills.

The urgency of this transformation is undeniable. According to the World Economic Forum (Higgins, 2013), 65% of children entering primary school today will work in jobs that do not yet exist. Meanwhile, (Manyika et al., 2017) estimates that by 2030, up to 375 million workers globally may need to switch careers due to automation. This signals a fundamental shift in the nature of work and traditional education systems, with heavy emphasis on memorization and standardized testing is not preparing students for this shift adequately (Oyeronke & Adeoye, 2024). Imagine a world where students are no longer just passive recipients of information but active problem-solvers, innovators, and lifelong learners. This is the promise of future-proof education. By leveraging artificial intelligence, virtual reality, adaptive learning platforms, and data-driven teaching methods, as shown in Figure 1, personalized learning experiences that equip students with the ability to think critically, adapt quickly, and continuously acquire new skills, essential for success in an era of constant change, can be created. The question we must ask ourselves is no longer whether education should evolve, but how we can harness these emerging technologies effectively to ensure that no learner is left behind. The future is not something we should fear, it is something we must prepare for. And that preparation starts with reimagining education today.

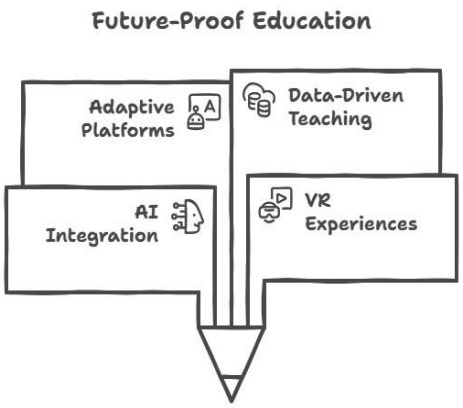

Figure 1: Future-Proof Education.

THE SHIFTING LANDSCAPE OF EDUCATION AND WORKFORCE DEVELOPMENT

Education has historically focused on the acquisition of knowledge, but in today's fast-evolving world, knowledge alone is no longer sufficient. The rise of automation, artificial intelligence (AI), and digital transformation has fundamentally altered the demands of the workforce, requiring individuals to cultivate skills that machines cannot easily replicate, such as emotional intelligence, complex

problem-solving, creativity, and adaptability (Paudel, 2024). Furthermore, digital literacy is no longer optional. As workplaces become increasingly digitized, proficiency in technology, coding, data analysis, and cybersecurity has become essential for workforce success (OECD, 2022). These shifts necessitate a transformation in education, one that moves beyond traditional rote learning to foster critical thinking, problem-solving, and real-world application of knowledge.

This evolution is occurring on a global scale, but the impact varies significantly across regions. The Global North, with its advanced infrastructure and technological ecosystems, is rapidly integrating STEM education, artificial intelligence, and data-driven learning methodologies. In contrast, many parts of the Global South face challenges such as limited access to digital infrastructure, outdated curricula, and gaps in teacher training, leading to disparities in digital readiness and employment opportunities. This global outlook on tech-driven education is summarized in Figure 2. Addressing this divide is critical to ensuring that all learners, regardless of geography, are prepared for the future of work.

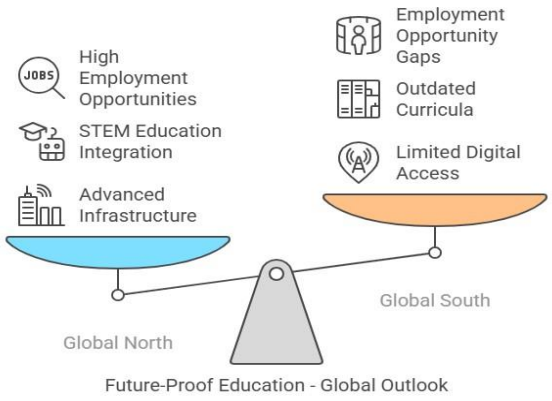

Figure 2: The Global Outlook on Tech-driven Future-Proof Education

This transformation aligns with Sustainable Development Goal 4 (SDG 4), which emphasizes inclusive and equitable quality education. Future-proofing education on a global scale requires not only increasing access to education but also ensuring that learners acquire skills that match the demands of a rapidly changing workforce. Governments, educational institutions, and privatesector leaders must work collaboratively to create flexible, technology-driven, and skills-based learning ecosystems that empower individuals worldwide.

The Rise of the Gig Economy and Its Impact on Skills Demand

The traditional model of lifelong employment with a single company is fading, giving rise to a gig economy that prioritizes freelance work, short-term contracts, and remote employment. This shift is driven by advancements in digital platforms, automation, and decentralized work structures, allowing professionals to work across industries, geographies, and time zones. The shift in the global employment landscape is shown in Figure 3.

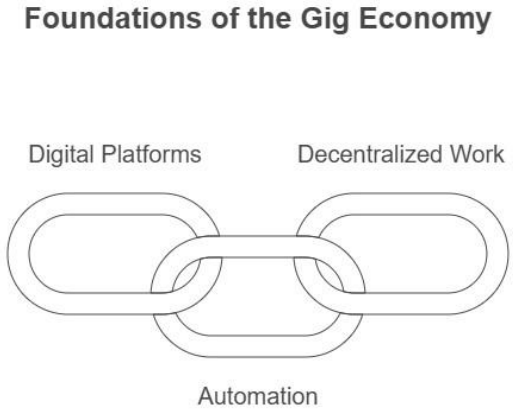

Figure 3: Drivers of the Shift in the Global Employment Landscape

According to the World Economic Forum (E. Team, 2025), by 2025, nearly 50% of all employees will require reskilling due to technological advancements. The gig economy is growing rapidly in both developed and developing economies, offering employment opportunities in technology, creative services, finance, and digital marketing.

However, this transition poses challenges: gig workers must continuously upskill to remain competitive, often without the formal support of traditional employers. The solution lies in lifelong learning models, micro-credentialing, and competency-based education, which equip individuals with the flexibility to adapt to

shifting job markets. Developed economies have already started integrating gig-friendly education models, where universities and institutions offer short-term certifications, online learning, and AI-driven personalized skill development. Meanwhile, in emerging economies, the focus must be on bridging the digital divide to ensure that gig workers have access to reliable technology, digital literacy programs, and financial security structures.

From Degrees to Competencies: The Global Credentialing Shift

Employers worldwide are increasingly prioritizing skills and competencies over traditional degrees. While formal education remains valuable, companies are now seeking candidates with practical experience, technical skills, and problem-solving abilities rather than just academic qualifications. Tech companies such as Google, IBM, and Tesla have begun hiring based on demonstrated competencies, bypassing traditional degree requirements in favor of portfolio-based assessments, coding boot camps, and professional certifications.

Massive Open Online Courses (MOOCs) and alternative credentialing platforms like Coursera, edX, and LinkedIn Learning are democratizing access to career-aligned education, providing learners with affordable, flexible, and industry-relevant training. This shift has significant implications for the Global North and South: In high-income nations, universities are redesigning programs to offer more competency-based learning, industry partnerships, and experiential education. This shift in credentialing and skilling to support the Gig economy is shown in Figure 4.

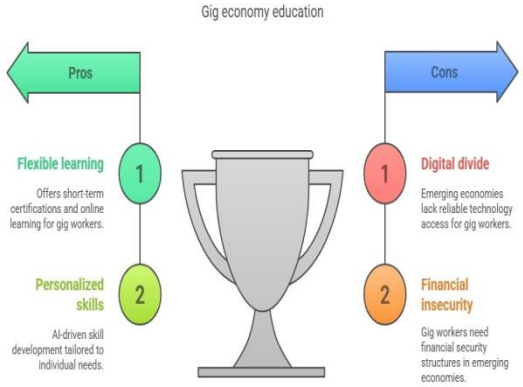

Figure 4: Future-proof Education and the Gig Economy.

In lower-income countries, where degree-based education has long been the standard for upward mobility, there is a growing need to align educational offerings with evolving workforce demands, ensuring that learners gain skills that are recognized and valued in global job markets. To keep pace with this transformation, governments and academic institutions must rethink credentialing systems, incorporating micro-certifications, digital badges, and blockchain-based verification methods to create a more inclusive and skill-oriented education ecosystem. The shift in credentialing and proof-of-skill in the future-proof education paradigm is shown in Figure 5.

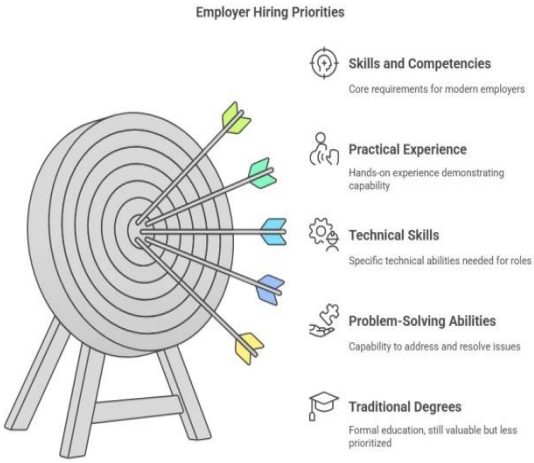

Figure 5: Credentialing and Proof-of-Skill in a Future-Proof Education Setting

Looking Ahead: The Role of Emerging Technologies in Education

The future of education is being shaped by emerging technologies, including AI-powered learning platforms, virtual reality (VR) simulations, blockchain for credential verification, and data-driven personalized education. These innovations have the potential to bridge global skill gaps, enhance accessibility, and provide scalable learning solutions that cater to diverse populations.

The question before us is no longer whether education must evolve, but how we can implement these changes effectively to ensure a more inclusive, adaptable, and future-ready global workforce. As we move forward, policymakers, educators, and industry leaders must collaborate to create dynamic, skill-driven, and technology-enabled learning ecosystems that empower learners everywhere.

Key Emerging Technologies Reshaping Skills Development

The future of education is being shaped by rapid technological advancements that are redefining the skills learners need to succeed in an evolving global economy. As automation, artificial intelligence (AI), and digital transformation accelerate, education must go beyond traditional models and embrace innovative, tech-driven approaches to equip students with future-proof competencies. Several emerging technologies are revolutionizing skills development, ensuring that learners gain practical, adaptable, and in-demand expertise

1. Artificial Intelligence (AI) & Machine Learning

AI-driven platforms personalize learning by adapting content to individual learners' needs. Intelligent tutoring systems, such as Carnegie Learning and Squirrel AI, provide targeted support, while AI-powered grading tools automate assessments, freeing educators to focus on mentorship and higher-order instruction (Adaji, 2024).

a. AI-driven tutoring systems adapt to individual learning styles, ensuring that students' progress at their own pace.
b. Automated grading and analytics help educators identify gaps in understanding, allowing for more targeted interventions.
c. AI can also predict skill trends, guiding students toward careers that match future workforce needs.

One of AI's most celebrated contributions to education is its capacity to personalize learning. Adaptive platforms like Carnegie Learning and DreamBox use ML algorithms to analyze student responses in real time and adjust content difficulty accordingly. Studies such as (Strielkowski et al., 2024), funded by RAND Corporation, found that students in personalized learning environments supported by AI performed better in math and reading compared to their peers in traditional settings. The research highlighted gains particularly for students who started below grade level, suggesting AI can help narrow achievement gaps.

However, personalization is not without critique. (Selwyn, 2015) warns that the "black box" nature of many AI-driven systems can mask educational decision-making, limiting teacher agency and potentially oversimplifying complex cognitive and social learning processes. For instance, if an AI system misinterprets a student's disengagement as lack of ability rather than external stressors, it may adjust learning paths incorrectly, resulting in unintended learning trajectories.

Figure 6 : AI-enabled classrooms (STEMpedia, 2023)

2. Virtual Reality (VR) & Augmented Reality (AR)

Immersive technologies are transforming how students engage with content. These immersive technologies enable experiential learning that was previously unimaginable. VR can transport students to historical sites or simulate surgical procedures, enhancing retention and engagement. AR overlays digital content onto physical environments, making abstract concepts tangible (Adeyeye, 2024).

VR and AR allow learners to interact with complex environments in a safe, controlled manner. For instance, biology students can explore the human body at a cellular level using VR simulations, while history students can walk through ancient civilizations reconstructed in AR. A 2020 metaanalysis by Hamilton et al. found that immersive learning environments improve knowledge retention and learner motivation, especially when content is visually complex or spatially oriented.

A notable case study is the use of *zSpace* in K-12 science classrooms across the U.S. This VR/AR platform enables students to dissect virtual frogs, manipulate molecules, or simulate physics experiments. According to (Mayer et al., 2022), students using VR for science instruction showed better conceptual understanding than those using textbook-based learning, primarily due to increased cognitive engagement and multisensory immersion

Figure 7 : students using virtual reality (VR) headsets in classroom, playing game about waste collection and waste sorting at the Mcedo Beijing School in Mathare neighborhood in Nairobi, Kenya (VOA, 2023)

a. VR enables students to step inside history, explore the human body in 3D, or conduct virtual chemistry experiments—without the risks of a real lab.
b. AR overlays digital information onto the physical world, enhancing interactive learning.
c. Industries like medicine, engineering, and aviation are already using VR for hands-on training, making it a game-changer in preparing students for complex, technical careers.

3. Blockchain & Digital Credentials

Blockchain technology is redefining credentialing by providing secure, verifiable, and portable records of academic and professional achievements. Initiatives like MIT's Digital Diplomas empower learners with lifelong, tamper-proof certification, fostering trust between employers and educational institutions (Grech & Camilleri, 2017). In an era where credentials must be portable, blockchain technology is redefining academic certification.

One of the biggest barriers to large-scale adoption is the lack of international standards and interoperability across platforms. Multiple blockchain solutions such as Blockcerts, Learning Machine, and Sony Global Education

use different architectures, making integration difficult. Without a unified framework, digital credentials risk becoming fragmented and less meaningful.

a. Blockchain-based learning records provide a secure, verifiable way to track lifelong learning.
b. Micro-credentials and digital badges allow learners to showcase specific skills, making traditional degrees less of a gatekeeper to employment.
c. This decentralized approach fosters continuous learning, enabling individuals to upskill and reskill flexibly throughout their careers.

While blockchain can enhance data integrity, it also raises privacy questions. Credentials stored on a public blockchain may expose sensitive personal information if not properly encrypted or permissioned. Furthermore, the immutability of blockchain poses a dilemma, what happens when a user wants a credential removed or updated?

4. Gamification and Edutainment

Engagement is key to effective learning, and gamification leverages human psychology to enhance motivation. Educational games and interactive simulations engage learners and improve motivation. Platforms such as Kahoot!, Duolingo, and Minecraft Education Edition leverage gamification principles to enhance retention and skill-building (Reprint & Hou, 2023).

a. Serious games and simulations allow students to tackle real-world problems in a risk-free, interactive environment.
b. Game mechanics, such as leaderboards and rewards, incentivize learning, making education both engaging and effective.
c. This approach has proven particularly successful in STEM education, helping learners develop computational thinking and problem-solving skills.

Gamification and edutainment have great potential to make learning more engaging, personalized, and impactful. When thoughtfully implemented, they promote motivation, knowledge retention, and collaborative learning. However, to maximize their impact, educators must ensure that game elements are pedagogically sound, inclusive, and aligned with long-term learning goals. Sustainable integration also requires professional training, infrastructure support, and ongoing evaluation to avoid cognitive overload or superficial engagement.

5. Robotics, Coding, and Automation in Education

As automation reshapes industries, coding and robotics are becoming essential skills for future careers. As automation reshapes industries, programming and robotics have become essential skills. Early exposure to coding through platforms like Scratch and Python-based curricula fosters computational thinking and problem-solving abilities (Wohl et al., 2017).

a. Introducing programming languages at an early age cultivates logical thinking and problem-solving abilities.
b. Hands-on robotics programs teach students about automation, AI, and engineering.
c. Cross-disciplinary applications of automation in healthcare, finance, and agriculture demonstrate that computational thinking is valuable beyond the tech industry.

Figure 8: School learners engage with robotics as part of the Department of Basic Education's

coding and robotics curriculum pilot (Sibahle Malinga, 2023).

Robotics and coding are more than technical subjects; they are vehicles for cultivating 21st-century competencies. When integrated effectively, they deepen STEM engagement, support diverse learners, and prepare students for a rapidly evolving job market. However, to realize this potential, education systems must address teacher training, ensure equitable access, and develop interdisciplinary curricula that connect technical skills with real-world applications.

Each of these innovations presents immense opportunities, but they also bring challenges that must be addressed for technology-driven education to be truly inclusive and effective.

The summary of the drivers of future-proof education is shown in Figure 9.

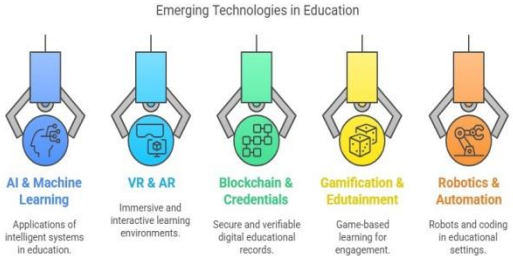

Figure 9: Future-Proof Education Drivers

Challenges in Implementing Technology-Driven Education

The integration of technology in education holds immense promise, offering personalized learning, global accessibility, and skill-based training to prepare students for the future. However, despite its potential, the widespread adoption of technology-driven education faces significant challenges. Infrastructure gaps, digital literacy disparities, financial constraints, and resistance to change all hinder seamless implementation, particularly in underserved communities.

One of the most pressing concerns is the digital divide, where unequal access to devices, internet connectivity, and technological resources creates disparities in learning opportunities. Additionally, teacher training and curriculum adaptation remain critical hurdles, as many educators struggle to keep pace with rapidly evolving digital tools. Furthermore, data privacy, cybersecurity, and ethical concerns surrounding AI-driven learning platforms raise questions about student protection and responsible technology use.

While technology has the power to revolutionize education, its successful implementation requires strategic planning, equitable policies, and collaborative efforts from governments, educators, and technology providers. Addressing these challenges is essential to ensuring that technology enhances, rather than widens educational opportunities for all learners.

As we embrace the transformative potential of technology in education, we must also confront the critical challenges that threaten to hinder its widespread adoption. While emerging technologies promise personalized learning, accessibility, and skills-based training, their successful implementation requires careful planning, investment, and policy alignment. Today, I will highlight three major obstacles; the digital divide, ethical concerns in AI-driven learning, and teacher preparedness and explore pathways to overcome them.

1. The Digital Divide: Ensuring Equitable Access

One of the most pressing challenges in technology-driven education is the digital divide the stark disparity in access to technology and internet connectivity that exacerbates educational inequalities. While high-income urban centers enjoy high-speed internet, digital devices, and interactive learning platforms, many rural and underserved communities lack even basic infrastructure to support online education.

In sub-Saharan Africa, only 17.8% of households have internet access, compared to 87% in highincome countries (Tchuisser et al., 2023). During the COVID-19 pandemic, students in lowincome regions were disproportionately affected, with millions unable to participate in online learning due to lack of devices, connectivity, and electricity.

Bridging this gap requires urgent policy interventions, including:

a. Investing in digital infrastructure: expanding broadband access, particularly in rural and remote areas.
b. Providing affordable devices: governments and private sector players must subsidize laptops, tablets, and mobile internet access for disadvantaged students.
c. Expanding digital literacy programs: training students and teachers to navigate technology effectively.

Without addressing these inequities, technology in education risks deepening rather than bridging socioeconomic gaps.
A summary of the challenges ahead for future-proof education, especially for developing economies, is shown in Figure 10.

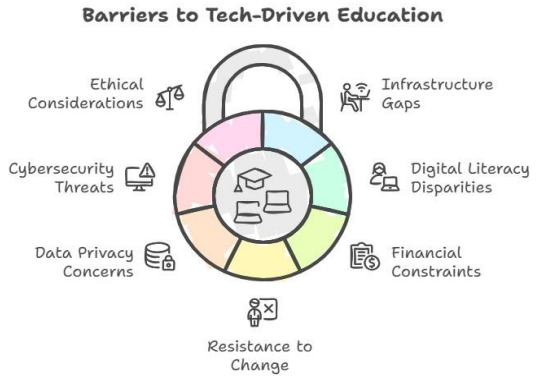

Figure 10: Challenges Ahead for Future-proof Education.

2. Ethical Concerns: Data Privacy & Algorithm Bias.

As artificial intelligence (AI) and adaptive learning platforms become more prevalent, they bring a new set of challenges; data privacy risks, algorithmic bias, and ethical concerns. AI algorithms are trained on data, data that is often reflective of historical and systemic biases. If not properly mitigated, these biases can be perpetuated or even amplified through educational AI systems. A landmark example is the controversy surrounding the UK's A-level grading algorithm in 2020. Due to pandemic-related school closures, the Office of Qualifications and Examinations Regulation (Ofqual) used an algorithm to estimate student scores. The model systematically downgraded students from low-income schools and upgraded those from historically high-performing (and often more affluent) schools.

Another concern lies in the use of facial recognition and emotion AI tools in classrooms. A study by (Raji et al., 2020) demonstrated that commercial facial analysis systems showed significant accuracy gaps across demographic lines, particularly underperforming for students with darker skin tones, females, and those with non-normative expressions. If such tools are used to measure engagement or monitor attendance, these inaccuracies could result in misjudgments that unfairly penalize certain groups.
To ensure ethical and equitable AI-driven education, we must:

a. Enforce data protection policies; develop transparent, GDPR-compliant frameworks for AI-driven platforms.
b. Reduce algorithmic bias; train AI models using diverse, representative datasets to avoid discrimination.
c. Promote digital ethics education; integrate data privacy awareness into school curricula.

If left unchecked, these ethical dilemmas could erode trust in technology-based learning rather than enhancing its potential.

3. Teacher Training: Preparing Educators for a Digital Age.

Technology is only as effective as the educators who implement it. Unfortunately, many teachers lack the training and confidence to integrate AI, gamification, virtual learning, and coding into their lessons. A 2021 OECD report found that only 40% of teachers worldwide feel confident using digital tools in the classroom. In Latin America, fewer than 30% of teachers have received formal training in blended learning models. Many traditional teacher training programs remain focused on textbook-based instruction, failing to equip educators with digital fluency and adaptive teaching strategies.

To empower teachers in this digital era, we need:

a. Comprehensive digital training: mandate technology certification for educators at all levels.
b. Ongoing professional development: governments must invest in workshops, mentorship programs, and online teacher communities.
c. Tech-integrated curricula: update teacher education programs to include AI, coding, and data literacy.

Strategies for Future-Proofing Education

To ensure that education evolves in tandem with technological advancements, we must adopt a multifaceted approach:

1. **Policy and Institutional Reforms**

Governments must embed digital literacy and emerging technology curricula into national education frameworks, ensuring systemic integration rather than piecemeal adoption (G. E. M. R.

Team, 2020)

a. Governments must establish forward-thinking policies that prioritize digital education and skills-based learning.
b. Curricula must evolve continuously to stay relevant in a rapidly changing world.

2. **Public-Private Partnerships**

Collaboration between educational institutions, technology firms, and industry leaders is crucial. Businesses must align curricula with workforce needs, providing mentorship and experiential learning opportunities (Manyika et al., 2017).

a. Collaboration between educational institutions and industry leaders ensures that learning aligns with real-world demands.
b. Apprenticeships, internships, and industry-driven training programs must become the norm.

3. **Lifelong Learning Culture**

The notion of a single degree sustaining a lifetime career is obsolete. Encouraging continuous skill development through micro-credentialing, online learning platforms, and workplace training will be key to long-term employability (Ahuja, 2024).

a. Learning should not end with formal education continuous upskilling and reskilling must be ingrained in society.
b. Platforms that offer flexible, modular, and on-demand education will be crucial in fostering lifelong learning habits.

A summary of the suggestions for addressing the myriads of problems facing the adoption of future-proof education globally is shown in Figure 11.

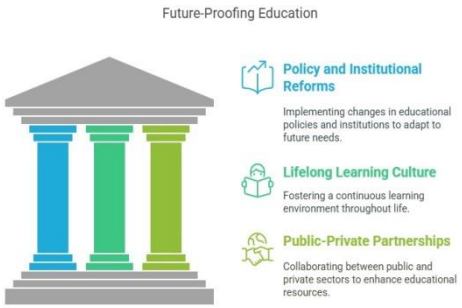

Figure 11: Suggestions for Accelerating the Adoption of Future-Proof Education Globally

Conclusion: The Call to Action

As we have explored today, the future of education is not a distant vision, it is already unfolding before us. Emerging technologies like artificial intelligence, virtual reality, blockchain, gamification, and robotics are redefining what it means to teach and to learn.

Yet, these opportunities come with serious challenges: the digital divide, ethical concerns, and the urgent need for teacher empowerment.

To ensure that no learner is left behind, we must collectively reimagine education with boldness, compassion, and innovation. Policymakers must prioritize equitable access to technology. Educators must be supported with continuous professional development to thrive in tech-integrated classrooms. Technologists and developers must design solutions with inclusivity and ethics at their core. And learners themselves must be empowered to become not just consumers of knowledge but creators, problem-solvers, and leaders for an unknown future.

We must shift the focus from simply preparing students for existing jobs to preparing them for lifelong learning**,** adaptive thinking, and entrepreneurial resilience. This is the true essence of future-proof education.

As the African proverb wisely says, *"The best time to plant a tree was 20 years ago. The secondbest time is now."*

The future will not wait for us. The time to act is now. Together, let us reimagine, reinvent, and future-proof education for the generations to come.

Thank you!

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ETHICAL MANAGEMENT OF AI-ENABLED UNIVERSITY CLASSROOMS: A DECOLONIAL LEADERSHIP FRAMEWORK

By

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Abstract
The rapid integration of artificial intelligence (AI) into higher education classrooms offers transformative potential for teaching and learning, but also risks perpetuating colonial power imbalances and epistemic injustices. This study employs a theory-synthesis design to integrate

decolonial theory, Indigenous knowledge systems, and leadership ethics literature into a coherent ethical management framework. Drawing on these bodies of work, the framework articulates four guiding principles: epistemic plurality, participatory co-creation, algorithmic accountability, and cultural responsiveness. First, epistemic plurality mandates centring Indigenous and other marginalised ways of knowing alongside Western paradigms in AI-infused curricula. Second, participatory co-creation requires institutional leaders to foster lecturer-student partnerships in tool selection, design, and evaluation. Third, algorithmic accountability calls for transparent procurement processes, impact audits, and mechanisms to identify and mitigate biased or extractive AI practices. Finally, cultural responsiveness ensures that AI deployment is attuned to local socio-historical contexts and bolsters community agency. Through case vignettes from three universities implementing AI tutoring, adaptive assessment, and predictive learning analytics, we demonstrate how senior academic leaders, Vice-Chancellors, Deans, and Department Chairs can operationalise these principles. The proposed framework offers a strategic roadmap for ethically stewarding digital transformation in tertiary education, resisting technological extractivism, and fostering more inclusive, socially just AI-mediated learning environments.

Keywords: Ethical management, decolonial leadership, AI-enabled classrooms, indigenous epistemologies, higher education.

Introduction

Artificial intelligence has infiltrated university teaching environments at an unprecedented pace (Zawacki-Richter et al., 2019). Platforms for adaptive tutoring and automated assessment are now present in courses across various disciplines (Selwyn, 2016). These technologies promise personalised learning pathways and increased efficiency in administrative tasks. Evidence suggests potential improvements in student engagement and performance when algorithms customise content to meet learner needs (Zawacki-Richter et al., 2019). However, the promise of transformation within higher education carries significant ethical concerns. Training datasets frequently reflect dominant cultural norms, thereby excluding Indigenous and other marginalised knowledge systems (Noble, 2018). The privileging of Western epistemologies within AI tools perpetuates colonial power relations that contemporary pedagogy seeks to dismantle (de Sousa Santos, 2018). Furthermore, unequal access to digital infrastructure exacerbates existing inequities between institutions and learner communities (Williamson & Hogan, 2021).

Leadership in higher institutions must reckon with these dynamics. Current governance models for educational technology inadequately address the risks associated with algorithmic bias and epistemic injustice (Ndlovu-Gatsheni, 2021). In the absence of deliberate ethical management, AI-enabled classrooms are at risk of reinforcing patterns of exclusion, even as they strive for innovation. This paper introduces a Decolonial Leadership Framework intended to guide senior academic leaders in the ethical implementation of AI tools. The framework is informed by decolonial theory, Indigenous epistemologies, and scholarship on leadership ethics, articulating four core principles: epistemic plurality, participatory co-creation, algorithmic accountability, and cultural responsiveness. Epistemic plurality necessitates the inclusion of diverse ways of knowing in curriculum design. Participatory co-creation positions lecturers and students as co-decision-makers in the adoption of technology. Algorithmic accountability establishes processes for transparent procurement and bias audits. Cultural responsiveness ensures that AI deployments align with local socio-historical contexts.

This study employs a theory-synthesis design to integrate decolonial theory, Indigenous epistemologies, and leadership ethics into a cohesive model for ethical AI management. Insights derived from this literature inform the

four guiding principles, which are then illustrated through case studies at three universities each demonstrating how AI tutoring, adaptive assessment, and predictive analytics can be governed in ways that uphold epistemic plurality, foster co-creation, ensure algorithmic accountability, and maintain cultural responsiveness. First, I situate the inquiry within key theoretical debates regarding coloniality, knowledge systems, and ethical leadership. I then delineate the steps of the theory-synthesis process, from literature identification to principle derivation. Next, I present the Decolonial Leadership Framework itself, elaborating on each principle with illustrative examples. The subsequent case studies reveal practical pathways for higher education leaders to translate theory into action. Finally, I reflect on the implications of this framework for institutional policy and practice, offering concrete recommendations to guide critical stakeholders such as Vice-Chancellors, Deans, and Department Chairs in their stewardship of AI-enabled classrooms and ultimately charting a course toward more just and inclusive digital futures in tertiary education.

Theoretical Foundations: Decoloniality, IKS and Ethical Leadership Lens

Decolonial thinking emerges from critiques of Western hegemony and seeks to expose the enduring structures of power inherited from colonial rule. Aníbal Quijano's concept of the "coloniality of power" highlights how modern institutions perpetuate racial and epistemic hierarchies long after formal decolonisation (Quijano, 2000). Walter Mignolo expands on this analysis by calling for "delinking" from dominant epistemologies to recover suppressed knowledge (Mignolo, 2011). Boaventura de Sousa Santos frames these efforts as an "epistemologies of the South" movement, arguing that knowledge from formerly colonised contexts offers indispensable critiques of universalist claims (de Sousa Santos, 2014). In educational technology, these insights illuminate how AI systems trained predominantly on Western datasets can reinforce colonial worldviews by marginalising non-Western data and pedagogies (Noble, 2018).

Indigenous knowledge systems furnish an epistemic counterpoint rooted in relationality, community stewardship, and land-based teachings. Linda Tuhiwai Smith highlights the importance of methodologies that privilege Indigenous voices and protocols (Smith, 2012). Marie Battiste argues for curriculum reform that honours Indigenous traditions as co-equal foundations for learning (Battiste, 2019). Such approaches foster "epistemic plurality," ensuring that AI-augmented learning environments do not default to a single paradigm but integrate multiple ways of knowing. Community-centred pedagogy further requires institutions to engage local stakeholders in co-designing technology solutions so that digital tools reflect cultural values and communal aspirations (Kovach, 2009).

Leadership ethics offers a complementary lens for understanding how university decision-makers navigate complex moral landscapes. Brown, Treviño, and Harrison define ethical leadership as modelling integrity and promoting ethical conduct through both action and policy (Brown et al., 2005). In higher education, ethical decision-making demands that leaders balance innovation with social responsibility, anticipating how new technologies might impact diverse learners (Komljenovic & Robertson, 2016). Existing governance frameworks for AI propose principles such as transparency, fairness, and accountability (Jobin, Ienca & Vayena, 2019). UNESCO's Recommendation on the Ethics of Artificial Intelligence emphasises human-centred values and instructs institutions to establish oversight mechanisms (UNESCO, 2020). Despite offering valuable starting points, these models seldom address the colonial dimensions of algorithmic power.

Bringing these literatures into dialogue requires a synthesis that retains the normative force of decolonial critique, the cultural depth of Indigenous pedagogies, and the procedural clarity of ethical governance. Such integration enables a leadership framework that not only prescribes high-level principles but also embeds them within existing institutional structures and decision-making processes. It supplies higher education stakeholders with conceptual tools to interrogate the colonial legacies embedded in AI, to engage communities as equal partners, and to institute governance practices that hold technology to rigorous ethical standards. The methodology underpinning this study is detailed in the subsequent section, which explicates the steps of the theory-synthesis design.

Methodology: Using Theory-Synthesis Design

This study adopts a theory-synthesis design to integrate disparate theoretical perspectives into a unified framework (Jaakkola, 2020). Theory synthesis involves systematically combining existing conceptualisations to generate higher-order constructs and propositions. It proceeds by identifying the core elements across multiple literatures, mapping relationships among these elements, and deriving novel theoretical insights. This approach is particularly appropriate here, as the ethical management of AI in university classrooms resides at the intersection of decolonial thought, Indigenous epistemologies, and leadership ethics. Thus, weaving these strands together, theory synthesis enables the construction of a coherent model that preserves the normative force of each tradition while addressing their overlapping concerns (Omodan, 2024).

The relevance of the design to this analysis

Theory synthesis commences with a precise delineation of the phenomenon under investigation and the theoretical domains intended for integration. In accordance with Jaakkola's guidance, this study initially defined the boundary conditions for inclusion specifically, conceptual work pertaining to decoloniality, Indigenous knowledge systems, and ethical leadership in the deployment of technology. Subsequently, it extracted and compared central constructs (e.g., coloniality of power, epistemic plurality, algorithmic accountability) to identify areas of convergence and tension. Ultimately, these constructs were synthesised into four guiding principles that constitute the Decolonial Leadership Framework.

Data sources and process

Literature selection adhered to specific criteria. Sources were included if they (1) provided a decolonial critique of Western epistemologies, (2) articulated Indigenous pedagogical principles, or (3) proposed models of ethical decision-making in the governance of educational technology. Peer-reviewed journals, scholarly books, and significant policy documents published in recent years were considered. The synthesis process was conducted in three phases:

- **Mapping**: Key concepts and relationships were charted across selected texts, facilitating the visualisation of thematic clusters.
- **Integration:** Overlapping constructs were amalgamated, and gaps were identified where concepts from one domain lacked counterparts in others.
- **Principle Derivation:** Through iterative discussion, the researcher distilled the mapped and integrated constructs into four actionable principles, ensuring that each principle reflected contributions from all three bodies of literature (Omodan, 2024).

This structured methodology ensures that the resulting framework is founded on rigorous conceptual bases and directly addresses the challenges of ethically managing AI in higher education classrooms.

The Decolonial Leadership Framework

Informed by the theory-synthesis design outlined in the previous section, the Decolonial Leadership Framework integrates decolonial critiques, Indigenous epistemologies, and

leadership ethics into a cohesive model for the ethical management of AI in university classrooms. Four interrelated principles epistemic plurality, participatory co-creation, algorithmic accountability, and cultural responsiveness serve to translate these theoretical insights into actionable strategies. Each principle articulates clear ethical imperative and corresponding practical measures, equipping key stakeholders, such as Vice-Chancellors, Deans, and Department Chairs, with the guidance necessary to deploy AI tools in ways that dismantle colonial power structures and promote social justice within higher education learning environments.

- ***Epistemic plurality****:* Epistemic plurality necessitates the recognition of multiple knowledge traditions as equally valid foundations for curriculum design. The inclusion of Indigenous and other marginalised worldviews counters the dominance of Eurocentric paradigms that pervade most AI systems (de Sousa Santos, 2018). Such plurality demands a revision of learning objectives to incorporate community-based knowledge alongside established disciplinary canons. Strategies include the co-design of modules with local elders or knowledge holders and the embedding of comparative case studies that juxtapose Western theories with non-Western practices (Battiste, 2019). Ethical leadership entails the allocation of resources for ongoing faculty development in diverse epistemologies and the review of AI-curated content to ensure representational balance.
- ***Participatory co-creation****:* Participatory co-creation positions lecturers and students as joint authors of AI-enabled learning environments. Collaborative models utilise shared decision-making structures that empower stakeholders to influence tool selection, customisation, and evaluation (Brown, Treviño, & Harrison, 2005). Mechanisms such as advisory councils and iterative design sprints facilitate inclusive feedback loops. Course teams pilot AI platforms in small cohorts, gather user insights, and refine algorithms to align with learner needs. Ethical governance structures mandate formal approval processes that require evidence of stakeholder engagement prior to large-scale deployment (Selwyn, 2016).
- ***Algorithmic*** **Accountability***:* Algorithmic accountability ensures that AI systems operate transparently and fairly. Transparency involves public documentation of data sources, model architectures, and decision criteria (Jobin, Ienca, & Vayena, 2019). Mandatory bias audits assess performance across demographic groups and trigger remediation plans when disparate impacts arise. Institutional governance bodies, comprising faculty, students, and community members, oversee procurement and conduct periodic impact reviews. Reporting protocols establish clear lines of responsibility for system failures or harms, enabling rapid corrective action. UNESCO's AI ethics recommendation underscores the importance of such oversight for safeguarding human rights (UNESCO, 2020).
- ***Cultural*** **Responsiveness***:* Cultural responsiveness aligns AI deployment with local socio-historical contexts and community priorities. Leaders commission ethnographic needs assessments to understand learners' lived experiences and tailor technological initiatives accordingly (Williamson & Hogan, 2021). Feedback loops involve community forums and digital town halls where users articulate contextual concerns and propose adaptations. Funding structures support co-development grants that facilitate partnerships between universities and cultural organisations. Ethical stewardship extends beyond technical fixes to include sustained relationships that honour local

agency and knowledge sovereignty (Ndlovu & Gatsheni, 2021).

This framework offers a strategic roadmap for stakeholders to navigate the ethical complexities of AI integration, ensuring that technological innovation in higher education advances decolonial aims and fosters inclusive learning landscapes. See the framework below for further clarity.

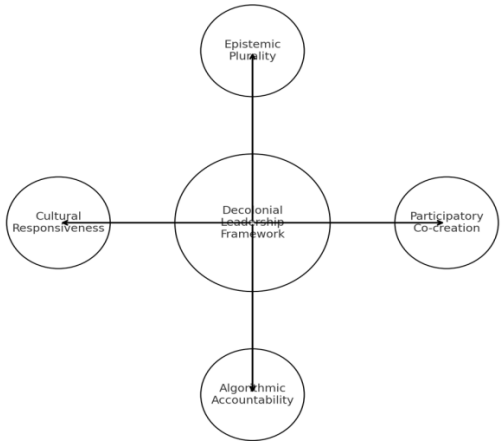

Figure 1: Decolonial Ethical AI Leadership Framework.

The DECOLAI Leadership Model, proposed by Bunmi Isaiah Omodan, synthesises decolonial theory, Indigenous epistemologies, and leadership ethics into a unified approach for stewarding AI in university classrooms. At its core, the model rests on four interdependent principles, Epistemic Plurality, Participatory Co-creation, Algorithmic Accountability, and Cultural Responsiveness each of which shapes and is reinforced by institutional leadership practices. Epistemic Plurality ensures that curricula integrate diverse knowledge traditions rather than privileging Western paradigms. Participatory Co-creation empowers lecturers, students, and community stakeholders as joint architects of AI-enabled learning environments. Algorithmic Accountability mandates transparent procurement, regular bias audits, and clear governance mechanisms to detect and address algorithmic harms. Cultural Responsiveness aligns AI deployment with local socio-historical contexts through ongoing community engagement and feedback loops. Guided by a theory-synthesis design, the DECOLAI model offers stakeholders in higher education a strategic roadmap for dismantling colonial power structures, safeguarding learner agency, and advancing social justice in digital pedagogy.

Case Vignettes (Hypothetical Scenarios)

The following vignettes illustrate how senior academic leaders might operationalise the DECOLAI Leadership Model in diverse university settings. Each scenario is hypothetical but grounded in plausible institutional practices, demonstrating concrete pathways for embedding Epistemic Plurality, Participatory Co-creation, Algorithmic Accountability, and Cultural Responsiveness in AI-driven teaching and learning.

University A: AI tutoring in a decolonial curriculum

In this hypothetical example, the Faculty of Humanities at "University A" implements an AI tutoring system to support first-year seminars in postcolonial theory. Rather than adopting a standard, commercially available platform, leadership commissions a cross-functional team including curriculum developers, instructional technologists, and community knowledge holders to co-configure the system's content algorithms. Local oral histories, Indigenous narratives, and critical theory excerpts are incorporated into the AI's response library, ensuring that student queries prompt examples from both Western and non-Western intellectual traditions. Faculty members receive specialised training to monitor the system's outputs, intervening whenever the AI defaults to Eurocentric framings or omits marginalised perspectives. Formative evaluation surveys reveal that students report higher engagement and deeper critical reflection when AI prompts resonate with their cultural contexts. This vignette operationalises Epistemic Plurality by embedding diverse ways of knowing into the AI's knowledge base and highlights how university leaders can foster ongoing

collaboration between academic units and cultural stakeholders.

University B: Adaptive assessment with indigenous co-design

At the imagined "University B," the School of Education pilots an adaptive assessment tool for an undergraduate teaching methods course. Senior leaders establish an advisory panel composed of faculty, students, and representatives from a neighbouring Indigenous community. Together, they define assessment criteria that reflect both pedagogical competencies and community values such as relational storytelling and land-based problem-solving. The AI platform's item bank is enriched with locally sourced case studies, art, and transcripts of oral traditions, enabling adaptive quizzes to evaluate learners on both standard educational benchmarks and culturally specific skills.

Each semester, the advisory panel reviews assessment outcomes and suggests refinements to question weighting and content diversity. Leadership mandates formal sign-off from the panel before scaling the tool campus-wide. Through this process, participatory co-creation becomes a governance norm, ensuring that technology selection and customisation respect Indigenous protocols and promote shared ownership of digital pedagogies.

University C: Predictive analytics & community safeguards

In the hypothetical "University C," the Office of Student Success implements predictive analytics software designed to identify at-risk students in large lecture courses. Acknowledging the potential for exacerbating existing inequities, the university leadership establishes a permanent Oversight Board composed of deans, student advocates, community liaison officers, and external ethicists. This board mandates quarterly bias audits to assess the accuracy of risk predictions across different demographic groups. When analyses indicate systematic under-prediction for students from historically underserved backgrounds, the board necessitates the retraining of the model using enriched datasets derived from recent community-conducted surveys.

A publicly accessible dashboard presents anonymised analytics performance and audit outcomes, thereby promoting transparency. Concurrently, all predictive alerts are directed to human advisors who engage with identified students through culturally appropriate outreach protocols. This vignette exemplifies Algorithmic Accountability and Cultural Responsiveness in tandem, illustrating how governance structures, audit mechanisms, and community engagement can mitigate algorithmic harms while aligning predictive practices with local values.

Discussion and Synthesis of Findings

Cross-case analysis of the hypothetical vignettes reveals consistent patterns in how AI integration can either perpetuate or disrupt colonial power structures. University A's embedding of Indigenous narratives in AI tutoring aligns with evidence that contextualised content fosters deeper learner engagement and critical reflection (Zawacki & Richter et al., 2019). The incorporation of non-Western epistemologies exemplifies the principle of epistemic plurality and confirms calls for curriculum designs that move beyond monocultural frameworks (de Sousa Santos, 2014). University B's co-design of adaptive assessments with Indigenous stakeholders demonstrates the practical benefits of participatory partnerships, supporting claims that shared decision-making yields systems more attuned to learner needs and cultural values (Holmes, Bialik, & Fadel, 2019). University C's establishment of oversight boards and routine bias audits echoes global AI ethics guidelines, highlighting the necessity of algorithmic accountability mechanisms to detect and correct disparate impacts (Jobin, Ienca, & Vayena, 2019). Across all cases, the tension between efficiency gains and ethical

imperatives becomes apparent; without intentional governance, efficiency risks overshadowing equity concerns (Noble, 2018). Simultaneously, the need for sustained stakeholder engagement emerges as a critical determinant of success, corroborating findings that trust in AI systems improves when communities participate in their design and evaluation (Williamson & Hogan, 2021).

Implications for Leadership Practice

Vice-Chancellors must articulate institutional AI strategies grounded in decolonial values. Crafting university-wide AI charters that define ethical priorities and governance structures can ensure coherence across faculties. Deans should convene standing AI ethics committees with balanced representation from faculty, students, community liaisons, and technical experts. These committees would oversee tool selection, conduct regular impact reviews, and authorise scaling only after stakeholder approval. Department Chairs can champion pilot initiatives that integrate multiple knowledge systems into AI curricula, paired with formal feedback cycles to refine system parameters. Embedding bias-audit requirements in procurement policies will mandate accountability from vendors. Leadership development programmes should include training in decolonial pedagogy and AI ethics, equipping academic managers with the conceptual tools needed to evaluate technological proposals through equity lenses.

Limitations & Future Research

Reliance on hypothetical scenarios restricts the capacity to generalise findings to real-world contexts. The lack of empirical data hinders insight into the long-term effects on student outcomes and institutional culture. Future research should pilot DECOLAI-informed interventions across diverse universities, capturing quantitative measures of engagement, achievement, and retention alongside qualitative accounts of learner and community experiences. Longitudinal designs would elucidate whether initial gains in inclusivity and trust are sustained over time. Furthermore, investigating the resource constraints faced by institutions in the Global South could reveal context-specific adaptations of the framework. Mixed-methods studies that integrate learning analytics metrics with ethnographic fieldwork and stakeholder interviews will provide a comprehensive understanding of how each principle operates in practice and inform refinements to the model.

Conclusion and Contribution to Practice

The Decolonial Leadership Framework enhances the understanding of how senior university leaders can ethically manage AI in higher education classrooms. By integrating epistemic plurality, participatory co-creation, algorithmic accountability, and cultural responsiveness, the model provides a comprehensive roadmap for embedding decolonial values into digital pedagogy. Its contribution to knowledge lies in synthesising diverse theoretical traditions into a unified set of actionable principles, thereby addressing a gap where existing AI governance guidelines neglect colonial dynamics and community partnerships.

The implementation of this framework promises multiple benefits. Curricular design gains depth and relevance when multiple ways of knowing inform AI-driven content, fostering richer learning experiences and critical engagement. Collaborative decision-making structures enhance stakeholder ownership, build trust in technology, and tailor tools to local needs. Robust governance mechanisms safeguard against algorithmic bias and ensure transparent, accountable practices. Community engagement processes situate AI initiatives within specific socio-historical contexts, strengthening institutional–community relationships and promoting technology as a vehicle for social justice rather than as a source of exclusion.

To translate this knowledge into practice, higher education leaders should undertake the following steps: (1) codify the four principles in an institutional AI charter; (2) establish interdisciplinary ethics committees with community representation; (3) pilot DECOLAI-informed projects with built-in feedback loops and bias audits; and (4) invest in capacity building that equips leaders and faculty with skills in decolonial pedagogy and AI ethics. Iterative evaluation, combining learning analytics with qualitative stakeholder feedback, will be essential to refine practices and demonstrate long-term impacts on equity and inclusion. Thus, committing to these actions, universities can transform AI from a potential vector of colonial reproduction into a catalyst for pedagogical innovation and social justice, thereby charting a more inclusive digital future for higher education.

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ENHANCING GEOGRAPHY EDUCATION THROUGH TECHNOLOGY: AN EXPERIMENTAL STUDY ON THE USE OF CLASSPOINT TOOL IN FCT COLLEGE OF EDUCATION ZUBA-ABUJA

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Abstract
ClassPoint is an electronic educational initiative and a classroom management tool that integrates seamlessly with PowerPoint. The study investigates the effectiveness of ClassPoint tool in enhancing the teaching of geography among students at the FCT College of Education, Zuba-Abuja, Nigeria. A sample of 50 students was purposively selected from the Geography department. A quasi-experimental design was adopted where academic performance and engagement of the students were compared. The sample was divided into two groups: (25 each per group) experimental group and control group. The experimental group was taught GEOG 409 using the ClassPoint Application while the control group was taught GEOG 309 using the conventional method. Both Pre-test and Post-test were conducted on the two groups and students' scores were recorded at the end of a 6 weeks treatment. The mean scores of the students were compared and results revealed statistically significant improvement in the experimental groups learning outcomes and engagement. This implies that the integration of digital tools in geography education can enhance comprehension, retention and students participation.

Keyword*: Classpoint, Experimentation, Technology, Pre-test, post-test.*

Introduction

Geography as a course plays a critical role in understanding spatial relationships, environmental processes and global interconnectivity. Although, traditional instructional methods in most Nigeria Colleges of Education lack the interactivity and engagement necessary for optimal learning, digital technologies have provided such. As the world transits into digital age, integrating educational technologies offers a pathway to enrich the teaching and learning experience. Technology-driven teaching tools like ClassPoint offer a promising solution to this problem.

ClassPoint is an interactive teaching platform that allows teachers to create engaging lessons, quizzes, and assessments (Vizcaynor, 2024). Students' engagement is an important aspect to make teaching and learning possible, and this is attainable with the application of appropriate teaching methodology to make learning exciting. Hagu (2013) stated that engaging the students can enhance their learning performance expressed through critical thinking skills and retention. Vizcaynor, (2024) discussed that students learning performance is reflected through their attainment of higher participation in class discussion, hands-on-activities and achieving high scores especially in quizzes.

Geography learning engagement and performance are possibly attainable with the application of interactive digital activities which is the Classroom Response System (CRS), which has recorded great improvement in students' performance in other subject areas but not well documented for geography (Abdelrady, 2022). The ClassPoint tool is a form of CRS technology that is experimented in this study to enhance the teaching and learning of geography. ClassPoint is a Classroom Response System (CRS) which can be integrated in Microsoft PowerPoint that will

make presentation into an interactive one. It can create quizzes within the power point presentation without the difficulty of changing into another application during the process. It comprises of different features such as different modes of questions, the polls, multiple choice and short type (Vizcayno, 2024). It allows students to answer the instructor-posed questions in class and instantly gives feedback to the students. The application of class point prepares the minds of the students to engage in more on assigned activities.

Statement of the Problem

Many tertiary institutions in Nigeria still depends on the traditional methods of delivering lectures which lacks the interactivity and engagement necessary for optimal learning. In spite of the potential benefits of educational technologies, many geography classrooms in Nigeria remain underequipped and instructors are often unfamiliar with modern tools.

The persistent use of didactic teaching methods may contribute to low students engagement and limited practical understanding of geographic concepts. It has become imperative for geography lecturers especially in FCT College of Education. Zuba to strive for a paradigm shift in teaching and learning of geography to be attuned with the technologically trend. This study therefore, aims to determine whether the use of ClassPoint can address these challenges by promoting interactivity and enhancing learning experiences or outcomes.

Objectives of the Study

This study has the following objectives:

1. To examine the impact of ClassPoint on students' performance in geography
2. To evaluate students' engagement and participation when taught using ClassPoint.
3. To assess teacher's experiences and attitudes towards integrating ClassPoint in the classroom.

Research Questions

The study will be guided by the following research questions:

1. Is there a significant impact in the academic performance of students taught geography using ClassPoint and those taught using traditional method?
2. What are the levels of students' participation and engagement when taught using ClassPoint?
3. What are the attitudes of teachers and experiences towards integrating ClassPoint in the classroom?

Significance of the Study

The significance of this study cannot be over emphasised as can be seen in the following areas:

1. **Contribution to existing literature:** this study will add to the growing body of research on technology – enhanced learning in Geography education
2. **Understanding the effectiveness of ClassPoint:** the study provides insight into the impact of ClassPoint on students learning outcomes in geography
3. **Improving teaching methods:** the findings of the study can inform geography teachers on how to integrate ClassPoint into their instructional practices effectively.
4. **Enhancing students' learning outcomes:** the study may help improve the learning outcomes of students by identifying the benefits and challenges of using ClassPoint.
5. **Educational policy:** policy makers may benefits from the findings of this study by integrating technology enhanced learning tools like ClassPoint into the curriculum.
6. **To FCT COE Zuba:** the findings of this study can inform the college approach to technology integration in geography education which in turn, will lead to improved students learning outcomes.
7. Generally, the efficiency of ClassPoint in teaching geography can contribute to the development of more effective teaching practices, improved learning outcomes and informed educational policies

Literature Review

Technology – Enhanced Geography Teaching

Technology integration in geography teaching has transformed the learning experiences, making it more interactive and practical (Mayer, 2009). For example, multimedia learning significantly improves retention and understanding of complex information. Prior studies (Adewale, 2021; Udo & Nwafor 2020) have highlighted the importance of interactive teaching in Nigerian Colleges of Education, but limited studies exist on the use of ClassPoint in geography instruction.

Technology tools exist for teaching geography and are widely used to augment conventional teaching methods. Some of these tools include the Augmented Reality (AR) apps which overlay digital information on to the real world (Evidence, 2019) and create immersive learning experience. AR apps like Google Expeditions allow students to visualize complex geographic data and explore real world environment (Adewale, 2021). Mayer (2009) said another technological tool used in teaching geography is the Geographic Information Systems (GIS) which, enable students to create, analyze and share geographic data and map. Mayer, (2009). Some GIS softwares used in schools bring professional-grade mapping capability to the classroom e.g QGIS and ESri's ArcGIS. All this technology enhances geographic teaching tools improve students' participation and interest in geographic classes.

However, the ClassPoint, a recent innovation allows for real-time quizzes, annotations and audience participation within Microsoft PowerPoint, has not been explored to the fullest in teaching geography. The ClassPoint tool is a form of Classroom Responses Systems (CRS) Technology that is used in this study being the first time for geography in FCT College of Education Zuba. This ClassPoint tool is integrated as an approach in teaching with the purpose of enhancing students' performance and engagement in geography.

The Classpoint Tool

According to Lee (2019), the motivating and interactive features of the ClassPoint application in the classroom setting can be taken into the account as one of the factors that contribute in strengthening students' learning satisfaction. The application helps students maintain their attention during e-learning activities. Recent survey by Bong & Chatterjee, (2021) revealed that 80% of students agreed that ClassPoint is a powerful tool for encouraging students involvement and participation in the classroom. In the same survey, 60% of students agreed that they responded to the interactive quizzes supplied via ClassPoint more frequently than they do verbally in the class. Abdelrady, (2022) adopted the ClassPoint to examine the effectiveness and interactivity of the tool in English as a Foreign Language (EFL) students learning satisfaction. Results indicated that the learning satisfaction of EFL students using ClassPoint is higher than that of EFL students not using ClassPoint. This result supports the effectiveness of the tool in enhancing teaching and learning in other fields of study.

Methodology

Research Design

To investigate the effectiveness of ClassPoint tool in teaching and learning geography, a quasi-experimental design was adopted involving two groups: experimental group (taught with ClassPoint) and control group taught with conversional methods.

Population of the study

The population of the study comprises of 400 level undergraduate students and 300 level undergraduate students (both levels are students of Ahmadu Bello University Zaria, (Zuba Campus). A sample of 25 students were selected from 400 level and 25 students from 300 level using purposive sampling technique.

Procedure and Data Collection

The 400 level students (25 in number) formed the experimental groupwhile the 300 level students (25 in number) formed the control group. The experimental group were taught GEOG 409 (climatology) using the ClassPoint tool for a period of 6 weeks whereas, the control group were taught GEOG 309 (Biogeography) with the conventional method. Pre and Post tests were carried out on both the groups within the 6 weeks of experimentation. The schedule of lectures for the control group was designed in such a way that students were assessed in the areas of knowledge, comprehension and skill development of the assigned course. The experimental group on the other hand, were taught using the ClassPoint application as a treatment. In this case, students were exposed to the use of the ClassPoint from their devices and were allowed to discover their talents through active participation with the tools. After every lecture delivery students were asked to answer short questions, multiple choice questions as well as some few quizzes on the app. At the end of every exercise, their scores were recorded based on their performance and a feedback was given to them. At the end of the 6 weeks, the post-test was administered on the two groups. Subsequently data was obtained for the research through the scores of the students' performance on both pre-test and post-test.

Results and Discussions

At the end of the 6 weeks treatment, the scores of both groups of students during pre-test were analysed under four learning domans viz: knowledge, comprehension, application and skills development. The t-test was used, where the mean scores and standard deviation were obtained at P-value P<0.001. Table 1 Summarizes the data:

Table 1: Students' Scores Comparison on Post Test

Learning	Group	N	Mean	SD	t-value	P
Knowledge Domain	Experimental control	25 25	5.16 2.88	1.24 1.14	25.33 df(48)	<0.001
Comprehension Domain	Experimental control	25 25	5.52 2.88	1.75 1.47	20.625 df(48)	<0.001
Application Domain	Experimental control	25 25	4.52 2.24	1.92 1.50	16.285 df(48)	<0.001
Skill development	Experimental control	25 25	6.6 1.76	1.4 1.2	46.095 df(48)	<0.001

Source: Author's Survey, 2025.

Interpretation of Results

Using p<0.001, the results of students performance, are highly statistically significant. The experimental group (taught by ClassPoint) showed significantly higher post-test scores compared to the control group. The p-value (p<0.001) indicates that the probability of observing these results by chance is extremely low. This suggests a strong causal relationship between using ClassPoint and improved test scores. The experimental group consistently outperforms the control group across all sets of means scores in the various domains. This suggests that the intervention of ClassPoint had a positive effect on students learning outcomes.

Lecturers' data was collected through structured interviews on issues bordering on the utilization of innovative pedagogies in teaching geography and the performance of students. They affirmed that students perform better in hands-on-activities and practical works

especially with the use of electronic devices. However, some unforeseen factors hinder them from integrating such tools in teaching. Such factors include inadequate devices to go round the class, electricity failure and bad network connectivity among others.

Implications of Findings

The findings of this study correspond with several other authors' (Evidence, 2019) work that established the effectiveness of CRS in enhancing teaching and learning. Lecturers and teachers may consider incorporating ClassPoint or similar tools into their teaching practices.

The significant differences in post-test scores suggest that ClassPoint can have a substantial impact on students learning. Observation data revealed increased students involvement, questions asked and peer interaction in the experimental group. Students reported that interactive quizzes and instant feedback made lessons more enjoyable and comprehensive.

Conclusion

The findings of the study affirm that interactive technologies like ClassPoint can significantly improve both the cognitive and affective dimensions of learning geography. This aligns with constructivist learning theories which emphasize active learner participation. The results also suggest that while teacher training is crucial, the benefits of technology integration out weight the initial learning curve.

Recommendations

This study recommends the following:

- ✓ Educational Institutions should invest in training teachers on the use of interactive tools
- ✓ Policy makers should integrate educational technologies into the National Teacher Education Curriculum.
- ✓ Further research can be conducted across different subjects and institutions to generalize findings.
- ✓ Provision of adequate devices, electricity to staff and students will go a long in enhancing the teaching of Geography.

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REVOLUTIONIZING SOCIAL STUDIES EDUCATION IN NIGERIA, THE ROLE OF ARTIFICIAL INTELLIGENCE IN THE 21ST CENTURY.

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Abstract
In the 21st century, the integration of Artificial Intelligence (AI) into the educational landscape offers transformative potential for social studies education in Nigeria. This paper explores the revolutionary role of AI in enhancing the curriculum, pedagogical practices, and student engagement within the social studies framework. As Nigeria grapples with diverse socio-political challenges, a robust social studies curriculum is essential for fostering critical thinking, civic responsibility, and cultural awareness among students. The study highlights how AI-driven tools can personalize learning experiences, provide real-time feedback, and facilitate data-driven decision-making for educators. By leveraging AI technologies, educators can create interactive and adaptive learning environments that cater to the diverse needs of students across the nation. Additionally, the research examines the potential of AI to enhance teacher training, streamline administrative tasks, and provide access to a wealth of resources and knowledge beyond traditional textbooks. Furthermore, this paper discusses the ethical considerations and challenges associated with implementing AI in education, including issues of equity, accessibility, and data privacy. Through a comprehensive analysis of case studies and empirical data, the findings indicate that AI can significantly enrich the social studies curriculum, making it more relevant and responsive to the realities of Nigerian society. Ultimately, this research advocates for policy reform and investment in AI technologies as a pivotal step towards revolutionizing social studies education in Nigeria, preparing students to navigate an increasingly complex world.
Keywords: Artificial Intelligence, Social Studies Education, Nigeria, 21st Century Learning.

Introduction

Digital technologies enhanced by artificial intelligence (AI) have significantly transformed daily life by profoundly influencing how society thinks, acts, and interacts (Chen et al., 2020). Yang (2022) highlights that AI-assisted technologies are increasingly prevalent in contemporary society, while Southgate (2019) notes their integration into our everyday routines. Defining AI is complex and elusive (Wang, 2019) for two main reasons identified by Chen et al. (2020): first, AI is characterized by a dynamic and evolving nature; second, it encompasses multiple disciplines. Experts from diverse fields, such as neuroscience, psychology, and linguistics, contribute their unique perspectives

and terminologies, complicating the formulation of a universal definition.

Artificial intelligence (AI) has emerged as a transformative force in the 21st century, profoundly influencing various aspects of daily life and shaping the future of society. Its integration into everyday routines and industries highlights its significance, while the complexities surrounding its definition and ethical implications underscore the need for ongoing discourse. This essay explores the multifaceted relevance of AI, examining its impact on daily life, economic implications, communication, ethical considerations, interdisciplinary collaboration, and future prospects.

AI technologies are increasingly embedded in our everyday experiences, enhancing convenience and efficiency. Virtual assistants like Siri and Alexa streamline tasks, while recommendation algorithms on platforms such as Netflix and Amazon personalize user experiences. This integration not only simplifies daily routines but also alters the way individuals consume information and make decisions, indicating a profound cultural shift in the way we interact with technology.

The economic impact of AI is significant, driving innovation and growth across various sectors. Industries such as healthcare, finance, manufacturing, and logistics leverage AI to boost productivity and create new markets. By automating routine tasks, AI enables human workers to focus on complex and creative endeavors, suggesting a potential evolution of job roles rather than outright displacement. This economic transformation reflects AI's capacity to reshape labor dynamics and drive competitive advantage.

AI has revolutionized communication by facilitating real-time language translation, sentiment analysis, and customer service automation. Social media platforms employ AI algorithms to curate content, influencing public discourse and shaping opinions. This shift raises important questions about accountability and the nature of truth in digital spaces, as the algorithms that govern information dissemination play a crucial role in shaping societal narratives.

Conceptual Framework

The literature reveals varied definitions of AI. John McCarthy, who coined the term, described AI as the science and engineering of creating intelligent machines, particularly computer programs (McCarthy, 2004). In contrast, Copeland (2022) offers a simpler definition, viewing AI as the capacity of computers or computer-assisted systems to perform tasks typically associated with intelligent beings. Kaplan and Haenlein (2019) expand on this by defining AI as a system's ability to accurately interpret external data, learn from it, and adapt its learning flexibly to achieve specific goals.

AI can be categorized into three types: narrow, general, and super AI (Southgate et al., 2018). Narrow AI, or weak AI, is the only form currently realized, functioning within limited contexts and unable to perform tasks outside its scope. Examples include natural language processing, image and voice recognition, and self-driving cars. Despite its limitations, narrow AI effectively handles routine tasks that can be challenging for humans. General AI, or strong AI, refers to machine intelligence that can match human intelligence, making complex decisions and forming connections between unrelated thoughts. Super AI, the highest classification, transcends human intelligence across nearly all domains and performs tasks beyond human capability. However, experts consider achieving anything beyond narrow AI a distant prospect (Dickson, 2017; Leahy et al., 2019).

Background of Social Studies Education in Nigeria

Social studies education in Nigeria has a rich and evolving history that reflects the country's socio-political landscape and educational reforms. The development of social studies as a formal subject in Nigerian schools can be traced back to the mid-20th century, influenced

by both local needs and international educational trends.

Social Studies was introduced in Nigeria in the late 1950s, primarily through initiatives supported by foreign institutions. The Ohio State University played a significant role by sponsoring training programs for Nigerian educators, which aimed to enhance the teaching of social studies in primary schools.

By the 1960s, social studies began to integrate various educational themes, including population education, environmental education, and human rights education. This integration was part of a broader effort to make education more relevant to Nigerian society. The 1970s marked a pivotal period when Social Studies was recognized as a core subject in the Nigerian educational system. The National Policy on Education (NPE) of 1977 emphasized social studies as essential for achieving national educational objectives, leading to its inclusion in primary and junior secondary school curricula. By the 1980s, social studies became a compulsory subject across all states in Nigeria, reflecting its importance in fostering civic responsibility and social cohesion among students. This period also saw the establishment of various educational institutions dedicated to training teachers in social studies.

Social Studies Education in Nigeria

The social studies education curriculum in Nigeria has been extensively examined by scholars who emphasize its critical role in shaping civic responsibility, promoting national cohesion, and addressing contemporary social issues. While many recognize the potential of social studies as a transformative educational tool, they also identify several challenges and areas for improvement within the curriculum.

One of the primary concerns among scholars is the relevance of the social studies curriculum to contemporary issues. Many argue that the curriculum should be more aligned with the current social, political, and economic challenges facing Nigeria. Researchers like Afolabi and Suleiman (2023) stress the importance of incorporating topics such as governance, human rights, and environmental sustainability. By addressing these contemporary issues, the curriculum can better prepare students to engage with the complexities of modern society and become informed citizens.

In addition to relevance, scholars assert that social studies education plays a crucial role in promoting civic education and responsible citizenship. Nwankwo and Okeke (2024) highlight the necessity of teaching students about their rights and responsibilities as citizens. A well-structured social studies curriculum can equip learners with the knowledge and skills needed to actively participate in democratic processes and contribute to community development. This civic focus is particularly important in a diverse and multicultural society like Nigeria, where understanding and tolerance are essential for national unity.

Many scholars advocate for an interdisciplinary approach within the social studies curriculum. They suggest integrating elements from history, geography, economics, and political science to provide students with a holistic understanding of societal dynamics. This interdisciplinary approach allows students to make connections between different subjects and develop critical thinking skills essential for analyzing complex social issues (Ibrahim and Mohammed, 2023). By fostering this integrative learning, students are better prepared to tackle real-world challenges.

Despite its potential, the implementation of the social studies curriculum faces significant challenges. Scholars like Ogunleye and Adetunji (2022) point out major barriers, including inadequate teacher training, lack of resources, and insufficient infrastructure. These challenges hinder the effective delivery of the curriculum, preventing it from achieving its intended goals. Addressing these issues is

crucial for enhancing the quality of social studies education in Nigeria.

Cultural relevance is another critical aspect highlighted by scholars. They emphasize that the curriculum should reflect the diverse cultural contexts of Nigeria. Adedoyin and Ojo (2022) argue that incorporating local histories, traditions, and values can make social studies more engaging and meaningful for students. This cultural relevance is essential for fostering a sense of identity and belonging among learners, helping them connect with the material on a personal level.

Assessment methods used in social studies education also warrant attention. Researchers advocate for the adoption of formative assessments that focus on students' understanding and application of knowledge rather than rote memorization. This shift can enhance critical thinking and analytical skills, which are vital for addressing real-world problems (Chukwudi and Uche, 2023). By prioritizing meaningful assessments, educators can better gauge student progress and adapt their teaching strategies accordingly.

Artificial Intelligence in Nigeria Educational Landscape

The rise of artificial intelligence (AI) has profoundly reshaped the educational landscape in Nigeria, particularly in the 21st century, revolutionizing methods of teaching and learning (Nwakwo and Okoye, 2022). As technology continues to evolve, AI is emerging as a critical tool for addressing significant educational challenges while offering new possibilities for improvement.

Nigeria's educational system has historically faced numerous obstacles, including inadequate resources, overcrowded classrooms and disparities in access to quality educational materials. The introduction of AI solutions is beginning to tackle these issues in innovative ways. AI-powered educational tools are now available, providing personalized learning experiences that adjust to the unique needs of each student. These platforms can analyze a learner's performance in real-time, delivering customized content that aligns with their individual learning pace and style (Adewale and Adeniyi, 2022).

One of the most remarkable effects of AI is its role in enhancing educational accessibility. With AI-integrated online learning platforms and virtual classrooms, students in remote or underserved areas of Nigeria can now access high-quality educational resources and instruction that were previously beyond their reach (Akinbode and Joseph, 2024). This shift is crucial for promoting educational equity, helping to reduce the urban-rural divide in educational opportunities.

In addition, AI has enabled the creation of intelligent tutoring systems and virtual assistants that provide support for both teachers and students. These tools help manage administrative tasks, offer immediate feedback, and provide additional learning support outside regular school hours. This not only increases the efficiency of educational delivery but also allows educators to concentrate more on interactive and engaging teaching strategies (Umar and Ibraheem, 2022).

Impact of Artificial Intelligence on Social Studies Education curriculum in Nigeria

The impact of artificial intelligence (AI) on social studies education is increasingly becoming a focal point for scholars examining innovative teaching and learning methods. Researchers have highlighted that AI can facilitate personalized learning in social studies by adapting curriculum content to meet individual student needs. This adaptability allows students to engage with materials at their own pace, enhancing comprehension and retention (Smith and Jones, 2021). AI-driven tools, such as interactive simulations and virtual reality experiences, have been shown to increase student engagement in social studies. These technologies allow learners to explore historical events and cultural contexts in immersive ways, fostering a deeper

understanding of complex social dynamics (Adedoyin and Ojo, 2022). Scholars emphasize that AI can promote critical thinking skills in social studies education by providing access to vast amounts of data and resources. AI tools can help students analyze different perspectives on social issues, encouraging them to evaluate sources and develop well-rounded arguments (Chen and Wang, 2023). AI systems can streamline assessment processes in social studies education by providing immediate feedback on student performance. This capability allows educators to identify areas where students may struggle and adjust their teaching strategies accordingly (Mohammed and Ibrahim, 2022).

AI has the potential to make social studies education more accessible for diverse learners. For instance, AI tools can support students with disabilities by offering tailored resources and assistive technologies that cater to specific learning needs (Olaniyan and Adeyemi, 2024). Scholars argue that the integration of AI in curriculum development can lead to more relevant and engaging social studies content. AI can analyze societal trends and student interests, helping educators design curricula that resonate with contemporary issues and diverse cultural narratives (Afolabi and Suleiman, 2023).

The 21st Century: An Overview

The 21st century, which began on January 1, 2001, is a period defined by remarkable technological advancements and profound social, political, and environmental changes. As we navigate through this century, several key themes emerge that shape our understanding of contemporary society.

One of the most significant transformations of the 21st century is the digital revolution. The rise of the internet, smartphones, and social media has fundamentally altered how we communicate and access information. With instant connectivity, individuals can share ideas and engage in discussions across the globe, breaking down geographical barriers. Moreover, advancements in artificial intelligence have begun to reshape industries, from healthcare to finance, enhancing efficiency and creating new possibilities.

Globalization has also accelerated in this century, leading to increased economic integration and cultural exchange. Countries are more interconnected than ever, with multinational corporations playing a crucial role in shaping global markets. While this integration fosters innovation and collaboration, it also raises questions about cultural preservation and economic disparities.

The Role of Artificial Intelligence in Revolutionizing Social Studies Education Curriculum in Nigeria in the 21st Century

The advent of artificial intelligence (AI) has the potential to transform social studies education in Nigeria, offering innovative solutions to enhance learning experiences and address existing challenges within the educational system. Scholars have extensively explored how AI can revolutionize the curriculum, emphasizing its multifaceted role in enriching social studies education in the 21st century.

One of the most significant contributions from scholars is the emphasis on AI's ability to create personalized learning experiences. Researchers like Afolabi and Suleiman (2023) argue that AI can analyze individual student performance and learning styles, allowing for tailored educational content that meets each learner's unique needs. This personalization can lead to improved engagement and understanding, as students interact with materials that resonate with their interests and abilities. By adapting to different learning paces, AI ensures that no student is left behind, fostering a more inclusive educational environment.

In addition to personalization, scholars have pointed out that AI-powered interactive tools, such as simulations and virtual reality experiences, can significantly enhance student engagement in social studies. Adedoyin and Ojo (2022) emphasize that these technologies allow students to immerse themselves in

historical events and cultural contexts, making learning more dynamic and impactful. This immersive approach not only fosters a deeper understanding of complex social issues but also motivates students to participate actively in their education, moving beyond traditional rote memorization.

AI can also play a crucial role in promoting critical thinking and inquiry-based learning within social studies education. Scholars like Ibrahim and Mohammed (2023) highlight that AI tools can provide students with access to vast amounts of data and diverse perspectives on social issues. This access encourages learners to engage in critical analysis, evaluate sources, and develop well-rounded arguments. By fostering these skills, AI prepares students to navigate the complexities of contemporary society, equipping them with the analytical tools necessary for informed citizenship.

Another significant contribution of AI is its ability to streamline administrative tasks for educators. Scholars, including Ogunleye and Adetunji (2022), have noted that AI can assist teachers in managing classroom activities, grading assessments, and providing feedback. This efficiency allows educators to focus more on instructional strategies and student engagement, ultimately enhancing the quality of social studies education. By reducing administrative burdens, AI enables teachers to dedicate more time to fostering meaningful interactions with their students.

Challenges of Integrating AI into Social Studies Education in the 21st century

The integration of artificial intelligence (AI) into social studies education holds great promise for enhancing teaching and learning. However, this integration is not without its challenges, which scholars have critically examined. Understanding these challenges is essential for educators and policymakers aiming to implement AI effectively in social studies curricula.

One of the primary obstacles to integrating AI in social studies education is the lack of adequate technological infrastructure. Many educational institutions, particularly in developing regions, struggle with insufficient internet connectivity and outdated hardware. These limitations hinder the effective use of AI tools, making it difficult for educators to leverage technology to enhance learning experiences (Akinola and Bello, 2023). Without reliable access to technology, the potential benefits of AI remain largely untapped.

Another significant challenge is the preparedness of teachers to implement AI technologies. Research indicates that many educators feel untrained and unprepared to utilize AI effectively within their teaching practices. This lack of professional development opportunities can lead to the underutilization of AI tools in the classroom, as teachers may hesitate to incorporate technologies they do not fully understand (Ogunleye and Adetunji, 2022). Addressing this gap in training is crucial for empowering educators to harness AI's potential in social studies education.

Ethical concerns also pose a challenge to the integration of AI in education. Issues related to data privacy and security are paramount, particularly when AI systems collect and analyze student data. Scholars emphasize the need for clear guidelines and protections to ensure that student information is handled responsibly. Without proper safeguards, there is a risk of surveillance and potential misuse of sensitive data, which can undermine trust in educational institutions (Nwankwo and Okeke, 2024).

Furthermore, integrating AI into social studies curricula requires a re-evaluation of existing educational frameworks. Many social studies programs are not designed to incorporate AI effectively, leading to a misalignment between educational goals and the capabilities of technological tools (Ibrahim and Mohammed, 2023). This disconnect can create confusion for educators and students alike, as they navigate

the intersection of traditional content and innovative technology.

Addressing the Challenges of Integrating AI into Social Studies Education Curriculum in 21st century

The integration of artificial intelligence (AI) into social studies education presents numerous challenges, but scholars have proposed various strategies to tackle these issues effectively. By focusing on enhancing infrastructure, improving teacher training, establishing ethical guidelines, aligning curricula, promoting equity, and fostering a positive attitude toward technology, educators and policymakers can create a conducive environment for AI integration.

One of the primary obstacles to AI integration is the lack of adequate technological infrastructure in many educational institutions. Scholars advocate for increased investment in educational technology, particularly in underserved areas. This includes improving internet connectivity and providing modern hardware in schools. Collaborative efforts between government, private sectors, and non-profit organizations can facilitate the development of robust technological infrastructures, ensuring that all schools have access to the necessary resources (Akinola and Bello, 2023). Such investments are vital for enabling effective use of AI tools in the classroom.

Another significant challenge is the preparedness of teachers to implement AI technologies. Comprehensive teacher training programs are essential to equip educators with the skills needed for effective AI integration. Scholars recommend professional development workshops that focus not only on the technical aspects of AI tools but also on pedagogical strategies for incorporating these technologies into social studies curricula. Ongoing support and mentorship can help teachers build confidence and competence in using AI effectively (Ogunleye and Adetunji, 2022). By prioritizing teacher training, educational institutions can enhance the overall quality of instruction.

Ethical considerations also play a crucial role in the integration of AI in education. Developing clear ethical guidelines for AI use is necessary to protect student data privacy and ensure transparency in how AI systems operate. Scholars emphasize the need for policies that govern data management and establish clear communication with stakeholders about how student data is collected and utilized (Nwankwo and Okeke, 2024). By addressing these ethical concerns, educational institutions can foster trust among students, parents, and educators.

Also, aligning curricula with the capabilities of AI tools is essential for effective integration. Many existing social studies programs are not designed to incorporate AI, leading to a disconnect between educational goals and technological capabilities. Scholars suggest collaborative curriculum design involving educators, technologists, and content experts to create relevant and engaging materials that incorporate AI while meeting educational standards (Ibrahim and Mohammed, 2023). This alignment ensures that AI tools enhance learning rather than detract from it.

Equity and access remain critical challenges in the integration of AI. To ensure that all students benefit from AI resources, initiatives should focus on providing equitable access regardless of socioeconomic background. Scholars recommend programs that offer subsidized technology and internet access for low-income students, as well as community partnerships that facilitate access to educational tools. Inclusive policies should be developed to ensure that all learners can engage with AI-enhanced education (Olufemi and Ajayi, 2022). Addressing equity is essential for fostering an inclusive educational environment.

Invest in Technological Infrastructure: Governments and educational institutions should prioritize investments in reliable internet connectivity and modern hardware to

ensure that all schools have the necessary resources to implement AI tools effectively.

Enhance Teacher Training Programs: Comprehensive professional development initiatives should be established to equip educators with the skills and confidence needed to utilize AI technologies in their teaching practices. Workshops should focus on both technical proficiency and pedagogical strategies.

Establish Ethical Guidelines: Clear policies must be developed to govern the use of AI in education, ensuring the protection of student data privacy and promoting transparency in AI operations. Stakeholders should collaborate to create these guidelines and communicate them effectively.

Align Curricula with AI Capabilities: Educators, technologists, and content experts should work together to design social studies curricula that integrate AI tools meaningfully. This collaboration will ensure that educational materials are relevant and engaging while meeting educational standards.

Promote Equity in Access: Initiatives should be implemented to provide subsidized technology and internet access for low-income students. Community partnerships can facilitate access to AI-enhanced educational resources, ensuring that all learners benefit from these innovations.

By implementing these recommendations, stakeholders can create a supportive environment for the effective integration of AI into social studies education, ultimately enhancing learning outcomes and preparing students for the complexities of the modern world.

Conclusion

The integration of artificial intelligence (AI) into social studies education in Nigeria presents a transformative opportunity to enhance teaching and learning experiences. As digital technologies evolve, AI's potential to personalize learning, improve accessibility, and foster critical thinking can significantly address existing challenges within the educational system. However, this integration is not without obstacles, including inadequate infrastructure, teacher preparedness, and ethical concerns regarding data privacy. To realize the full benefits of AI in social studies education, it is essential to invest in technological infrastructure, implement comprehensive teacher training programs, and establish clear ethical guidelines. Moreover, promoting equitable access to AI resources will ensure that all students can benefit from these innovations, regardless of their socioeconomic background. By fostering a positive attitude toward technology among educators and encouraging critical engagement among students, the educational landscape can become more inclusive and responsive to contemporary societal issues.

Recommendations

1. Governments and educational institutions should prioritize investments in reliable internet connectivity and modern hardware to ensure that all schools have the necessary resources to implement AI tools effectively.
2. Government and stakeholders should development comprehensive professional initiatives to equip educators with the skills and confidence needed to utilize AI technologies in their teaching practices. Workshops should focus on both technical proficiency and pedagogical strategies.
3. Educators, technologists, and content experts should work together to design social studies curricula that integrate AI tools meaningfully. This collaboration will ensure that educational materials are relevant and engaging while meeting educational standards.
4. Parents and government should provide subsidized technology and internet access for low-income students. Community partnerships can facilitate access to AI-enhanced educational resources, ensuring that all learners benefit from these innovations.
5. Government and Stakeholders should create a supportive environment for the effective

integration of AI into social studies education, ultimately enhancing learning outcomes and preparing students for the complexities of the modern world.

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THE POTENTIAL OF SOCIAL STUDIES EDUCATION IN ACHIEVING SUSTAINABLE DEVELOPMENT GOALS (SDGs) IN SECONDARY SCHOOLS IN THE NORTH CENTRAL ZONE OF NIGERIA

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Abstract

Social Studies Education holds an immense potential as a transformative tool for achieving the Sustainable Development Goals (SDGs) in secondary schools in Nigeria and beyond. Many schools in Nigeria are faced with diverse socio-economic challenges that requires targeted educational strategies to equip young learners with the knowledge, values and skills essential for sustainable development. Thus, this study examined the potential of Social Studies education in achieving Sustainable Development Goals (SDGs) in secondary schools across the North Central Zone of Nigeria. The study employed descriptive survey design. The research sampled 900 teachers and students from Niger, Plateau and Benue States as participant. Instrument for data collection was structured questionnaire. The statistical tools of mean and standard deviation were used for the data analysis. The findings revealed that while Social Studies promotes key SDG concepts such as environmental sustainability, gender equality and global citizenship, the implementation is constrained by inadequate teacher training, limited instructional materials and curriculum overload. The study concludes that Social Studies education holds significant promise for advancing SDGs in Nigerian secondary schools if systematically supported through curriculum reform, teacher development, and policy reinforcement.

Keywords: Social Studies Education, Sustainable Development Goals (SDGs), Secondary Schools, Nigeria.

Introduction

Education is recognized globally as a key driver in achieving the SDGs particularly Goal 4 which advocates for inclusive and equitable quality education and lifelong learning opportunities. This supports the broader vision of empowering individuals with the necessary skills, knowledge and attitudes necessary for sustainable living and decision-making. Social Studies education plays a pivotal role in fostering sustainable development particularly in regions like the North Central Zone of Nigeria. As a multidisciplinary subject that integrates elements of history, geography, political science and sociology, it provides a framework for equipping students with the

knowledge, values and skills necessary to address global challenges. By collaborating its objectives with the Sustainable Development Goals (SDGs), Social Studies can help create an informed and proactive citizenry, foster progress in education, social equity, environmental sustainability and economic development (UNESCO, 2023). Also, Social Studies Education can cultivate in informed citizenry capable of contributing to sustainable development. It provides students with a deep understanding of their social environment and equips them with critical thinking and problem-solving skills. According to Oganwu and Oboh (2019) Social Studies Education in Nigeria is designed to help students develop a sense of responsibility and a commitment to social justice, both of which are essential for addressing the complex challenges associated with the SDGs.

Social Studies education uniquely positions itself to foster critical thinking, promote social awareness, and encourage active citizenship. It integrates themes such as environmental sustainability, human rights and global interconnectedness which are pivotal in addressing the challenges of sustainability. However, in the North Central Zone of Nigeria where socio-economic and environmental challenges are prevalent, this educational focus becomes even more essential. Embedding SDG-related concepts in Social Studies curricula can lead to a systemic shift. This involves equipping students with sustainability competencies, such as problem-solving, ethical decision-making and collaborative skills (Okam, 2018). Research by UNESCO, (2023); Kioupi & Voulvoulis, 2019) in similar contexts has emphasized the importance of holistic education that promotes stakeholders' awareness, participation and collaboration in achieving SDG outcomes. Amadi (2018) notes that the infusion of SDG-related content into Social Studies curricula has the potential to transform education into a powerful tool for sustainable development in Nigeria. This approach not only prepares students academically but also builds their capacity to contribute meaningfully to sustainable development in their communities and beyond.

Accordingly, Social Studies Education supports Goal 16 which focuses on promoting peaceful and inclusive societies, providing access to justice for all and building effective and accountable institutions. By teaching students about governance, civic engagement and the rule of law, social studies education fosters a culture of peace and non-violence. This is particularly relevant in Nigeria, where social studies can play a vital role in addressing the root causes of conflict and promoting national integration. Osokoya (2019) asserts that through the teaching of Social Studies, students learn about the importance of diversity, tolerance and dialogue which are essential for maintaining peace and stability in a pluralistic society like Nigeria. Nwafor (2020) highlights the importance of Social Studies in promoting social justice and equity. Oganwu, & Oboh, (2019) suggests that a robust Social Studies curriculum can contribute to the reduction of inequalities and the promotion of inclusive development, especially currently as the country strives to meet its development targets, it is imperative to prioritize Social Studies Education as a key strategy for achieving the Sustainable Development Goals in secondary schools in the North Central zone and Nigeria at large.

Problem Statement

Social Studies education despite its uniqueness in equipping students to navigate societal challenges remains underexplored. In the North Central zone of Nigeria's characterized by diverse cultures, socioeconomic challenges and environmental issues, the potential of Social Studies education in advancing the United Nations' Sustainable Development Goals (SDGs) also has yet to be fully

harnessed. The SDGs a global framework aimed at addressing issues such as poverty, inequality, education, gender equity and climate action, require a holistic and localized approach for effective implementation. Secondary schools are critical spaces where these ideals can be instilled, yet the realization of this potential in the North Central Zone faces several obstacles. The region grapples with inadequate educational resources, inconsistent teacher training and socio-political instability. These challenges hinder the effective delivery of Social Studies education and reduces its ability to influence students' understanding and commitment to sustainability principles. Another significant issue is the lack of awareness and practical application of SDG-related concepts among students. Social Studies education often remains theoretical with minimal opportunities for experiential learning or community-based projects that could directly engage students with real-world sustainability challenges. This gap not only diminishes the relevance of the subject but also limits its impact on fostering proactive and informed citizens who can contribute to achieving the SDGs. Addressing these challenges requires an in-depth investigation into the current state of Social Studies education in the North Central Zone, Nigeria.

It is crucial to examine the extent to which the subject incorporates SDG-related themes, the capacity of teachers to deliver such content effectively and the structural barriers limiting the subject's transformative potential. By identifying these gaps, stakeholders in education can design targeted interventions to enhance the role of Social Studies in building a generation of learners equipped to contribute meaningfully to sustainable development. Thus, the problem of this study centered on understanding and optimizing the potential of Social Studies education in achieving Sustainable Development Goals (SDGS) in secondary schools in the North Central zone of Nigeria.

Justification of the Study

The United Nations' Sustainable Development Goals (SDGs) provide a universal blueprint for addressing global challenges such as poverty, inequality quality education and climate change. Social Studies with its interdisciplinary approach offers a unique opportunity to foster critical thinking, civic responsibility and environmental awareness among students, making it a crucial tool in achieving sustainable development. In Nigeria's North Central zone, Nigeria, the potential of Social Studies education to contribute to the realization of the SDGs is immense. However, this potential is often limited by gaps in curriculum integration, teacher preparedness and practical application. Exploring and enhancing the role of Social Studies in secondary schools can help equip students with the competencies needed to address local and global sustainability challenges.

Therefore, this study is justified because it seeks to bridge the knowledge gap on the relationship between Social Studies education and the SDGs in the North Central Zone. By examining the curriculum, teaching techniques and practical application of Social Studies, the research will provide valuable insights for teachers, policymakers, and stakeholders. It aims to highlight ways in which Social Studies can be better in support with the SDGs which will ultimately contribute to the development of informed and responsible citizens who can drive sustainable development in their communities.

Objectives of the Study

This study unveiled the potential of Social Studies Education in achieving Sustainable Development Goals (SDGS) in secondary schools in the North Central zone of Nigeria. The study achieved the following;

1. To evaluate the extent to which Social Studies education in secondary schools corresponds with the principles and objectives of the SDGs.
2. To assess the level of preparedness and capacity of Social Studies teachers to incorporate SDG-related themes into their teaching.
3. To examine the challenges faced by teachers in integrating SDGs concepts into Social Studies education in secondary schools in the North Central Zone.

Research Questions

This study provided answers to the following research questions.

1. To what extent does Social Studies education in secondary schools corresponds with the principles and objectives of the SDGs in the North Central Zone, Nigeria?
2. How prepared are Social Studies teachers to incorporate SDG-related themes into their teaching practices in the North Central Zone, Nigeria?
3. What are the challenges faced by teacher in integrating of SDG concepts into Social Studies education in secondary schools in the North Central Zone, Nigeria?

Literature Review

The Sustainable Development Goals (SDGs) adopted by the United Nations in 2015 present a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. For Nigeria, a nation marked by vast cultural diversity, economic disparities and socio-political challenges, achieving these goals is both an urgent necessity and a formidable challenge. Among the various strategies to realize the SDGs, education particularly Social Studies Education emerges as a critical tool. Social Studies Education with its focus on social awareness, civic responsibility, and the development of democratic values has the potential to foster the knowledge, skills, and attitudes necessary for achieving sustainable development in Nigeria. According to National Council for the Social Studies (NCSS, 2012) Social Studies Education is defines as a methodology drawing upon many disciplines, including anthropology, archaeology, economics, geography, history, law, philosophy, political science, psychology, religion, and sociology, as well as appropriate content from the humanities, mathematics, and natural sciences. Social Studies is a study of survival in an organized curriculum as well as the process of finding solutions to such problems (Ogundare, 2016). In this assertion, Social Studies as a subject in Nigeria educational system needs to be implemented in secondary schools because of its objectives to cater for social problems especially in a situation whereby Nigeria as a country is facing social problems such as religious intolerance, suicide bombing and acts of terrorism that pervaded the relationship of citizens especially in the north central region where many lives were lost, properties worth billions of Naira were destroyed. In his study, Ajiboye (2019) ascribed Social Studies as a school subject that is out to direct and give learners a free hand and opportunity to make enquiries, investigate, discover, discuss, experiment and acquire experiences in order to make decisions on social issues and problems and find solutions to them. Social Studies should help students acquire knowledge, master the processes of learning and become active citizens.

So, the integration of the Sustainable Development Goals (SDGs) into Social Studies curricula holds significant potential to promote awareness and action towards these global objectives. The SDGs, particularly Goal 4 (Quality Education), emphasize inclusive and equitable quality education that fosters lifelong learning opportunities for all, aiming to address social inequities, environmental sustainability and economic challenges.

The Sustainable Development Goals (SDGs) are a collection of 17 interlinked global goals

designed to be a blueprint for achieving a better and more sustainable future for all. The SDGs were formulated as part of the 2030 Agenda for Sustainable Development, a comprehensive plan to eradicate poverty, protect the planet, and ensure prosperity for all by the year 2030. The SDGs build on the success of the Millennium Development Goals (MDGs), while also addressing their shortcomings by emphasizing a more inclusive and holistic approach to development that leaves no one behind (United Nations, 2015). Each of the 17 goals is accompanied by specific targets 169 in total designed to be achieved within a 15-year timeframe. These goals cover a broad range of social, economic, and environmental development issues. They include ending poverty and hunger, improving health and education, achieving gender equality, ensuring clean water and sanitation, promoting affordable and clean energy, and fostering innovation and infrastructure (Sachs, 2015).

Indeed, Goal 1 aims to end poverty in all its forms everywhere. It recognizes poverty as a complex problem with multiple dimensions that include lack of income, lack of access to basic services, and exposure to various forms of violence (World Bank, 2016). Goal 2 aims to end hunger, achieve food security, improve nutrition, and promote sustainable agriculture. It emphasizes the need for innovative agricultural practices and equitable food distribution to ensure food availability for all (FAO, 2017). SDG 3 seeks to ensure healthy lives and promote well-being for people of all ages. It focuses on reducing maternal mortality, ending epidemics of communicable diseases, and ensuring universal access to healthcare services (World Health Organization, 2018). Goal 4 focuses on ensuring inclusive and equitable quality education and promoting lifelong learning opportunities for all. It addresses the need for equal access to education at all levels and the elimination of gender disparities in education (UNESCO, 2016).

SDG 5 aims to achieve gender equality and empower all women and girls. It highlights the importance of eliminating all forms of discrimination and violence against women and girls and ensuring equal participation in leadership and decision-making processes (UN Women, 2017). Goal 6 focuses on ensuring the availability and sustainable management of water and sanitation for all. It addresses the challenges of water scarcity, water pollution, and inadequate sanitation services, particularly in developing countries (UNICEF and WHO, 2019). SDG 7 aims to ensure access to affordable, reliable, sustainable, and modern energy for all. It emphasizes the need for expanding renewable energy sources and improving energy efficiency (International Energy Agency, 2018). Goal 8 promotes sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all. It underscores the importance of fostering economic development and addressing unemployment and underemployment issues (International Labour Organization, 2017). SDG 9 focuses on building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation. It highlights the need for sustainable industrial policies and the expansion of scientific research and innovation (United Nations Industrial Development Organization, 2018). Goal 10 aims to reduce inequality within and among countries by promoting social, economic, and political inclusion for all, regardless of age, sex, disability, race, ethnicity, origin, religion, or economic or other status (UNDP, 2019).

SDG 11 aims to make cities and human settlements inclusive, safe, resilient, and sustainable. It addresses urban challenges such as housing, transportation, and pollution, and promotes sustainable urban planning (UN-Habitat, 2018). Goal 12 seeks to ensure

sustainable consumption and production patterns. It focuses on reducing waste generation, promoting sustainable practices, and encouraging industries Goal 13 take urgent action to combat climate change and its impacts. This goal emphasizes strengthening resilience to climate-related hazards, integrating climate change measures into national policies, and improving education and awareness (IPCC, 2018). Goals 14 aim at conserving the use of oceans, seas and marine resources for sustainable development. This goal targets the sustainable management of marine ecosystems, reducing marine pollution, and protecting marine biodiversity (UN Ocean Conference, 2017).

Goal 15 aim to protect, restore and promote sustainable use of terrestrial ecosystems, manage forests sustainably, combat desertification, and halt biodiversity loss. This goal seeks to conserve and restore the use of terrestrial ecosystems such as forests, wetlands, drylands, and mountains (UNDP, 2018). Goal 16 promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels. This goal focuses on reducing violence, ending abuse, exploitation, trafficking, and ensuring access to justice (UNODC, 2018). Goal 17 strengthen the means of implementation and revitalize the global partnership for sustainable development. This goal emphasizes enhancing global partnerships for sustainable development and mobilizing resources to achieve the SDGs (United Nations, 2019).

Social Studies education in Nigerian secondary schools plays a crucial role in advancing the Sustainable Development Goals (SDGs) by equipping students with the knowledge, attitudes, and skills needed to address societal challenges. The curriculum emphasizes citizenship education, environmental awareness, and social justice, fostering values that align with key SDGs such as quality education (SDG 4), gender equality (SDG 5), and reduced inequalities (SDG 10). By teaching about sustainable resource use, human rights and global interdependence, Social Studies cultivates critical thinking and problem-solving skills essential for achieving sustainable development (Obanya, 2014). The focus on environmental education supports SDG 13 (Climate Action), while discussions on poverty and social equity address SDGs 1 (No Poverty) and 2 (Zero Hunger). Also, promoting civic responsibility encourages active participation in democratic processes and governance, contributing to SDG 16 (Peace, Justice, and Strong Institutions).

Also, Social Studies teachers in Nigeria's North Central Zone demonstrate varying levels of preparedness to incorporate Sustainable Development Goal (SDG) themes into their teaching practices. While many teachers acknowledge the importance of addressing global issues like poverty, climate change, and gender equality, their ability to effectively integrate these concepts into lessons is often hindered by insufficient training. Most teacher education programs lack specific modules on SDG-related themes resulting in limited awareness and capacity among educators to connect these goals with the Social Studies curriculum (Adeyemi, 2020). Challenges such as inadequate resources, outdated instructional materials, and large class sizes constrain teachers' ability to deliver engaging and contextually relevant lessons. Many educators also face difficulties in accessing continuous professional development opportunities focused on SDG concepts. The lack of government support and policy alignment further hampers efforts to mainstream SDGs into classroom practices (United Nations, 2015). Despite these barriers, Social Studies teachers show a willingness to innovate, often adapting existing content to emphasize themes like civic responsibility and environmental sustainability (Ikwumelu, 2022). Addressing these challenges requires targeted teacher

training, provision of SDG-focused teaching resources, and policy reforms that prioritize the integration of sustainable development into educational frameworks.

Methodology

This study adopted a descriptive survey design to investigate the potential of Social Studies education in achieving the Sustainable Development Goals (SDGs) in secondary schools in the North Central Zone of Nigeria. A descriptive survey design was chosen as it facilitates the collection, analysis and interpretation of data to understand the characteristics, opinions and perceptions of the respondents concerning the phenomenon under investigation. The study focused on three states in the North Central Zone of Nigeria: Niger, Plateau, and Benue. This zone was selected due to its diverse socio-cultural and ethnic composition which provides a unique context for examining how Social Studies education can address issues central to sustainable development. The population of the study consisted of four hundred eighty-five thousand five hundred and twenty-one (485,521) Social Studies teachers and students in junior secondary schools within the selected states. These groups are directly involved in Social Studies education and they provided valuable insights into its role in promoting the SDGs. The targeted sample size for this study was 900 respondents comprising of 300 participants each from two schools in Niger, two schools in Plateau and two schools in Benue States to make up six (6) schools under study. The sample included Social Studies teachers and students selected using a multi-stage random sampling technique to ensure representativeness. The primary data collection instruments was structured questionnaire titled *"Potential of Social Studies Education in Achieving SDGs (PSS-SDG)"* that was used to gather quantitative data. The research instruments was reviewed by three experts in Social Studies Education, Ahmadu Bello University Zaria, Nigerian. A pilot study was conducted with a small sample from a non-targeted area within the North Central Zone to refine the instruments. The reliability of the questionnaire was determined using the test-retest method and a reliability coefficient of 0.78 computed using Cronbach's alpha. The data collection involved the administration of the questionnaire issued to three (3) trained research assistants. Respondents completed the questionnaire during school hours. Statistical tools of Mean and Standard Deviation were used to summarize the responses to the research questions.

Result and Discussions

Research Question one: To what extent does Social Studies education in secondary schools correspond with the principles and objectives of the SDGs in the North Central Zone, Nigeria?

Table One: ***Mean and Standard Deviation of Responses of Students and Teachers on the Alignment of Social Studies Education with SDG Principles*** **(N = 900)**

S/n	Items	Students			Teachers		
		$\overline{X}$	SD	Decision	$\overline{X}$	SD	Decision
1	Social Studies promotes awareness of environmental sustainability.	3.45	1.12	Accepted	3.51	1.08	Accepted
2	The curriculum of Social Studies addresses social justice and equity issues.	3.27	1.24	Accepted	3.33	1.19	Accepted
3	Social Studies exposes students to global citizenship values in line with SDGs.	3.30	1.21	Accepted	3.36	1.25	Accepted
4	Lessons in Social Studies adequately reflect goals such as gender equality and quality education.	3.10	1.36	Accepted	3.0	1.31	Accepted

Table 1 reveals that both students and teachers perceive Social Studies education as aligning with SDG principles. The highest agreement was seen in promoting environmental sustainability and global citizenship. These findings align with the view of UNESCO (2021) which asserts that Social Studies plays a foundational role in building SDG competencies like critical thinking, civic responsibility, and sustainability awareness.

Research Question 2: How prepared are Social Studies teachers to incorporate SDG-related themes into their teaching practices in the North Central Zone, Nigeria?

Table Two: ***Mean and Standard Deviation of Responses of Students and Teachers on Teachers' Preparedness for Integrating SDG Themes*** **(N = 900).**

S/n	Items	Students			Teachers		
		$\overline{X}$	SD	Decision	$\overline{X}$	SD	Decision
1	Social Studies teachers are knowledgeable about the SDGs.	3.12	1.28	Accepted	3.28	117	Accepted
2	Teachers receive regular training on integrating SDG themes into lessons.	2.81	1.33	Rejected	2.94	1.38	Rejected
3	Teachers use instructional materials that support SDG topics.	3.04	1.19	Accepted	3.09	1.22	Accepted
4	Teachers relate current issues to SDG goals in classroom discussions.	3.16	1.25	Accepted	3.22	1.31	Accepted

From Table 2, it is evident that while teachers and students recognize some level of preparedness in integrating SDG-related topics, training remains a weak point. Most respondents disagreed that teachers receive regular capacity-building workshops. This supports Eze & Okeh (2020) who found that inadequate professional development limits effective implementation of global education themes in Nigerian secondary schools.

Research Question 3: What are the challenges faced by teachers in integrating SDG concepts into Social Studies education in secondary schools in the North Central Zone, Nigeria?

Table Three: ***Mean and Standard Deviation of Responses of Students and Teachers on Challenges in Integrating SDGs into Social Studies Education*** **(N = 900)**

S/n	Items	Students			Teachers		
		$\overline{X}$	SD	Decision	$\overline{X}$	SD	Decision
1	There is a lack of adequate instructional materials tailored toward SDG integration.	3.42	1.29	Accepted	3.58	1.22	Accepted
2	Teachers lack the required training and professional support to teach SDG-related content.	3.25	1.26	Accepted	3.47	1.20	Accepted
3	Overloaded curriculum prevents thorough coverage of SDG topics.	3.36	1.22	Accepted	3.40	1.18	Accepted
4	There is insufficient collaboration with external agencies supporting SDG education.	3.09	1.30	Accepted	3.15	1.27	Accepted

Table 3 identifies the major barriers to SDG integration in Social Studies education, including insufficient training, inadequate materials, and lack of collaboration with stakeholders. These findings echo the observations of Yusuf & Adeleke (2021) who note that teacher capacity and system-level support are critical for embedding SDG values into school curricula effectively.

Conclusion

This study investigated the extent to which Social Studies education aligns with the principles of the Sustainable Development Goals (SDGs), the preparedness of teachers to integrate SDG themes and the challenges encountered in this integration process within secondary schools in the North Central Zone of Nigeria. Findings revealed that Social Studies as a subject has strong potential to promote sustainable development through its content, which encourages environmental awareness, civic engagement, gender equality and responsible citizenship. However, the study also identified the challenges such as lack of teacher training, inadequate instructional materials and limited institutional support, which hinder effective implementation. While teachers show willingness and basic knowledge of the SDGs, there is a need for greater structural support and curriculum enhancement to fully unlock the transformative power of Social Studies education for sustainable development in Nigeria.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. The Federal Ministry of Education, in collaboration with curriculum developers (e.g., NERDC), should ensure that Social Studies curricula are explicitly aligned with SDG targets, with specific themes, case studies, and project-based learning modules.
2. Regular workshops, seminars, and professional development programs should be organized for Social Studies teachers to improve their understanding and ability to integrate SDG-related themes into classroom teaching.
3. Schools should be equipped with modern teaching materials, visual aids, and digital content that focus on sustainable development, global citizenship, and social justice.
4. Government and educational institutions should collaborate with NGOs, development partners, and international organizations to support SDG education through sponsorship, materials, and technical assistance.
5. School administrators and education boards should develop evaluation mechanisms to regularly assess how well SDG-related content is being implemented in Social Studies education.

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PERCEPTION AND READINESS ON THE ADOPTION OF ROBOTIC TECHNOLOGIES FOR ENHANCING ENVIRONMENTAL SANITATION PRACTICES IN FCT COLLEGE OF EDUCATION ZUBA, ABUJA, NIGERIA

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Abstract

This study examined the perception and readiness on the adoption of robotic technologies for enhancing environmental sanitation practices in FCT College of Education Zuba, Abuja, Nigeria. The study focused on three core areas: the level of awareness and perception of robotic sanitation technologies among staff and students, the perceived benefits of using such technologies and the challenges anticipated in their implementation. A descriptive survey design was adopted. The population of the study consisted of 3580 NCE I to NCE III students and 743 academic and non-academic staff that amount to 4,323 individuals as of the 2024/2025 academic year at the FCT College of Education Zuba, Abuja. The population was first stratified into two main groups (staff and students). Also, random sampling was used to select participants' proportionate size. The sample size was determine using Taro Yamane formula to obtained a total sample size of 303 students and 63 academic and non-academic staff to make up a total of 366 respondents selected. The data was collected using

a structured questionnaire titled "(AROTESQ), designed on a 4-point Likert scale of Strongly Agree (4), Agree (3), Strongly Disagree (2) and Disagree (1). The results revealed a moderate to high level of awareness and a generally positive perception toward robotic technologies for enhancing environmental sanitation practices. Respondents identified significant benefits such as reduced human exposure to waste, consistency in cleaning, improved access to difficult areas and time and labour efficiency. However, key challenges highlighted include the high cost of robotic systems, limited technical expertise, job security concerns and potential maintenance issues. The study concludes that while the adoption of robotic sanitation systems holds great promise, it requires strategic planning, capacity building and institutional readiness to overcome the identified challenges and ensure sustainability.

Keywords: Robotic Technology, Environmental Sanitation, FCT College of Education Zuba, Abuja.

Introduction

Environmental sanitation remains a cornerstone for public health and sustainable development especially within the educational institutions where high human traffic and dense population can exacerbate hygiene-related issues. As institutions strive to maintain cleanliness and ensure a healthy learning environment, there is a growing need to investigate innovative and efficient methods of waste management and sanitation. One of the most promising advancements in this area is the integration of robotic technologies to support and enhance environmental sanitation practices (Fadare & Oyedele, 2022). Thus, in advance countries such as Japan, China, Germany, United States, South Korea, Sweden, Singapore amongst others robotic technologies have increasingly become central to various sectors such as; manufacturing industries, healthcare, agriculture and more recently, environmental management. These technologies offer a unique advantage in performing repetitive, hazardous or labour-intensive tasks with higher precision that reduced human error and improved efficiency (Kumar & Singh, 2020).

In the context of sanitation, robots can be programmed to perform tasks such as street sweeping, waste segregation, disinfection and litter collection which are critical for maintaining hygiene standards especially in institutional settings (Adebayo & Okonkwo, 2023). Accordingly, the adoption of robotic solutions for environmental sanitation is not only about automation but also about sustainability and resilience. For instance, during the outbreak of the COVID-19 pandemic which almost affected the whole nation, the importance of hygiene and sanitization has been brought to the forefront globally. Robotic technologies were rapidly deployed in many countries for disinfecting public spaces, hospitals and schools by demonstrating their effectiveness and potential for broader applications (Zeng, Chen & Lew, 2021).

In educational institutions, where traditional methods of sanitation often rely heavily on manual labour and are subject to human limitations, robotic systems present an opportunity for a paradigm shift toward smarter and safer sanitation (Ajayi & Eze, 2021). In Nigeria, however, the adoption of such advanced technologies remains limited, largely due to factors such as cost, lack of awareness, infrastructural deficits and resistance to change. There is a gap in research and implementation within educational settings particularly in Colleges of Education that serve as training grounds for future teachers and professionals. For instance, the FCT College of Education Zuba located in Nigeria's presents a relevant case for investigating the awareness, readiness and potential of adopting robotic technologies to address its sanitation needs.

This study is therefore, poised to unveiled the level of awareness and perception among staff and students regarding robotic technologies for enhancing environmental sanitation practices in FCT College of Education Zuba, Abuja, Nigeria, it's assesses the potential benefits and identify the challenges that may hinder the implementation of robotic technologies within the College arena. generally, it aims to contribute to the growing body of knowledge on smart environmental management systems in Nigeria and offer practical insights into how robotic technologies can be integrated into the sanitation framework of tertiary educational institutions.

Statement of Problem

Environmental sanitation in tertiary institutions like FCT College of Education Zuba, Abuja is often challenged by limited manpower, inadequate facilities and reliance on manual cleaning methods. These traditional practices are insufficient to meet the growing hygiene demands of a densely populated academic environment. While robotic technologies offer innovative solutions for automated cleaning and waste management, their adoption in Nigerian Colleges remains low due to limited awareness, technical constraints and infrastructural gaps. There is also a lack of research on stakeholders' perceptions and institutional readiness for such technologies. This study seeks to fill that gap by unveiling the perception and readiness on the adopting of robotic technologies for enhancing environmental sanitation practices in FCT College of Education Zuba, Abuja, Nigeria.

Justification of the Study

This study is timely and relevant given the growing need for innovation in environmental sanitation, especially in academic environments where cleanliness directly impacts learning outcomes and public health. The adoption of robotic technologies represents a forward-looking approach that aligns with global trends in smart campus development and sustainable environmental management. The FCT College of Education Zuba, Abuja serves as a training ground for future educators and professionals, and this make it an ideal setting to pioneer such technological advancements.

Investigating the awareness, perceived benefits and challenges of adopting robotic sanitation systems will not only inform policy and administrative decisions at the institutional level but also contribute to broader national conversations around digital transformation in education and environmental sustainability. Indeed, the study will provide data that can guide the design of training programmes, infrastructure development and partnerships with technology providers. It will also add to the limited body of literature on the integration of robotics in sanitation within Nigeria's educational context and also will serve as a reference point for future research and development initiatives.

Objectives of the Study

The main objective of this study is to unveil the perception and readiness on the adoption of robotic technologies for enhancing environmental sanitation practices in FCT College of Education Zuba, Abuja.

Specifically, the study seeks to:

1. Examine the level of awareness and perception of staff and students regarding the adoption of robotic technologies for environmental sanitation in the College.
2. Identify the perceived potential benefits of using robotic technologies to improve environmental sanitation practices in the institution.
3. Investigate the anticipated challenges and limitations associated with the implementation of robotic sanitation technologies in the College.

Research Questions

The following research questions guided the study:

1. What is the level of awareness and perception of staff and students regarding the adoption of robotic technologies for

environmental sanitation practices in the FCT College of Education Zuba, Abuja?

2. What are the perceived potential benefits of adopting robotic technologies for improving environmental sanitation practices in the FCT College of Education Zuba, Abuja?
3. What challenges and limitations are anticipated in implementing robotic technologies for environmental sanitation in the FCT College of Education Zuba, Abuja?

Literature Review

Concept of Environmental Sanitation

Environmental sanitation refers to the management of environmental conditions to promote health and prevent disease particularly through proper waste disposal, hygiene maintenance and pollution control (World Health Organization, 2020). In educational institutions, the importance of sanitation cannot be overemphasized as it directly affects the health, productivity and learning outcomes of students and staff. In many Nigerian institutions, sanitation practices are often hindered by inadequate personnel, lack of funding and poor maintenance culture (Adejumo & Olayinka, 2022). The need for more efficient and sustainable approaches to environmental cleanliness has led to the exploration of innovative technological solutions.

Theoretical Framework

The adoption of robotic technologies is often analyzed using the Technology Acceptance Model (TAM) developed by Davis (1989) which emphasizes perceived usefulness and perceived ease of use as key determinants of technology adoption. Extended versions of TAM have incorporated variables such as perceived risk, trust and facilitating conditions. In educational institutions, acceptance of robotics is influenced not only by users' perceptions but also by institutional readiness, availability of funding and policy support (Ajibade & Mutula, 2021).

Robotic Technologies in Environmental Sanitation

Robotic technologies are increasingly being integrated into various sectors including healthcare, manufacturing, security and environmental management. In the context of sanitation, robots can be designed to perform tasks such as floor cleaning, waste collection, vacuuming and even disinfection especially in areas difficult or dangerous for humans to access (Zeng *et al.*, 2021). These technologies are not only efficient but also reduce exposure to biohazards, improve consistency in cleaning standards and lower long-term operational costs (Kumar & Singh, 2020). Globally, countries like China and South Korea have deployed cleaning and disinfection robots in hospitals and public places particularly during the COVID-19 pandemic, proving their effectiveness in real-time applications.

Awareness and Perception of Robotic Sanitation Solutions

Awareness plays a vital role in the acceptance and successful integration of new technologies. In developing countries particularly Nigeria, awareness of robotic sanitation tools is still relatively low especially within public institutions (Fadare & Oyedele, 2022). A lack of exposure to robotics in education, inadequate training opportunities and resistance to change often contribute to negative perceptions or disinterest in such innovations. Studies by Ajayi & Eze, (2021) have shown that positive perception is often tied to prior knowledge, perceived usefulness and institutional readiness for technological change.

Benefits of Robotic Technologies in Sanitation

The benefits of robotic sanitation technologies are multifaceted. These include improved efficiency, reduced labour costs, enhanced safety for sanitation workers and consistency in performance (Bharadwaj & Srivastava, 2021). In academic institutions, automated systems could ease the burden on overstretched

cleaning staff, promote cleaner environments conducive to learning and set an example for adopting sustainable innovations. Also, the use of robotics aligns with global efforts to achieve some of the United Nations Sustainable Development Goals (SDGs), particularly SDG 6 (clean water and sanitation) and SDG 9 (industry, innovation and infrastructure) (UNDP, 2022).

Challenges to Adoption of Robotic Technologies

Regardless of the apparent benefits, several barriers hinder the adoption of robotic technologies in Nigeria's educational institutions. These include high initial costs, poor infrastructure (e.g., unreliable electricity), lack of technical expertise and limited policy support for technological innovation (Adebayo & Okonkwo, 2023). Also, the absence of local manufacturers and dependence on imported robotic systems make maintenance and adaptation difficult. Institutional bureaucracy and skepticism from stakeholders can also impede progress.

Empirical Review

Several studies have empirically examined the application of robotic technologies in environmental and educational contexts. According to Kumar & Singh (2020) conducted a study on the use of robotics in smart waste management across urban centers in India. They found that robotic systems significantly reduced human exposure to waste and improved the efficiency of waste collection in dense areas. Their findings support the potential of robotics for sanitation in institutions with high population density. Zeng et al. (2021) evaluate the role of service robots in public disinfection during the COVID-19 pandemic. Their research in Chinese public facilities demonstrated that robots were effective in maintaining consistent hygiene standards, especially in high-risk areas such as schools and hospitals.

In the same vein, Fadare & Oyedele (2022) investigated the readiness of Nigerian institutions to adopt smart sanitation systems. Their findings indicated that while the interest in automation exists, awareness is low and institutional frameworks to support robotics are underdeveloped. Ajayi & Eze (2021) assessed perceptions of smart technologies among Nigerian tertiary institution staff and students. They reported that awareness campaigns, demonstrations, and inclusion in academic curricula significantly influenced willingness to embrace robotic technologies. Adebayo & Okonkwo (2023) reviewed barriers to robotic innovation in Nigerian urban environments. Their study pointed to infrastructural deficits, policy gaps and lack of skilled personnel as the primary hindrances to adoption.

Research Methodology

Research Design

The study adopted a descriptive survey research design. This design was deemed appropriate because it enabled the researcher to gather data from a representative sample of staff and students to assess their awareness, perceptions and perceived challenges regarding the adoption of robotic technologies for environmental sanitation. The survey approach allowed for the collection of data on current attitudes, opinions, and institutional readiness without manipulating any variables.

Population of the Study

The population of the study consisted of four thousand three hundred and twenty-three (4,323) academic and non-academic staff as well as students of the FCT College of Education Zuba, Abuja. As of the 2024/2025 academic year, the College had an estimated population of 3580 students comprises of 1182 NCE 1, 971 NCE 2 and 1427 NCE 3 students, while the academic and non-academicstaff members population amount to 743 making a total population of 4,323 individuals in all.

Sample and Sampling Techniques

To obtain a representative sample of the population, the study employed a stratified random sampling technique. The population was first stratified into two main groups: staff

and students. From each group, random sampling was used to select participants proportionately to their size was based on the total population of 4,323. To determine the appropriate sample size, the Taro Yamane formula was used:

$$n = \frac{N}{1 + N\,(e)^2}$$

Where:

n = sample size
N = population size (4,323)
e = level of precision (margin of error), usually **0.05 (5%)**

Thus, a total sample size of 366 respondents was selected.

Instrumentation for Data Collection

The primary instrument used for data collection was a structured questionnaire titled "***Adoption of Robotic Technologies for Environmental Sanitation Questionnaire (AROTESQ).***" The questionnaire items were rated using a 4-point Likert scale of Strongly Agree (4), Agree (3), Strongly Disagree (2) and Disagree (1).

Validation of Instrument

The instrument was subjected to face and content validation by two experts: one in Educational Technology and another one in Environmental Studies at the University of Abuja, Abuja. Their suggestions and recommendations were incorporated to improve clarity, relevance and objectivity of the items.

Reliability of Instrument

A pilot study was conducted using 30 respondents from a similar College (FCE Kontagora) who were not part of the main study. The Cronbach's Alpha was computed to test internal consistency and the reliability coefficient obtained was 0.82, indicating that the instrument was reliable.

Method of Data Collection

The researcher with the aid of trained research assistants administered the questionnaire physically to the respondents in the study area. Respondents were briefed on the purpose of the study and their participation was voluntary. The data collection took place over a period of one week.

Method of Data Analysis

Data collected from the field were analyzed using both descriptivestatistics of mean score and standard deviations. Thus, mean score of 2.50 and above was considered as an agreement threshold, while mean scores below 2.50 were considered disagreement.

Data Analysis and Results

Research Questions 1: What is the level of awareness and perception of staff and students regarding the adoption of robotic technologies for environmental sanitation practices in the FCT College of Education Zuba, Abuja?

Table 2: Mean and Standard Deviation of Responses on theLevel of Awareness and Perception of Staff and Students Regarding the Adoption of Robotic Technologies for Environmental Sanitation Practices. N366

S/n	Items	SA	A	D	SD	Mean ($\bar{x}$)	Std. Dev. (σ)	Decision
1	I am aware of what robotic technology means.	120	150	60	36	3.24	0.86	Agree
2	I have seen or heard of robots being used for sanitation.	90	145	85	46	3.04	0.94	Agree
3	I believe robotic sanitation can improve cleanliness in the College.	135	140	55	36	3.27	0.89	Agree
4	The college should consider adopting robotic sanitation systems.	145	130	50	41	3.29	0.91	Agree

Source: Field Survey, 2025.

The data in Table 2 shows the level of awareness and perception of staff and students regarding the adoption of robotic technologies for environmental sanitation practices in FCT College of Education Zuba, Abuja. All the four items in the table received mean scores above 3.00, indicating general agreement among respondents. Therefore, there is a moderate to high level of awareness and positive perception among staff and students regarding robotic technologies for sanitation. While not everyone has directly encountered robotic sanitation systems, most respondents understand what robotic technology means and believe it would be beneficial for the College. The strong agreement on adoption indicates openness to innovation in sanitation methods.

Research Questions 2: What are the perceived potential benefits of adopting robotic technologies for improving environmental sanitation practices in the FCT College of Education Zuba, Abuja?

Table 3: Mean and Standard Deviation of Responses on thePerceived Potential Benefits of Adopting Robotic Technologies for Improving Environmental Sanitation Practices N366.

S/n	Items	SA	A	D	SD	Mean ($\bar{x}$)	Std. Dev. (σ)	Decision
1	Robotic sanitation reduces human exposure to waste.	150	135	55	26	3.36	0.84	Agree
2	Using robots can ensure consistent cleaning routines.	140	140	60	26	3.34	0.82	Agree
3	Robotics can improve sanitation in hard-to-reach areas.	130	145	55	36	3.26	0.88	Agree
4	Robotic technologies can save labor and time.	138	150	48	30	3.32	0.86	Agree

Source: Field Survey, 2025.

The data in Table 3 indicatesthe perceived potential benefits of adopting robotic technologies for improving environmental sanitation practices in FCT College of Education Zuba, Abuja. The findings mean scores for all items range from 3.36 which shows consistent agreement. The respondents recognize multiple benefits of robotic sanitation to enhanced hygiene through reduced human exposure, consistent and reliable cleaning routines, improved access to difficult areas and saving of labour and time. This reflects a strong belief in the efficiency and effectiveness of robotics in sanitation tasks.

Research Questions 3: What challenges and limitations are anticipated in implementing robotic technologies for environmental sanitation in the FCT College of Education Zuba, Abuja?

Table 4: Mean and Standard Deviation of Responses on theChallenges and Limitations are Anticipated in Implementing Robotic Technologies for Environmental Sanitation N366.

S/n	Items	SA	A	D	SD	Mean ($\bar{x}$)	Std. Dev. (σ)	Decision
1	The cost of robotic sanitation systems is a major concern.	160	130	45	31	3.36	0.87	Agree
2	Lack of technical know-how can hinder their adoption.	150	125	55	36	3.27	0.90	Agree
3	I do not think that job security will be negatively impacted by adopting robotic systems.	70	100	140	56	2.34	1.02	Disagree
4	I doubt that maintenance and repairs of robotic systems will be a significant problem.	65	95	155	51	2.28	0.95	Disagree

Source: Field Survey, 2025.

The data in Table 4 shows the challenges and limitations are anticipated in implementing robotic technologies for environmental sanitation in the FCT College of Education Zuba, Abuja. Overall, the findings show that stakeholders at the FCT College of Education Zuba anticipate several key challenges in implementing robotic technologies for environmental sanitation. In Item 1 of this table 4 the respondents agreed that the cost of robotic sanitation systems poses a major challenge with mean score of 3.36, while Item 2 also agreement that insufficient technical know-how could hinder implementation with mean score of 3.27. In item 3 and item 4, The respondents disagreed with the statement that job security will not be negatively impacted with mean score below 2.50, and thatthe idea that maintenance and repair would not be an issue with mean score of 2.28 Overall, the findings show that stakeholders at the FCT College of Education Zuba anticipate several key challenges in implementing robotic sanitation technologies which includes; high costs, lack of expertise, job security concerns and maintenance difficulties. These challenges need to be addressed strategically for any robotics-based sanitation initiative to succeed.

Discussion of Results

The analysis from Table 2 indicates a moderate to high level of awareness among staff and students about robotic technologies. Most respondents are familiar with the concept of robotics and hold a positive perception towards its application in sanitation. This supports the view of Fadare & Oyedele (2022) who asserted that awareness is a fundamental precursor to the successful integration of robotic technologies in public institutions especially in developing countries like Nigeria. However, the finding also mirrors the concern raised by Ajayi & Eze (2021) that while perception may be positive, actual exposure to robotics is often limited due to inadequate training and infrastructural constraints.

Also, data from Table 3 shows that respondents acknowledge the numerous benefits of robotic sanitation which is ranging from; reduced human exposure to waste, consistent cleaning routines, improved access to hard-to-reach areas and labour and time savings. These perceived benefits is closely aligned with the findings of Bharadwaj & Srivastava (2021) and Kumar & Singh (2020) who highlighted that robotic systems can enhance operational efficiency, worker safety and cleanliness standards. Moreover, the findings echo global experiences as noted by

Zeng et al. (2021), where cleaning and disinfection robots proved effective particularly in public settings during the COVID-19 pandemic.

Table 4 reveals that respondents foresee significant challenges to the adoption of robotic sanitation systems with the most notable being; high cost of acquisition, lack of technical expertise, concerns about job displacement and doubts about maintenance and repair capabilities. These challenges echo the concerns outlined by Adebayo & Okonkwo (2023) who emphasized that in the Nigerian context, infrastructural deficits, cost implications and limited local expertise are major barriers to robotics adoption. The skepticism about maintenance and job security also confirms the resistance to change highlighted by Fadare & Oyedele (2022) which is often due to insufficient policy support and institutional preparedness.

Conclusion

The findings of this study emphasize the potential of robotic technologies in enhancing environmental sanitation practices within educational institutions particularly at the FCT College of Education Zuba. There is a generally positive attitude and moderate awareness among staff and students regarding the use of robotic systems in sanitation. The perceived benefits are consistent with global trends pointing to improved hygiene, safety and operational efficiency. Nonetheless, the study also highlights critical challenges such as high initial costs, lack of technical expertise, job security concerns and maintenance issues that could hinder implementation. Therefore, while the integration of robotics into environmental sanitation practices is desirable and timely, it must be supported by adequate funding, training, infrastructure, and policy support to achieve effective and sustainable outcomes.

Recommendations

Based on the findings, the following recommendations emerged;

1. The College management should organize workshops, seminars and training sessions to increase awareness and understanding of robotic sanitation systems among staff and students.
2. The government, private sector and development partners should provide financial support to subsidize the cost of acquiring and maintaining robotic sanitation equipment.
3. Institutions should collaborate with robotics and technology companies to build local technical capacity for installation, operation, and maintenance of robotic systems.
4. Clear institutional and national policies should be formulated to support the integration of robotics in sanitation, including frameworks for sustainability, procurement, and workforce transition.
5. The College should consider initiating pilot projects on robotic sanitation in selected high-traffic areas within the campus to demonstrate feasibility and assess real-world outcomes before full-scale adoption.
6. Involve all stakeholders including students, staff, administrators, and community leaders in the planning and decision-making process to foster buy-in and reduce resistance.

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ECONOMIC AND SOCIAL IMPLICATIONS OF DRUG ABUSE IN A SOCIETY AND THE WAY FORWARD

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Abstract

Drug abuse is a significant social and economic problem that affects individuals, families, communities, and society as a whole. The negative effects of drug abuse are far-reaching and can have a devastating impact on all aspects of life. As such this paper tends to x-ray some of the negative effects drug abuse can significantly impact on a society and the economy at large. It leads to lost productivity, increased

healthcare costs, and higher crime rates. The paper also examines some social implications of drug abuse on society including an increase in the number of broken families, child neglect, and social isolation. It also contributes to violence, social unrest, and a decline in the quality of life in communities. As a way forward, the paper highlights some preventive measures, treatment measures, law enforcement, and community support to address the problem of drug abuse in society. By taking a comprehensive approach to the problem of drug abuse, a healthier and safer society can be created for everyone.

Keywords: Economic, Social, Implications and Drug Abuse.

Introduction

We all want our children and loved ones to be healthy, and we want neighborhoods and countries to be safe. The whole of the international community shares the same goals of protecting the health and welfare of people everywhere. It is popularly believed that the youths of any society are the leaders of tomorrow. They are the vehicles through which positive changes can be realized. This is why many tend to invest in the future development of their youths. A substantial amount of time and resources are often expended by parents, stakeholders as well as the government so as to explore and harness the youth's available potentialities.

As such, any society that consciously or unconsciously ignores the development of its youth may tend to have its future national development affected negatively. According to Radda (2005), when youth are neglected, they tend to find escape and solace in such things as drug abuse, pick-pocketing, loitering, rape, auto theft, truancy, delinquent or criminal act, and insurgency. But most often, we tend to forget the basic shared etiquette when it comes to debates on issues of drug policy which is rooted in the fact that drug use for non-medical purposes is harmful.

The United Nations Office on Drugs and Crime, UNODC (2022), succinctly put it that the use of drugs by adolescents in their early stage is harmful and often puts their mental health in danger World drug challenges further complicate the picture. Records have shown that the production of cocaine is high, and markets for drugs (methamphetamine and amphetamine) are fast expanding and skyrocketing to new and more vulnerable regions.

It is obvious that the cultivation of illicit drugs can only further the impoverishment of affected communities particularly in the long run. The UNODC (2022) observed that the rule of law, as well as its stability, are undermined due to the impact drugs exert on the environment through drug trafficking and illicit flow associated with corruption.

Illicit drug markets are linked with violence and other forms of crime. Drugs can fuel and prolong the conflict, and the destabilizing effects as well as the social and economic costs which hinder sustainable development.

The Concepts of "Drug" and "Drug Abuse"

Drugs are often viewed by various scholars and researchers in different ways. For instance, UNODC (2022) define drug as anything that when consumed by a living organism tends to alter one or a myriad of its functions. Owing to their chemical nature, drugs (legal or illegal) alter body functions, and how people think, perceive things, or act. These include substances that are useful or harmful to the body. Researches have shown that there are numerous ways through which drug administration can be done. For instance, drugs are injected, chewed, and smoked while others are sniffed (UNODC, 2022 & Radda, 2005). Also, Ghodse (2003) viewed drugs as substances that other than those required for the conservation of normal health modify some certain processes within the body of the

organism when consumed. On the other hand, in the field of medicine, drugs are considered to be elements that have curative or preventative capabilities against diseases (Kawugana and Faruna, 2018).

According to Matowo (2013), the drugs that are beneficial to humanity may also be the same drugs that are detrimental to mankind. He posited that drugs that are meant to cure diseases and to alleviate sick human condition may however be misused over-the-counter drugs and this is called drug abuse. It has become a social problem because it has afflicted the family, the economy, and the community. Drug and alcohol abuse in our nation's teenagers has become a major public health issue. Matowo further elaborates that drug abuse is any use of drug for non-medical purposes almost always for altering consciousness. That is, it simply refers to substances that change the mental or physical state of a person and that may be used repeatedly for that effect leading to abnormality. More succinctly put, Fatima (2017) posited that drug abuse is an illicit, non-medical use of a limited number of substances that have the properties and strength to alter the mental state of a being in ways that are considered by social norms and defined by statute to be inappropriate, undesirable, harmful and threatening to the life of the user and to the society at large. For instance, Alcohol, heroin, cocaine, opium, marijuana, *sheesha,* faeces, to mention but a few, are some of the harmful substances abused.

Types of Drugs

A drug prescribed by a physician is referred to as medicine (Sahu and Sahu, 2012). Such drugs are often referred to as prescription drugs and can only be authorized by professional and licensed medical practitioners. Over-the-counter drugs are usually referred to as OK drugs and sold without any essential prescription (Akinkuoto, 2020). In view of this, Fatima (2017) highlighted the following four typologies of substance abuse:

- **Depressants:** central nervous system depressants are some of the most widely used and abused drugs in existence. They are believed to relieve stress and anxiety, and some induce sleep. Depressants produce a host of other side effects including problems of dependence. Alcohol is the most common depressant used to ease tension, cause relaxation, or help users forget their problems.
- **Stimulants**: stimulants are substances that act on the central nervous system. The user experiences pleasant effects initially, such as a sense of increased energy and sometimes a state of euphoria. A typical example of a major central nervous system (CNS) stimulant is cocaine. Other minor stimulants include coffee, tea, and some soft drinks.
- **Hallucinogens:** Hallucinogens are substances that alter sensory processing in the brain, causing perceptual disturbances, and changes in thought processing include volatile solvents and aromatic hydrocarbons.
- **Marijuana:** This is a vegetable substance sometimes referred to as Cannabis Sativa. It consists of dried and crushed leaves, flowers, stems, and seeds. It has some sedative effects.

Similarly, UNODC (2022), in its report highlighted the prevalent of the following types of substance abuse especially in developing economies.

- **Tranquilizers:** Tranquilizers are believed to produce calmness without bringing on drowsiness. Examples of such drugs include Librium, Valium.
- **Narcotics:** Are drugs that cause drowsiness or induce sleep and can also relieve pain. They include opium, heroin, morphine, codeine, and pethidine. Heroin is perhaps the most dangerous of all these when injected. It produces dream world where all cares and worries disappear, physical pain diminishes, fear disappear, foolish courage develops and natural inhibitions are dropped. As a result,

sexual permissiveness, dare-devilry, aggressiveness, and recklessness in driving. Narcotics are generally believed to have adverse consequences for human health. They are also believed to increase criminal acts, increase sexual appetite, and lead to dependency and addiction.

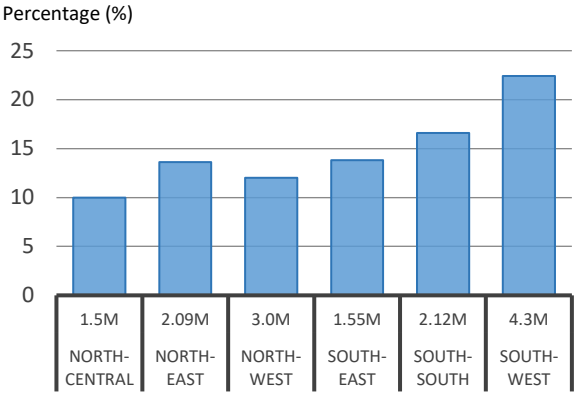
- **Miscellaneous Group:** This group includes inhalants like *nitrous* oxide, volatile solvents and household products like glues, spot removers, tube repair kits or *sholisho*, *sheesha*, animal faeces, etc.

Prevalence of "Drug Abuse" in Nigeria

The UNODC's 2021 World Drug Report highlights the need to close the gap between perception and reality to educate young people and safeguard public health." The report observed that between 2010 and 2019, the number of people using drugs increased by 22 percent. It linked the increase to the growing global population, and following the demographic changes, it is projected that by 2030, the number of people using drugs will have further increased by 11 percent. In 2019, joint research by the National Bureau of Statistics (NBS) and the Centre for Research and Information on Substance Abuse (CRISA) with technical support from the UNODC, revealed a damning account of rising drug use in Nigeria, noting that as of the time of the research, 14.3 million Nigerians aged between 15 and 64 years engaged in drug use. But the latest report by the UNODC hints of a sharp degeneration above the global average in the near future.

According to the report, instead of the expected 11 per cent increase in the global number of drug users by 2030, the projection is 40 per cent in Nigeria, and the whole of Africa. In Nigeria, this would signify that the country will have to grapple with approximately 20 million drug users by 2030, further deepening the public health and public security challenge," the report stated. The statistics also say 11 million Nigerians took to cannabis as of 2018 while 4.6 million and 2.4 million others were said to have used *opioids* and cough syrups, respectively. Other substances said to have been commonly taken in Nigeria include tranquilizers and sedatives, solvents, and inhalers, among others.

According to the data, the prevalence of drug use in Nigeria on a geopolitical zonal basis reveals that the South-west tops the chart with about 4.382 million users amounting to 22.4 percent of Nigeria's total figure of 14.3 million users. The South-west comprises Lagos, Ogun, Oyo, Osun, Ondo, and Ekiti states.



Source: NBS, CRISA and UNODC Report on drug use and health in Nigeria, 2018 **Prevalence of Drug-abuse in Nigeria**

The North-west zone, comprising Kano, Sokoto, Kaduna, Zamfara, Katsina and Kebbi States closely follows the South West with 3 million drug users as of 2018, while the South-south region of Edo, Delta, Rivers, Cross River, Bayelsa and Akwa Ibom States ranks hird with 2.124 million users. The country's region that is already ravaged by long years of conflict, that is, the North-east, comprising Borno, Yobe, Bauchi, Taraba, Adamawa and Gombe States, recorded 2.09 million users to rank 4th on the log. The South East zone of Abia, Imo, Anambra, Enugu and Ebonyi States recorded about 1.55 million drug users while the North Central zone of Kwara, Kogi, Benue, Niger, Nasarawa and the Federal Capital Territory recorded 1.5 million users to take 5th and 6th positions respectively.

Many reasons account for the increase cases of drug use and abuse in Nigeria. Some the reasons include poor economic condition, rising cases of illiteracy, marriage crisis, polygamy and large family, among others. Also, findings through the patients have shown that anywhere the male

parent is absent or has less economic power, which he described as super-ego, the children tend to take substances. The immediate past registrar of the University of Lagos, Taiwo Ipaye, linked the crisis to the breakdown in the country's socio-cultural values. She said the family value is no longer entrenched as was the practice in the past (Premium Times, June, 26th 2021).

Causes of drug abuse among Nigerian youths

Several factors are responsible for drug abuse among the Nigerian youths today. Some of these factors are highlighted as follow:

- **Economic factors**: Economic factors such as unemployment, poverty and low cost of drugs contribute to drug and substance abuse (Matowo, 2013). He went further to emphasize that the situations is aggravated by lack of skills, opportunities for training and re-training and lack of committed action to promote job creation by private and community entrepreneurs. Adolescents with personality problems arising from social conditions have been found to abuse drugs. According to Nyameh, Yakubu, Teru and Titus (2013), the socioeconomic status of most Nigerians is below average. Poverty is widespread, broken homes and unemployment is on the increase. Therefore, our youths roam the streets looking for employment or resort to begging. Frustration arising from these problems lead to recourse in drug abuse for temporarily removing the tension and problems arising from it.
- **Nonchalant attitude of parents and the community towards the youth**: According to Radda (2005), parents have not built strong and positive relationship with their children. They hardly sit with them and talk about the substance abuse. The parents also allow their children to engage in drug and substance peddling as long as they received something in return. Also, as a result of being busy working they are unable to supervise their children. The community to a large extent contributes towards this menace in the sense that there is lack of community ownership in this area. This leaves the youth with a gap to explore the use of drugs and substances. In addition, there's also unavailability of role model and those available exalts the use of alcohol and drug which makes it "cool".
- **Mass media influence**: Youth are sensitive to advertisement and copy quickly. Evidence abounds that children, youths and undergraduates who watch a lot of television programmes learn to rely on stereotypes of the various groups presented by the media. These children then transfer what they have learned from television to real life situations. This, if the stereotype is presented and always watched by adolescence who are curious and favours drugs taking, they will end up imbibing the culture of drug taking. The glamour in advertising alcohol and cigarette smoking makes the youth to practice what the advert depicts (Premium Times, June 26, 2021).
- **Peer Pressure**: Peer pressure plays a major role in influencing many adolescents into drug abuse. This is because peer pressure is a fact of teenage and youth life. As they try to depend less on parents, they show more dependency on their friends. In Nigeria, as other parts of the world, one may not enjoy the company of others unless he conforms to their norms (Fatima, 2017).
- **The Need for Energy to Work for Long Hours**: The increasing economic deterioration that leads to poverty and dis-empowerment of the people has driven many parents to send their children out in search of a means of earning something for contribution to family income (Sahu and Sahu, 2012). These children engage in hawking, bus conducting, head loading, scavenging, serving in food canteens etc., and are prone to drug taking so as to gain more energy to work for long hours.
- **Depression, emotional and psychological stresses:** Stress related events or activities which makes someone to be very sad and

disheartened such as anxiety, frustration, and economic depression often takes to drug or drink alcohol in order to forget their problem or becomes happy (Kawugana and faruna, 2018). This later on turns to a habit, hence drug abuse.

- **Experimental Curiosity**: according to Matowo (2013), curiosity to experiment the unknown facts about drugs motivate adolescents into drug use. The first experience in drug abuse produces a state of arousal such as happiness and pleasure which in turn motivate them to continue.
- **Stigmatization and withdrawal symptoms**: If a drug user stopped, the user experiences "stigmatization and withdrawal symptoms" from the public. The consequence of it is pain, anxiety, excessive sweating and shaking. The inability of the drug user to tolerate the symptoms motivates him to return and continue (Matawo, 2013).
- **The need to satisfy a spouse in bed**: Ghodse (2003) is of the opinion that the need to satisfy a partner sexually in bed prompt some men and women to take into drugs. They tend to prioritize sex over other responsibilities. Most of them use drugs to enable them satisfy either of their partner. A persistent use of these to drugs make them to become addicted.
- **Politicians**: Some of our politicians use our youths to achieve their aim of winning election at all cost. They tend to freely supply these youths with the drugs and encourage them to use it in order to carry out the operation. As a result, they become addicted (The Guardian, 2019).

Government efforts to fight drug and substance abuse in Nigeria

Over the years, several measures were put in place by the government to ameliorate the supply and consumption of drugs especially among youths in Nigeria. Hence trailing this to the Nigerian experience, Buhari in 1984 issued a decree which spelt out penalties for both pushers and users of drugs illicitly. This could not deter both the groups. With the coming of Babangida, the law was repealed and later replaced with the establishment of the National Drugs Law Enforcement Agency (NDLEA). All these have been government's indication and concern for the problem, an effort to nip in the bud the problem of drug and substance abuse but to no avail. Between January 21st and 24th, 1992, a joint session of academics, media practitioners, health and social workers and other related fields as well as Non-Governmental Organizations (NGOs) converged at the National Institute of Policies and Strategic Studies (NIPSS), Kuru, Jos Plateau State, for a national conference on the scourge of drugs abuse and trafficking. This gathering made several revelations which were worth noting:

First, it was opined that the menace of hard drugs itself is a product of the antisocial behaviors which are prevalent in the society, particularly corruption and the craze for ostentatious life styles which have driven people to this life styles in search for money at all cost.

Secondly, Nigeria has outgrown her unenviable stature of a mere conduit but has quickly grown to a drug consuming nation. The Rt. Rev. Dr. G. G. Ganaka, the Catholic Bishop of Jos in his work; The Role of Religious Organizations in the War against Drug Abuse averred that "Everything God created is good including hard drugs, but the problem is that they are wrongly used". Hard drugs to him do not only destroy the body but also the soul of men. Ganaka (1993) views on attempt to prevent drug abuse shows; "that all attempts are spectacularly unsuccessful, this is because the numbers of fresh users and addicts grow daily. May be the time has come for reprisal, thus no matter how agonizing we are on, the way we have gone about dealing with drugs so far seems futile".

The NDLEA has been launching nationwide enforcement activities to seize drugs of abuse and arrest drug abusers in the community; sensitization program, rehabilitation and border patrol to checkmate trafficking of illicit drugs to and from Nigeria (NDLEA, 2020). The 2019 NDLEA report has shown that in the last 10

years of operations, a total of 56, 745, 795, 555 kg of drugs were seized, 85, 058 persons with drug-related offences were arrested and 16, 937 cases were secured and convicted (Abdallah, 2019).

Recently, The Federal government of Nigeria, through Pharmacists Council of Nigeria (PCN) - an agency in charge of regulating the practice of pharmacy in Nigeria, banned the operation of open drug markets in Nigeria (Akinkuotu, 2020). This effort was introduced to sanitize the drug distribution system in the country. The PCN also prohibits the handling of drugs by unlicensed personnel, especially prescription and controlled only drugs.

The National Agency for Foods and Drugs Administration and Control (NAFDAC), an agency of the Federal government of Nigeria, banned the manufacturing, importation and sale (without a valid prescription) of codeine and codeine-containing syrups in Nigeria. In 2018, the agency shut down some pharmaceutical companies involved in the manufacturing of codeine-containing syrups in the country.

Other strategies by the Federal government include the establishment of the National Drug Control Master Plan, NDCMP (2015-2019). The NDCMP is a national blueprint for addressing the complex issues of drug trafficking, production, cultivation, and abuse in Nigeria. In 2018, the Federal government constituted a Presidential Advisory Committee for the Elimination of Drug abuse in Nigeria. The committee was saddled with the responsibility of advising the government on ways to reduce the increasing burden of drug abuse in the country (The Guardian, 2019). However, the literature suggests that the burden of drug abuse may continue to rise in Nigeria due to the involvement of politics in law enforcement and lack of political goodwill.

Implications of drug abuse in a society

The economic and social costs of drug abuse are very high. The negative effects include the financial losses and distress suffered by alcohol and drug related crime victims, increased burdens for the support of adolescents and young adults who are not able to become self-supporting, and greater demands for medical and other treatment services for these youth (Kawugana and Faruna, 2018). For the purpose of this study, these implications can be viewed from two perspectives, viz: economic implications and social implications.

Economic implications:

- **Implications on labour market** - Youths under the influence of drugs tend to be unproductive workers, beside absenteeism at work place and lack of commitment and work performance of such person is always very poor and the percentage of dependents on the economy increases. According to Nyameh, Yakubu, Teru and Titus (2013) drug abuse and trafficking often render the labor market saturated with unwanted or not qualify labor force, which in turn affects foreign investment and economic development.
- **Implications on Government spending** – Government spends a lot of funds on security and settlement of IDPs created by insurgent as a result of drug abuse instead of using such funds to provide basic needs and infrastructural development.
- **Financial Implications**: They result from the financial losses and distress suffered by alcohol- and drug-related crime victims, increased burdens for the support of adolescents and young adults who are not able to become self-supporting, and greater demands for medical and other treatment services for these youth (Adlaf, and Bondy, 1996).

Social implications:

- **Security Implications** – Drugs and substance abuse breed crimes. The surge in criminality across the nooks and crannies of the country cannot be dissociated with the increasing drug use among Nigerians. The multifarious violent conflicts rocking the country are also part of the byproducts of the abuse of substances by individuals (Premium Times, June, 26th 2021). Also, drug abuse among the youths leads them to perpetrate criminal acts such as robbery, burglary, rape,

vandalization of public properties, to mention a few. According Kawugana and Faruna (2018) 95% of the number of insurgencies such as kidnapping, banditry and robbery, as well as social unrests are due to drug abuse.

- **Implications on politics**: Drug abuse increase number of political thuggeries which resulted to killing of innocent citizen. The urge to crave for power makes political office holders and other gullible civil and public servants to loot public funds to recruit drug addicted youths to carry out their heinous acts. This increases the number of insane persons in the society (Kawunga and Faruna, 2018).
- **Implications on education and health**: Drug and substance abuse is detrimental to children's education. Sahu and Sahu (2012) posited that declining grades, absenteeism from school/college and other activities, and increased potential for dropping out of school/college are problems associated with youth drug and substance abuse. Youths under the influence of drugs abandon their education and opt for various cultist organizations. They perpetrate all kinds of evil activities in the school and society at large. Similarly, it makes the users become unstable. The victims of drugs tend to lose their sanity and start to behave abnormally. It infiltrates a lot of diseases into the system of the user like HIV/AIDS and can eventually lead to their death.

Conclusion

In conclusion, the consequences of drugs and substance abuse on society in general and especially on the youths are tremendously negative in all spheres of life and require immediate intervention. Collaborative efforts of all stakeholders are needed to bring lasting solutions to the menace.

The Way forward

In an attempt to proffer meaningful solutions aimed at curbing the menace of drug abuse in our society, the following suggestions are highlighted.

- Government and stakeholders in a community should devote enough resources to generate employment opportunities and empower the youths to make them productive and responsible members of society. This will help to curb the menace of drug abuse.
- Community leaders, Well-meaning individuals, parents, and the entire community are saddled with the responsibility of inculcating moral values in the youths. The entire community has a big role to play in the prevention of drug abuse.
- There is a need to legislate the activities of the mass media as regards obnoxious advertisements like those of tobacco and alcohol (Liquor) etc. Instead, they should direct their activities toward facilitating the government's campaign against drug abuse.
- Non-Governmental Organizations (NGOs) and Community-Based Organizations (CBOs) should, occasionally, organize and encourage sensitization campaigns against drug abuse as well as engage in rehabilitation programs.
- The government should declare a state of emergency in NDLEA and NAFDAC by employing more security personnel (NDLEA & NAFDAC) and providing them with equipment to fight drug abuse.
- The community needs to supplement government efforts by embarking on routine supervision of patent medical stores and ensure that they are registered with appropriate bodies and also ensure that they do not engage in the sales of banned drugs. Also, street drug hawking should be discouraged since this can promote accessibility to drug abusers.
- School administrators, whether private or public should make an effort to organize workshops, lectures/symposiums to enlighten the people on the dangers of drugs and substance abuse.
- Finally, community leaders, NGOs, CBOs, and other well-meaning citizens should devote resources to providing sporting facilities for the youth. Similarly, they need

to rise to the task of monitoring political activities in the community and to check the excesses of gullible politicians.

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EFFECT OF DIGITAL TECHNOLOGY IN THE TEACHING AND LEARNING OF ECONOMICS EDUCATION IN FCT. COLLEGE OF EDUCATION ZUBA, ABUJA.

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Abstract
This study examines the effect of digital technology in teaching and learning of economics education in FCT College of Education Zuba, Abuja, using a mixed-methods approach. Guided by the Technology Acceptance Model (TAM) and Constructivist Learning Theory, the research explores the adoption and impact of digital tools such as e-learning platforms and multimedia resources on student engagement, academic performance, and overall learning experience. Survey data from 150 students and 20 lecturers, along with interviews, reveal that 65% of students use e-learning platforms, and 58% report improved academic performance. However, challenges such as unreliable internet access (only 35% have reliable connectivity) and limited digital literacy among educators hinder full integration. The Chi-Square test results ($\chi^2 = 10.62$, $p < 0.05$) confirm a significant positive relationship between digital technology use and academic performance, leading to the rejection of the null hypothesis. The findings suggest that digital technology enhances access to resources, fosters interactive learning, and improves outcomes, but infrastructure gaps and training needs must be addressed. Recommendations include investing in reliable internet, providing digital literacy training for educators, and increasing funding for digital tools. This study contributes to the growing body of knowledge on digital technology in education, offering actionable insights for policymakers and educators in Nigeria and beyond.
Keywords: Effects, Digital Technology, Economics Education.

Introduction

The rapid advancement of digital technology has revolutionized education systems worldwide, transforming how knowledge is delivered and accessed. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2021), digital tools have the potential to bridge educational gaps, particularly in developing countries, by providing access to quality resources and fostering inclusive learning environments. In higher education, the integration of digital technology has been shown to enhance student engagement, improve academic performance, and prepare learners for the demands of the digital economy (Bates, 2019).

Globally, the adoption of digital technology in education has accelerated, particularly in the wake of the COVID-19 pandemic. The World Economic Forum (2020) reported that over 1.2 billion students worldwide shifted to online learning during the pandemic, highlighting the critical role of digital tools in ensuring educational continuity. In economics education, digital technology has enabled students to access real-time data, participate in virtual simulations, and engage in collaborative

projects with peers across the globe (Bennett & Maton, 2010). For instance, platforms like Coursera and edX have partnered with top universities to offer online economics courses, reaching millions of learners worldwide (ICEF Monitor, 2021).

In Nigeria, the adoption of digital technology in education is gaining momentum, albeit with significant challenges. According to a report by the National Universities Commission (NUC, 2022), only 40% of Nigerian universities have fully integrated digital tools into their curricula, citing issues such as inadequate infrastructure, limited digital literacy, and unreliable internet connectivity. In FCT College of Education Zuba, Abuja, the use of digital technology in economics education is still evolving, with educators and students exploring innovative ways to leverage digital tools for teaching and learning.

This study examines the effect of digital technology in teaching and learning of economics education in FCT College of Education, Abuja, focusing on its impact on student engagement, academic performance, and overall learning experience. By drawing on global insights and local realities, the research aims to provide actionable recommendations for policymakers and educators to enhance the integration of digital tools in economics education.

Research Questions

1. What is the extent of digital technology adoption in teaching and learning of economics education inFCT, College of Education, Abuja?
2. How does digital technology influence students' academic performance in teaching and learning of economics?
3. What are the challenges associated with the use of digital technology in teaching and learning of economics education?
4. What strategies can be implemented to enhance the integration of digital technology in in teaching and learning of economics education?

Research Objectives

1. To assess the level of digital technology adoption in in teaching and learning of economics education in FCT College of Education Zuba, Abuja.
2. To evaluate the impact of digital technology on students' academic performance in economics.
3. To identify the challenges hindering the effective use of digital technology in in teaching and learning of economics education.
4. To propose strategies for improving the integration of digital technology in in teaching and learning of economics education.

Hypothesis

H_0: The integration of digital technology has no significant impact on the teaching and learning processes in in teaching and learning of Economics Education in FCT College of Education, Zuba, Abuja.

Literature Review

The integration of digital technology in education has been widely studied, with researchers highlighting its potential to enhance learning outcomes. According to Selwyn (2016), digital tools such as e-learning platforms and multimedia resources facilitate personalized and interactive learning experiences.

In the context of economics education, digital technology enables students to access real-time data, engage in simulations, and collaborate with peers globally (Bennett & Maton, 2010). Recent studies have further highlighted the transformative potential of digital technology in education, particularly in the wake of the COVID-19 pandemic. Dhawan (2020) and Hodges, Moore, Lockee, Trust, and Bond. (2020) discuss the rapid shift to online learning, emphasizing both the opportunities and challenges of digital education. Similarly, Rapanta, Botturi, Goodyear, Guàrdia, and Koole. (2020) underscore the importance of

teacher presence and active learning in online environments.

However, studies have also identified challenges such as inadequate infrastructure, limited digital literacy among educators, and resistance to change (Ertmer & Ottenbreit-Leftwich, 2013). Also, Trust and Whalen (2020) emphasize the need for teacher training in digital literacy, a key challenge identified in this study. Alenezi (2020) and Kumar and Bervell (2019) provide insights into the effectiveness of e-learning platforms and mobile learning, respectively, which are highly relevant to the study's focus on the use of digital tools in economics education. Finally, Sintema (2020) and Zimmerman (2020) offer critical perspectives on the broader implications of digital technology in education, particularly in resource-constrained environments.

In Nigeria, the adoption of digital technology in education is still in its early stages, with institutions like FCT College of Education, Zuba, Abuja, facing unique challenges such as unreliable internet connectivity and insufficient funding (Adu & Olatundun, 2013). This study builds on existing literature by exploring the specific effects of digital technology on economics education in this context.

Theoretical Framework

This study adopted an integrated theoretical approach that combine Technology Acceptance Model (TAM) with Constructivist Learning Theory. The Technology Acceptance Model (TAM), developed by Davis (1989), is a widely used framework for understanding how users accept and use technology. It focuses on two key factors: Perceived Usefulness (PU) which is the extent to which a person believes that using a particular technology would enhance their performance (e.g., improved academic performance in economics education) and Perceived Ease of Use (PEOU) which shows the extent to which a person believes that using the technology would be free of effort (e.g., ease of using e-learning platforms or multimedia resources).

The Constructivist Learning Theory, rooted in the works of Piaget (1970) and Vygotsky (1978), emphasizes that learners construct knowledge through active engagement with their environment, social interaction, and reflection. Key principles include: Active Learning, Social Interaction and Scaffolding. This integrated theoretical framework provides a robust foundation for analyzing the effect of digital technology on economics education. It addresses both the adoption of technology (TAM) and its impact on the learning process (Constructivism), while also considering the challenges and barriers that may arise. This framework aligns well with the research questions and objectives of the study, offering a comprehensive approach to understanding the role of digital technology in education.

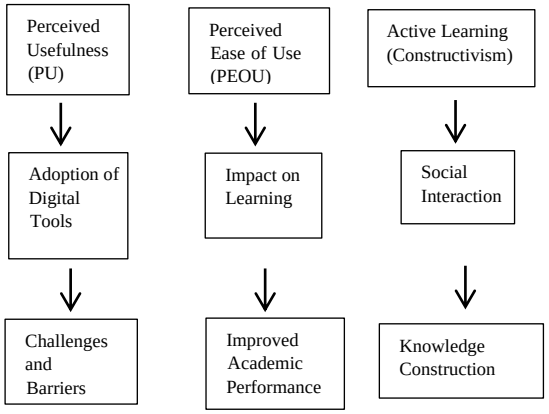

Figure 1. Integrated Theoretical Framework
Source: Author's Design, 2025

Methodology

This study adopts a mixed-methods approach, This study adopts a mixed-methods approach, combining quantitative and qualitative data collection techniques. A survey was administered to 150 economics students and 20 lecturers in FCT College of Education, Abuja, to gather quantitative data on the adoption and impact of digital technology. Also, semi-structured interviews were conducted with 10 lecturers and 15 students to gain deeper insights into their experiences and challenges. Data were analyzed using descriptive statistics for quantitative data and thematic analysis for qualitative data. The study was conducted over

a period of three months, ensuring comprehensive data collection and analysis.

Validity and Reliability

To ensure face and content validity of the instrument, the questionnaire was reviewed by an expert in Measurement and Evaluation to make certain that it could adequately gauge the constructs intended. A pilot study was conducted on 30 students outside the final sample. Cronbach's Alpha coefficient was used to test the reliability of the instrument, which recorded a reliability score of 0.87.

Results

The data collected from the survey and interviews were analyzed using both quantitative and qualitative methods. The quantitative data were processed using SPSS software, while the qualitative data were analyzed thematically. Below are the results presented in tabular format for clarity.

Table 1: Survey Results on Digital Technology Adoption and Usage

S/N	Items	Percentage (%)	$\bar{x}$	SD
1	Students using e-learning platforms.	65%	**3.45**	0.78
2	Lecturers using multimedia resources.	70%	**3.60**	0.82
3	Students reporting improved performance.	58%	**3.30**	0.75
4	Lecturers facing technical challenges.	40%	**2.90**	0.85
5	Students with reliable internet access.	35%	**2.50**	0.90

Source: Field Analysis using SPSS24, 2025.

Table 1 indicates that a significant proportion of students (65%) and lecturers (70%) use digital tools such as e-learning platforms and multimedia resources in economics education. However, only 35% of students reported having reliable internet access, which highlights a critical barrier to effective technology integration. Additionally, 58% of students acknowledged that digital tools improved their academic performance, suggesting a positive correlation between technology use and learning outcomes.

Table 2 shows the result of the Thematic analysis of the interview responses. The result revealed that while digital technology enhances the learning experience, technical challenges such as unreliable internet connectivity and inadequate infrastructure remain significant obstacles. Lecturers expressed a strong need for training to improve their digital literacy, while students and lecturers alike showed a positive attitude toward the potential of digital tools in education.

Table 2: Survey Results on Digital Technology Adoption and Usage.

S/N	Theme	Frequency (F)	Key Findings
1	Improved learning experience	12	Students reported better understanding of economic concepts through simulations.
2	Technical challenges	10	Unreliable internet and lack of access to digital tools were common issues.
3	Need for training	8	Lecturers emphasized the need for professional development in digital literacy.
4	Positive attitude toward technology	15	Both students and lecturers expressed enthusiasm for digital tools.
5	Infrastructure gaps	7	Both students and lecturers expressed enthusiasm for digital tools.

Source: Field Analysis using SPSS24,

Test of Hypothesis

To test the hypothesis, we will use Chi-Square (χ^2) Test of Independence. This test is appropriate because it helps determine whether there is a significant association between two categorical variables—in this case, the use of digital technology (e.g., e-learning platforms, multimedia resources) and its impact on student academic performance (improved or not improved).

Ho: The integration of digital technology has no significant impact on the teaching and learning processes in Economics Education in FCT, College of Education, Zuba, Abuja.

Table 3: Chi-Square Test Results

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10.62[a]	1	.001
Likelihood Ratio	10.75	1	.001
Linear-by-Linear Association	10.50	1	.001
N of Valid Cases	200		

Source: Field Analysis using SPSS24, 2025.

Table 3 shows the result of the Pearson Chi-Square with p-value (0.001) at 5% level of significance and degree of freedom 1. Since the p-value is less than the significance level of 0.05, we reject the null hypothesis. This indicates that there is a statistically significant association between the use of digital technology (e-learning platforms) and improved academic performance in teaching and learning economics education.

Discussion of Findings

The study reveals that 65% of students and 70% of lecturers use digital tools such as e-learning platforms and multimedia resources. However, only 35% of students have reliable internet access, indicating moderate adoption with significant barriers. This finding aligns with Adu and Olatundun (2013), who noted that Nigerian institutions face challenges in adopting digital technology due to inadequate infrastructure and unreliable internet connectivity. Similarly, Selwyn (2016) highlights that while digital tools are increasingly adopted in education, infrastructure gaps remain a critical barrier, especially in developing countries.

Also, the study found that 58% of students reported improved academic performance due to the use of digital tools. The Chi-Square test ($\chi^2 = 10.62$, $p < 0.05$) confirms a significant positive relationship between digital technology use and academic performance. This finding is consistent with Bates (2019), who argued that digital technology enhances student engagement and academic performance by providing access to quality resources and fostering interactive learning. Similarly, Bennett and Maton (2010) found that digital tools like simulations and online collaboration platforms improve learning outcomes in economics education.

Furthermore, the study identified key challenges to include unreliable internet connectivity, inadequate infrastructure, and limited digital literacy among educators. These barriers hinder the full potential of digital tools in economics education. This finding agrees with Ertmer and Ottenbreit-Leftwich (2013), who identified inadequate infrastructure and limited digital literacy as major obstacles to effective technology integration in education. Additionally, National Universities Commission (NUC, 2022) reported that only 40% of Nigerian universities have fully integrated digital tools, citing similar challenges.

While the findings align with most scholars, there is a slight disagreement with Davis (1989) in the context of perceived ease of use. Some students and lecturers in this study reported technical challenges, suggesting that digital tools may not always be perceived as easy to use, especially in resource-constrained environments like Nigeria. This contrasts with Davis's assumption that ease of use is a critical factor in technology adoption.

Conclusion

The study concludes that digital technology has a significant positive impact in teaching and learning of economics education FCT College of Education Zuba, Abuja, enhancing student engagement, academic performance, and access to resources. However, challenges such as inadequate infrastructure and limited digital literacy must be addressed to maximize the benefits of digital tools. The findings align with the Technology Acceptance Model (TAM) and Constructivist Learning Theory, highlighting the importance of perceived usefulness, ease of use, and active learning in the adoption and effectiveness of digital technology.

Recommendations

Based on the findings, the study recommends that stakeholders and government alike should collaborate and put in mechanisms to;

1. Address internet connectivity and access to digital tools to ensure seamless integration of technology.
2. Provide regular digital technology training for educators to improve their digital skills and confidence in using technology.
3. Increase funding and policy support for digital technology in education, particularly in developing regions.
4. Equip students with digital devices and training to enhance their ability to use digital tools effectively.

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APPLICATION OF DIGITAL TECHNOLOGIES IN TEACHING AND LEARNING GEOGRAPHY: OPPORTUNITIES AND CHALLENGES

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Abstract

The integration of digital technologies in teaching and learning has revolutionized educational practices, particularly in the fields of Geography and Environmental Studies. This paper investigates the application of digital tools and platforms in enhancing the teaching and learning of Geography and Environmental Studies in the 21st century. The paper highlights the potential of Geographic Information Systems (GIS), virtual field trips, online simulation tools, and digital mapping technologies to transform the spatial experience. interactive, and engaging learning experiences. The paper also discusses the benefits of using digital technologies to facilitate real-time data analysis, foster collaborative learning, and improve students' understanding of complex Geographical and Environmental issues. Furthermore, it examines the challenges associated with the adoption of these

technologies, including limited access to digital resources, the digital divide, and the need for proper teacher training. The paper concludes by suggesting practical strategies for integrating digital technologies into Geography and Environmental Studies curricula to foster critical thinking, enhance problem-solving skills, and prepare students for the demands of a technology-driven world.
Keywords: Digital Technology, Teaching, Learning, Geography, opportunities and challenges.

Introduction

Digital technologies implemented in education during the 21st century modernized conventional teaching and learning schemes throughout different academic fields. These technological improvements benefit the study of Geography specifically because they generate fresh approaches to connect students and make challenging ideas easier to understand. Learning experiences now benefit from Geographic Information Systems (GIS) alongside virtual field trips and online simulation tools and digital mapping because students can now interact with data while exploring various environments through technology that solves problems previously impossible for them to address it (Harris and Crosby, 2020).

These digital tools create extensive learning opportunities through immersive data-driven interactive experiences that make them essential for undergraduate studies across various fields. Spatial analyses along with environmental observation which have been traditional in geography now depend heavily on digital technology for offering detailed expanded educational content. Environmental Studies benefits from technological innovations by improving student abilities to process data and reveal environmental patterns as well as achieve collaborative problem-solving activities.

The implementation of these technologies faces multiple difficulties when integrated together. The large digital inequality between students along with limited educational resource availability and insufficient teacher training stand as major obstacles to achieving general digital tool implementation in educational settings. The benefits provided by using digital technology in education exceed all other considerations. The technological tools enhance educational outcomes because they develop analytical thinking abilities while presenting new approaches to study which result in student preparedness for technological work environments.

This paper investigates the usage of digital technologies for teaching Geography Education to students in the current century. This paper analyzes available tools with a focus on their benefits for student participation along with the obstacles that need to be resolved before implementing them successfully. This paper presents operational strategies to merge educational technology into proper curriculum design which will boost student performance along with professional aptitude development in the subject domain (Ryan & Aasetre, 2020).

Conceptual Framework

Digital Technology

Digital technologies are used in education to provide engaging learning environments that inspire and motivate students to learn. They have long been heralded as a means for educational transformation. Various researches have established connections between digital technologies and student engagement, motivation, and positive learning outcomes (Fokides & Kefallinou, 2020; Heindl & Nader, 2018; Kotsari & Smyrnaiou, 2017; Moyer *et al.*, 2018).

According to Anderson & Dron, (2011) Digital technologies in education refer to the use of electronic tools, systems, devices, and resources that generate, store, or process data. These technologies include, but are not limited to, computers, tablets, digital cameras, social media, online courses, virtual reality (VR), and artificial intelligence (AI). The integration of

these digital tools into education is not just about replacing traditional methods, but enhancing the educational experience by providing new and innovative ways of learning. This involves opening classrooms to engage in connected learning and exploration beyond the boundaries of the school, and incorporating technologies into the curriculum to facilitate diverse and flexible delivery of content. Digital Technology can also increase inclusivity, equity and social responsibility by providing a learning environment that inspires students and prepares them for a technology focused society. Similarly, Marc Prensky (2001), describes "digital natives" as the generations of students who have been raised in a world where digital technology is ubiquitous. These students are characterized by their ability to process information quickly, their preference for graphics over text, and their reliance on digital devices for communication and learning. Prensky argues that the traditional educational system, which relies heavily on lectures and textbooks, is often misaligned with the learning styles of digital natives. To effectively educate this new generation, there is a growing need to integrate digital technologies into the classroom to make learning more interactive and engaging. In the same vein, digital technology its encompasses not only academic achievements but also the application of skills, knowledge, and competencies in real-world settings (Mayer, 2008).

Without prejudice to how digital technology is defined; its relevance cannot be over emphasized. The studies are predominantly focused on single use technologies in small to medium size studies. They may point to improved student learning outcomes, but it is difficult to infer or judge system-level implications.

Application of Digital Technologies to Learning in Geography

Geography as a discipline plays a critical role in helping students understand the complex interrelationships between people, places, and environments. It fosters spatial thinking, environmental awareness, and global citizenship. Traditionally, geography education has relied on textbooks, paper maps, globes, and fieldwork to convey concepts related to physical and human landscapes. However, with the evolving demands of 21st-century education and the increasing digitization of knowledge, there has been a significant shift in pedagogical approaches within geography classrooms

The integration of digital technology into geography education has revolutionized teaching and learning processes, offering innovative tools and methodologies that enhance student engagement and understanding. Digital technologies play a crucial role in enhancing environmental geography education by promoting sustainable practices and real-world applications of classroom learning. Olatunde-Aiyedun *et al.* (2024) demonstrated that integrating tools like GIS and remote sensing in community garden projects improved students' environmental stewardship attitudes and practical skills. The development of mobile learning applications, such as M-Geo Ganesha, aims to facilitate meaningful and holistic learning experiences for high school geography students. These applications are designed to align with current educational guidelines and have been validated for their effectiveness in enhancing student engagement and understanding of geographic concepts.

Virtual Field Trips (VFTs) have emerged as a significant digital tool in geography education, especially during disruptions like the COVID-19 pandemic. Mercer *et al*. (2022) discussed the development of VFTs as a means to future-proof geography teaching, emphasizing their role in providing immersive learning experiences when traditional fieldwork is not feasible.

The utilization of Web GIS platforms has been shown to improve spatial thinking abilities and self-efficacy among students. A study conducted in Singapore demonstrated that incorporating Web GIS into a tourism geography course significantly enhanced students' performance in spatial thinking

assessments and increased their motivation to engage with geographic content.

Looking ahead, the continuous evolution of digital technologies presents opportunities for further innovation in geography education. Embracing advancements such as virtual reality, augmented reality, and interactive mapping can provide immersive learning experiences, allowing students to explore geographical concepts in dynamic ways.

Challenges in Implementing Digital Technologies

i. Limited Access to Digital Resources

A primary challenge in using digital technology in Geography Education is the limited availability to digital resources, despite their anticipated benefits. Access to technology computers, tablets, and high-speed internet is particularly inconsistent among schools and districts in low-income or rural areas. The digital gap, defined as the disparity between those with access to modern digital tools and those without, has resulted in variations in educational opportunities. Smith *et al*. (2020) assert that students in underdeveloped regions often encounter significant obstacles in accessing the digital tools and resources necessary for benefiting from online learning and digital education. The absence of access to digital resources such as GIS, online simulations, and virtual field trips may hinder students' ability to engage with these tools, hence limiting their learning experience and educational opportunities. Moreover, given the absence of requisite infrastructure, schools may struggle to effectively integrate new technology into their curricula, so disadvantaging certain students.

Governments, educational institutions, and technology companies must collaborate to provide equitable access to digital resources to address this problem. Initiatives providing affordable or complimentary technology, alongside community-oriented solutions such as internet hotspots or mobile learning centers, may assist in bridging the digital divide. An essential first measure for equitable education in Geography Education (Hudson & Lang, 2019) is ensuring that every student, regardless of location or socio-economic status, has access to digital resources.

Furthermore, in digital contexts, cooperative learning fosters digital literacy, collaboration, and global citizenship attributes essential for the twenty-first century. In Geography and Environmental Studies, where global problems like as resource management, environmental preservation, and climate change are universally relevant, cooperative learning enhances understanding of global concerns and collective responsibility. Engaging in projects that tackle real-world challenges enhances students' comprehension of the subject matter while fostering effective collaboration to address significant environmental concerns (Ziegler & Koller, 2019).

ii. The Digital Divide

Apart from limited access to digital resources, the digital divide also connects to the variation in the quality of technology available to students. While some schools and universities have current technology and fast internet, others may have outdated equipment or inconsistent internet connections, therefore greatly limiting their potential to totally incorporate digital tools into the learning process. This discrepancy might result in variations in academic performance as students who have better access to technology have more chances for learning and involvement. Moreover, the digital divide transcends just physical technology access. It also addresses variations in digital literacy, that is, the ability to make wise use of digital resources. Particularly in less developed locations, many teachers and students can lack the necessary skills to use such technologies like GIS, online simulation platforms, or collaborative mapping tools. This lack of digital literacy might prevent instructors and students from fully using the opportunities of current technology in Geography Education (Smith *et al.* 2020). Closing the digital divide depends critically on providing digital literacy instruction to teachers

and students. These addresses ensuring instructors has the knowledge and skills necessary to effectively use digital technology in the classroom. Furthermore, curricular adjustments should focus on integrating digital literacy as a fundamental component to ensure that students are not only exposed to digital technology but also competent in using them to solve problems and analyze data (Hudson & Lang, 2019).

iii. Teacher Training

Successful use of digital technology into Geography Education curriculum requires sufficient teacher preparation. Numerous educators, particularly in poor nations, lack adequate training in digital tools, hence limiting their capacity to integrate new technology into their pedagogical methods. Hudson and Lang (2019) assert that inadequate professional development may leave instructors feeling overwhelmed or lacking confidence in using new technology in the classroom, resulting in unsuccessful implementation.

Teacher training programs must be structured to provide educators with the competencies and expertise required to use digital resources, including GIS, online simulations, and virtual field excursions. Professional development must be continuous, providing educators with chances to investigate emerging technology and enhance their competencies routinely. Furthermore, educators need to get assistance from school administrators and policymakers in the integration of digital technologies via the provision of essential resources, time, and professional development opportunities (Ziegler & Koller, 2019).

Finally, digital technologies provide significant potential to improve instruction and learning in Geography and Environmental Studies, difficulties like restricted access to digital materials, the digital divide, and the need for teacher training must be resolved. By addressing these concerns, educators may cultivate more fair and engaging learning environments, therefore equipping students to confront the environmental issues of the 21st century.

Benefits of Digital Technologies in Teaching and Learning Geography

i. Immediate Data Analysis

The ability to analyze real-time data is one of the most significant advantages of digital technology for Geography Education. Students have traditionally examined regional trends and environmental occurrences using historical records or static data sets. Digital technologies such as GIS, remote sensing, and internet databases enable students to access real-time data on many environmental issues, including air pollution, climate change, and natural disasters.

The analysis of real-time data facilitates the understanding of dynamic geographical and environmental phenomena. Students may see the effects of deforestation, monitor meteorological trends, or examine changes in biodiversity using real-time data streams from sensors and satellites. Frazier and Davis (2018) assert that real-time data analysis enhances students' comprehension of complex data and refines their problem-solving skills by enabling the application of theoretical knowledge to current, real-world situations. Moreover, real-time data enables students to comprehend the immediacy of addressing global environmental issues and examine the direct impacts of human actions on the ecosystem (Baker & Lucke, 2020).

Furthermore, the use of real-time data in the classroom enhances students' critical thinking skills by encouraging them to analyze trends, identify patterns, and formulate responses based on their findings. This fosters an active learning environment where students engage in discovering and resolving real difficulties rather of just consuming information passively (Harris & Crosby, 2020). Incorporating real-time data into Geography Education courses would empower educators to help students connect classroom learning to the external

environment, so enhancing the relevance and applicability of their education.

ii. Collaborative Learning

Moreover, digital technology fosters cooperative learning, an essential element of modern education. Students participating in cooperative learning specifically, groups addressing problems, exchanging ideas, and creating projects cultivate collaboration and communication abilities. Students may now more readily engage in geographical and environmental initiatives using digital technologies such as online platforms, collaborative mapping tools, and virtual learning environments, irrespective of their physical location. According to Johnson and Benassi (2020), digital technologies facilitate real-time project collaboration among students, hence fostering participation and the exchange of ideas in virtual settings. Platforms such as Google Docs, online GIS tools, and cloud-based project management software enable students to collaboratively build maps, analyze data, and disseminate findings to peers, so enhancing the learning experience.

Collaborative learning expands students' perspectives on complex geographical and environmental issues via peer-to-peer interactions that facilitate the sharing and critique of each other's work. Moreover, in digital environments, cooperative learning enhances digital literacy, teamwork, and global citizenship attributes essential for the twenty-first century. In Geography and Environmental Studies, where issues like as resource management, environmental conservation, and climate change are global in nature, collaborative learning enhances understanding of international challenges and collective accountability. Engaging in projects that address real-world challenges enables students to enhance their understanding of the subject matter while also acquiring effective collaboration skills to resolve pressing environmental issues (Ziegler & Koller, 2019).

Practical Strategies for Integration

i. Curriculum Integration

Integrating digital technologies into the Geography Education curriculum is essential for enhancing students' learning experiences and preparing them for the challenges of a technology-driven world. A well-designed curriculum should provide students with the opportunity to engage with digital tools such as Geographic Information Systems (GIS), virtual field trips, and online simulations in a way that complements traditional teaching methods. The integration of digital tools should not be seen as an add-on or supplementary activity, but as an essential part of the learning process.

One practical strategy for curriculum integration is the development of project-based learning (PBL) assignments that incorporate digital tools. For example, students could use GIS to analyze changes in land use or urbanization in their local community. Virtual field trips can be incorporated into lessons on environmental conservation, allowing students to explore ecosystems that are not accessible to them physically. Online simulations can help students understand complex processes, such as the impact of climate change on different ecosystems, or model sustainable resource management practices. According to Harris and Crosby (2020), integrating these tools into project-based assignments allows students to apply their knowledge in real-world contexts, fostering deeper understanding and critical thinking skills.

Another strategy is the incorporation of digital storytelling into the curriculum. Digital storytelling, which combines multimedia elements like video, audio, and text, can be used to engage students in creating presentations or reports on geographical and environmental topics. This approach encourages creativity and enhances communication skills, as students must synthesize information, design compelling narratives, and present their findings using digital tools (Taylor & Harrison, 2021). Additionally, digital storytelling allows students to work collaboratively, combining

their research and technological skills to produce high-quality projects that can be shared with peers, educators, and the wider community.

Furthermore, educators should align digital technology integration with the specific learning outcomes of the Geography Education curriculum. For example, GIS can be used to teach students about spatial analysis and geographic inquiry, while virtual field trips can help them explore environmental issues in different geographic contexts. By aligning the use of digital tools with curriculum goals, educators can ensure that technology enhances, rather than distracts from, the learning process (Frazier & Davis, 2018).

ii. Professional Development for Educators

Successful use of digital technology into Geography Education curriculum requires sufficient teacher preparation. Numerous educators, particularly in poor nations, lack adequate training in digital tools, hence limiting their capacity to integrate new technology into their pedagogical methods. Hudson and Lang (2019) assert that inadequate professional development may leave instructors feeling overwhelmed or lacking confidence in using new technology in the classroom, resulting in unsuccessful implementation.

Teacher training programs must be structured to provide educators with the competencies and expertise required to use digital resources, including GIS, online simulations, and virtual field excursions. Professional development must be continuous, providing educators with chances to investigate emerging technology and enhance their competencies routinely. Furthermore, educators need to get assistance from school administrators and policymakers in the integration of digital technologies via the provision of essential resources, time, and professional development opportunities (Ziegler & Koller, 2019).

Finally, digital technologies provide significant potential to improve instruction and learning in Geography and Environmental Studies, difficulties like restricted access to digital materials, the digital divide, and the need for teacher training must be resolved. By addressing these concerns, educators may cultivate more fair and engaging learning environments, therefore equipping students to confront the environmental issues of the 21st century.

Conclusion and Recommendations

The integration of digital technologies represents important possibilities to boost teaching quality and student education in Geography Education curricula. The incorporation of GIS alongside virtual field trips with online simulations in project-based work and digital storytelling assists educators to train students through critical thinking and problem-solving alongside collaborative learning approaches. These technologies require sufficient professional development together with training and collective assistance for teachers to be truly effective. Educational institutions can give teachers the skills to utilize digital resources effectively by running teacher development programs while providing resources and supportive learning environments. This enables teachers to deliver modern instruction methods which students need for success in a digital society. Therefore, the paper suggested the implementation of these practical strategies will allow educational institutions to unify digital resources while providing equal learning opportunities and building an interactive classroom that intends students for Environmental Studies advancements.

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DIGITAL HISTORICAL SIMULATION (DHS) AND THE FUTURE OF HISTORY TEACHING IN NIGERIA'S TERTIARY INSTITUTIONS

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Abstract
This paper examines how emerging digital technologies, especially in multimedia such as VR, AI, holography, olfactory cues, and haptic interfaces are reshaping history education through immersive simulation. By transforming students from passive recipients into active participants, such tools enable experiential engagement with historical environments and artifacts. Drawing on interdisciplinary research and global case studies, the study demonstrates how simulations enhance historical empathy, analytical skills, and knowledge retention, while acknowledging risks of oversimplification, presentism, and ethical challenges. It proposes a pedagogically rigorous framework for integrating digital simulation into tertiary-level history teaching, positioning Nigeria within these global developments and advocating for a reimagined, inquiry-driven approach to historical learning.

Keywords: *Historical Simulation, History Teaching, Pedagogy, Digital Technologies.*

Introduction

History education has long grappled with the challenge of making the past engaging and meaningful for contemporary learners. Traditional pedagogical methods, while essential for developing critical reading and analytical skills, often fall short in capturing the complexity and contingency of historical processes for digital-native students. The emergence of digital simulation technologies offers a promising and transformative pedagogical avenue to bridge this gap, enabling students to "live" history rather than simply read about it (Strathmore, 2023).

The rise of digital technologies such as Virtual Reality (VR), Immersive Virtual Reality (IVR), Artificial Intelligence (AI), digi-scents, 3D holography, and haptic feedback devices has redefined what is possible in the teaching and learning of history. These tools make it feasible for learners to experience history not merely as observers but as active participants, capable of exploring reconstructed historical environments, interacting with virtual artifacts, and engaging with historical figures and events in immersive, sensorially rich simulations (Villena Taranilla et al., 2019; Barbara, 2022). This evolution signifies a paradigm shift from mere memorization of historical facts to experiential understanding, positioning the students not as passive recipients but as co-creators of historical meaning (Strathmore, 2023).

This paper explores the evolving role of historical simulation in shaping the future of history education at tertiary levels in Nigeria. It assesses the interdisciplinary foundations of this approach, drawing insights from history, pedagogy, mathematical fractals, and game studies to argue that digital simulations offer

unparalleled opportunities to inhabit historical perspectives and understand the complexities of causality and contingency. Through case studies and curriculum analyses across various educational systems, it highlights how simulations can cultivate skills in source criticism, empathy, and long-term knowledge retention (Strathmore, 2023; Barbara, 2022).

The paper proposes a deliberate effort at integrating digital simulations into history education in a manner that is both pedagogically effective and historically responsible, arguing that the future of history education lies not in replacing traditional methods, but in reimagining them through digital immersion and inquiry-driven experiences that make history both accessible and meaningful to 21st century learners.

Conceptual Overview and Evolution of Historical Simulation

Historical simulation refers to educational strategies that replicate past events or social processes to aid students' understanding of historical causality, agency, and context. According to Taylor and Young (2023) *"simulationenables learners to walk in the shoes of historical actors, making decisions and facing consequences in real time"*. This approach transforms students from passive recipients into active constructors of knowledge.

Globally, simulation, as a pedagogical tool, has taken various forms. In its early days, ancient societies used dramatic reenactments to preserve historical narratives. Though not a theater in the modern sense, Plato's dialogues involving Socrates often took the form of reenacted philosophical conversations. These dialogues were performed or read aloud in schools, and they encouraged critical thinking through dramatized inquiry. Nightingale (1995) observed that Socrates' conversations, as presented by Plato, were often recited or performed in educational settings, turning philosophy into a kind of drama that taught through role-play and dialogue.

Greek tragedies and comedies were not only entertainment but also educational tools. Playwrights like Sophocles and Euripides embedded moral, civic, and philosophical lessons into their dramas, which were performed during state-sponsored festivals like the Dionysia, attended by students and citizens alike. GoldHill (2007), noted thatGreek tragedy was a civic institution and a means of collective instruction, particularly in the education of young male citizens.

In ancient Rome, students of rhetoric engaged in declamations, which were dramatic reenactments of legal and political cases. These were performed as practice for public speaking and legal careers and were central to Roman education. This, as explained by Bloomer (2011), is a kind of rhetorical performance that functioned as both a pedagogical tool and a form of cultural theater.

And in Ancient Egypt**,** religious dramas, such as the Abydos Passion Play, reenacted the death and resurrection of Osiris. These dramas had educational and religious purposes, teaching myths, morality, and cultural values to initiates and the general public. Frankfort (1978) observed that the Passion Play of Osiris at Abydos may be regarded as one of the earliest forms of dramatic instruction, serving both ritualistic and pedagogical functions.

With the advent of computers, in the 20th century, digital historical simulations became possible. Early examples include educational games like The *Oregon Trail*, which introduced players to the hardships of 19th century pioneers. More sophisticated simulations, such as *Civilization,* and *Total War* provided complex historical scenarios that require strategic thinking (Wright, 2015).

Recent advancements in Virtual Reality (VR) and Artificial Intelligence (AI) have pushed historical simulation into new frontiers. VR experiences, such as 1943 Berlin Blitz and Assassin's Creed Discovery Tour, allow students to explore historical environments in unprecedented detail. AI-driven simulations use adaptive learning to tailor historical

scenarios based on students' decisions, making history education more personalized (Peterson, 2020).

Theoretical Framework

This study draws on three complementary learning theories, *Experiential Learning Theory*, *Constructivist Learning Theory*, and *Social Learning Theory*, to explain how digital historical simulations can transform history teaching in Nigeria's tertiary institutions.

i. ***Experiential Learning Theory:*** Propounded by Kolb's (1984), this theory posits that knowledge is developed through a cyclical process of concrete experience, reflective observation, abstract conceptualization, and active experimentation. Digital historical simulations offer immersive, interactive experiences that align with this cycle, allowing students to virtually "enter" historical contexts, reflect on their actions, connect them to historical concepts, and test alternative decisions. This cyclical engagement promotes deeper comprehension and retention of historical knowledge.

ii. ***Constructivist Learning Theory:*** As articulated by Piaget (1952) and Vygotsky (1978), this theory emphasizes that learners actively construct meaning through interaction with their environment and through social mediation. Digital historical simulations enable students to explore causation, agency, and contingency in history by engaging directly with simulated scenarios and collaborating with peers. Vygotsky's concept of the Zone of Proximal Development underscores the role of scaffolding, which can be embedded in simulations through adaptive feedback and guided tasks to support learners' progression.

iii. ***Social Learning Theory:*** As propounded by Bandura's (1977) further explains Simulations' potential by highlighting the role of observation, imitation, and social reinforcement in learning. Role-playing elements in Historical Simulation allow students to assume historical personas, observe modeled behaviors such as source analysis or negotiation, and imitate these processes in collaborative settings. This not only reinforces cognitive understanding but also fosters empathy and perspective-taking, a critical outcome in historical education.

Together, these theories provide a robust framework for designing and evaluating Digital Historical Simulation interventions in Nigeria's higher education. They explain how such tools can shift history teaching from passive reception to active, socially mediated, and experiential learning, thereby enhancing both cognitive and affective learning outcomes.

Historical Simulation in Action and a case for its Nigerian Adaptability.

As noted elsewhere, historical simulation is not a new concept. Role plays and dramatic reenactments are used in the past as a simulative pedagogical tool in the teaching of historical lessons. This paper however, focuses more on digital simulation. And this section cites case studies of digital simulative projects, at global stage relating them to the Nigerian situation.

i. Mission US

Mission US is a digital interactive game developed by WNET Thirteen and Electric Funstuff. The game puts students into the shoes of fictional characters set in real historical contexts, such as the American Revolution and slavery in antebellum America. In one of its most acclaimed episodes, *Flight to Freedom*, players assume the role of Lucy, a 14-year-old enslaved girl in 1848 Kentucky. Through Lucy's journey, students learn about the underground railroad, resistance to slavery, and the complex choices enslaved people had to make. Evaluations of Mission US have shown significant improvement in students' historical understanding and empathy. As Bain and Monte-Sano (2008) noted, by participating in a complex narrative, students engage with

history in a way that traditional textbooks rarely permit.

If adapted to the Nigerian context, a digital platform similar to Mission US could revolutionize the teaching and learning of history in Nigeria's tertiary institutions. Instead of focusing on the American Revolution or slavery in the United States, the game could immerse students in pivotal moments of Nigerian history, such as the transatlantic slave trade in Badagry, the Sokoto Jihad, resistance to colonial conquest, the Aba Women's Riot of 1929, the Nigerian Civil War, or the struggle for independence. Players could assume the roles of fictional characters embedded in these historical periods, making decisions that reflect the dilemmas, resistance, and agency of real historical actors. For instance, the student can virtually, assume the role of *Muhammad Al-Bukhari b. Ahmad* (the Wazir of Sokoto as of the time of the final conquest of the Caliphate's capital by the British colonialists on 15th/03/1903) who temporarily took leadership of the Caliphate, after the flight of Caliph *Muhammadu Attahiru I* (and his subsequent assassination by the British forces), and will have to decide the fate of the *Ummah* between three alternatives of either fighting to death, mass exodus to Holy Land (Mecca) or surrender and submission to colonial rule [See Adeleye (1968) for details of this dilemmatic historical episode]. Assuming such roles in a simulated environment would not only deepen students' factual knowledge but also foster historical empathy, allowing learners to understand the lived experiences, moral choices, and socio-political complexities of Nigeria's past.

ii. Anne Frank House

The Anne Frank House in Amsterdam launched a VR experience that enables users to walk through the secret annex where Anne Frank and her family hid during World War II. Especially designed for people who cannot visit the physical location, the simulation offers a deeply emotional and immersive connection to Holocaust history. The use of VR facilitates historical empathy and spatial understanding According to a study by UNESCO (2020) such simulations contribute to a nuanced and personal understanding of historical trauma, especially for younger audiences who are digital natives.

In the Nigerian context, a VR experience similar tothe*Anne Frank House* could be developed to preserve and teach key aspects of Nigeria's history, particularly events tied to conflict, oppression, and resilience. For instance, students could virtually explore historic sites such as the slave cells in Badagry, the Ogbunike caves used as refuges during inter-ethnic wars, or even war-ravaged towns from the Nigerian Civil War. This form of immersion would allow learners to "walk" through reconstructed environments, seeing the cramped quarters of a slave holding cell, the destroyed homes after air raids in Asaba in 1967, or the meeting room where nationalist leaders planned independence movements. Such VR storytelling would personalize history, moving beyond abstract textbook accounts into spaces that evoke emotional engagement and empathy.

iii. Google Expedition

Google Expeditions was an immersive educational app that allowed teachers and students to explore virtual reality (VR) and augmented reality (AR) experiences across a wide range of subjects, including history. Using inexpensive VR headsets (like Google Cardboard) and mobile devices, classrooms could be virtually transported to historical sites, museums, and re-creations of significant moments in history. Students could virtually walk-through divided Berlin during the Cold War, Colosseum and Forum of the ancient Rome, World War I trench and the great pyramids of ancient Egypt. Although the app was officially discontinued in 2021, its legacy continues through the Google Arts & Culture platform and other educational VR initiatives. Google Expeditions was especially important for democratizing access to digital historical

simulations by making immersive experiences accessible in under-resourced schools (Brown and Lee, 2021).

In the Nigerian context, a Google Expeditions–style platform could be a game-changer for history teaching in tertiary institutions, especially in under-resourced universities and colleges where access to historical sites and museums is limited, due to finance, atmosphere of insecurity and other factors. Instead of visiting Berlin, Rome, or Egypt, or even to a Nigerian monument that is far remote and utterly unsecured, Nigerian students could be virtually transported to significant national and regional heritage sites, such as the Benin City Walls, the Osun-Osogbo Sacred Grove, the ancient NOK culture settlements, or the Badagry Slave Route. They could also experience 3D re-creations of key historical moments, like the Aba Women's Riot of 1929, the independence negotiations at Lancaster House, or the Enugu coal miners' strike of 1949. Using affordable VR tools such as Google Cardboard or mobile-based AR, lecturers could guide students through these spaces, providing real-time commentary, discussion prompts, and historical analysis. This would democratize access to Nigeria's cultural heritage, ensuring that even students far from these locations gain a spatial and visual appreciation of historical environments.

iv. Assassin's Creed: Discovery Tour

The *Discovery Tour* mode in *Assassin's Creed Origins* and *Assassin's Creed Odyssey* strips away combat and adds historical guides to allow users to explore Ancient Egypt and Ancient Greece, respectively. The game developers collaborated with historians and archaeologists to create historically accurate environments. This tool has been used in both secondary and university history education. Reinhard (2018) opine that although initially a commercial game, Assassin's Creed's Discovery Tour has found utility in classrooms, providing an interactive sandbox for learning about architecture, daily life, and culture.

In the Nigerian context, a Discovery Tour–style historical simulation could be developed to allow students in tertiary institutions to explore richly detailed, historically accurate reconstructions of Nigerian societies across different eras. Instead of Ancient Egypt or Greece, the virtual environment could recreate key periods such as the height of the Benin Kingdom, the Kanem-Borno Empire, the Sokoto Caliphate, the Yoruba city-states, or colonial Lagos. Students could wander through bustling Benin markets, observe the artistry of ivory carvers, explore the Great Mosque of Kano at its zenith, or walk along the Lagos Marina in the 1920s. Historical guides based on the model used in *Assassin's Creed*b could provide context about political systems, trade networks, religion, architecture, and daily life, all grounded in archaeological and historical research.

v. *Reacting to the Past (RTTP)*

Although not entirely digital, RTTP has adopted digital platforms to facilitate role-playing simulations in higher education. Students assume roles based on historical figures and debate major issues from the past using primary texts. For instance, *The Trial of Galileo* and *The French Revolution* simulations have been successfully integrated into digital learning management systems like Canvas or Moodle. McFall (2017) observe that reacting to the past simulations, especially when digitized, transform the classroom into a historically informed theater, engaging students with ideas, contexts, and consequences of historical actions.

In the Nigerian context, a digitally adapted Reacting to the Past (RTTP) model could be a powerful tool for teaching history in tertiary institutions. Instead of reenacting *The Trial of Galileo* or *The French Revolution*, Nigerian students could assume roles in historically significant events such as the 1914 Amalgamation debates, the Aba Women's Riot of 1929, the 1945 General Strike, the independence constitutional conferences, or the peace talks during the Nigerian Civil War.

Using learning management systems like Canvas or Moodle, or even locally developed platforms, students could access digitized primary sources such as colonial records, nationalist speeches, newspaper archives, or oral histories. In their assigned historical roles, they would research their character's background, craft arguments, and participate in structured debates or negotiations mirroring the real events.

Digitizing RTTP simulations would make them more accessible and scalable, allowing universities and colleges with limited physical space or large class sizes to still offer interactive historical role-play. It would also enable blended or fully online learning, an advantage for Nigeria's open and distance learning institutions. By engaging in these simulations, students would go beyond memorizing dates and events, they would grapple with historical dilemmas, understand multiple perspectives, and appreciate the socio-political contexts of decision-making. As McFall (2017) observes, RTTP transforms the classroom into a historically informed theater, and in Nigeria's case, it could become a stage where students wrestle with questions of colonialism, governance, identity, and unity.

Challenges of Digital Historical Simulation in Nigeria

Nigeria reflects a case of troubled trajectory in History teaching. In the early 2000s, history was controversially removed from the national curriculum due to its perceived redundancy and political sensitivities (Falola & Matthew, 2008). This policy led to a generational gap in historical knowledge. It was only in 2019 that history was reinstated as a compulsory subject in primary and junior secondary schools. These researchers however, observed that despite the leap forward recorded of recent in the teaching and learning of history, digital historical simulation in Nigeria is still emerging. History education at all levels remains text-based and examination-oriented. The integration of ICT in teaching has no doubt improved over the years, especially after the introduction of computer education in schools, but its impact on history pedagogy is limited. Nwosu and Samuel (2019) revealed that history teachers in Nigerian schools largely depend on traditional methods such as storytelling, textbook teaching, and lectures due to lack of training, infrastructure, and digital resources. Consequently, the potential of digital simulations in enhancing historical understanding remains underutilized.

Several obstacles hinder the effective adoption of digital historical simulations in Nigeria, and they include:

i. ***Infrastructure Deficiency****:* the country's power supply and ICT infrastructure remain poor and unevenly distributed. While urban centers may enjoy relatively stable internet connectivity, rural areas frequently suffer from poor network coverage and erratic power supply, or lack of both absolutely, making the deployment and use of resource-intensive simulation platforms in schools difficult if not impossible (Yina, 2020). This "digital divide" exacerbates inequalities in access to digital tools and educational resources across different socio-economic groups in Nigeria.

ii. ***Lack of Foundational Digital Archives:*** the foundational archival materials upon which historical simulations depend are themselves inadequately digitized. The National Archives of Nigeria, for example, initiated a digitization programme in 2003 but has since seen minimal progress due to chronic under-funding, absence of a coherent digitization policy, and a shortage of trained technical personnel to manage the process (Balogun, 2019).

iii. ***Lack of Digital Literacy****:* Both teachers and students often lack the necessary technical skills to navigate or create digital simulations.

iv. ***Policy and Curriculum Constraints****:* The history curriculum does not yet prioritize the use of simulation tools, and education policies have not fully embraced ICT for

content-specific instruction in humanities. As noted by Asor and Princely (2023), there is no comprehensive legislative framework governing digital preservation, and partnerships with international bodies for technical and financial support remain sporadic and uncoordinated.

v. ***Funding and Support****:* There is limited financial investment in educational technologies by the government and private sector, particularly in the humanities and arts.

Despite the above challenges however, Nigeria possesses vast potential for the development of digital historical simulations. And these serve as a prospect points for a bright future in the adoption of digital historical simulation. They include:

i. ***Rich Historical Heritage****:* Nigeria's diverse history, from Nok civilization and the Benin Empire to the colonial period and post-independence conflicts, offers fertile ground for historical simulation.
ii. ***Youthful Population****:* A digitally inclined youth demographic could drive demand for interactive learning tools.
iii. ***Tech Ecosystem Growth****:* The rise of Nigerian tech startups and innovation hubs in cities like Lagos and Abuja presents an opportunity to develop homegrown digital educational tools.
iv. ***Academic-Industry Collaboration****:* Universities can partner with tech firms to develop digital history content tailored for Nigerian context.

One promising initiative is the digital reconstruction of cultural heritage sites such as the ancient city walls of Kano and the Benin Moat using 3D modeling. If such projects are incorporated into teaching platforms, they could serve as the foundation for more extensive simulation-based learning.

The Benefits of Historical Simulation in History Teaching

Historical simulation in its digital form offers a lot of benefits in the teaching and learning of History. Some of these benefits are:

i. ***Enhanced Engagement****:* traditional methods of history teaching, lectures, textbooks, and rote memorization, often fail to capture the imagination of students. In contrast, simulations present history as an interactive and participatory endeavor. According to McCall (2021): *"Simulation games engage students in historical problem-solving and narrative exploration in ways that traditional pedagogies rarely can"*. By stepping into the roles of historical actors, students become emotionally and intellectually involved, which fosters deeper interest and retention.
ii. ***Historical Empathy and Critical Thinking****:* when learners are immersed in a simulated historical context, they must make decisions based on the limited information available to historical figures, taking into account the cultural, social, and political realities of the time. This encourages students to "think historically" by analyzing cause and effect, continuity and change, and multiple perspectives. Kee and Graham (2012) argues that, *"Digital simulations create a space for students to consider what people in the past thought, felt, and decided, fostering an empathetic understanding of historical agency"*.
iii. ***Experiential Learning Opportunities:*** Through role-playing and decision-making, students experience the complexities and uncertainties of historical events firsthand. For example, simulations such as *Mission US* or *Reacting to the Past* allow learners to explore revolutions, social movements, or diplomatic crises by embodying historical figures and debating contemporary issues. This form of active learning improves not just content acquisition but also skills such as negotiation, collaboration, and argumentation (Martin & Sam, 2008).

iv. ***Personalized Learning:*** digital simulations support differentiated learning and inclusivity. Because these tools often include multimedia elements; such as visuals, narration, and branching narratives, they cater to diverse learning styles. They also allow students to progress at their own pace, revisit key moments, and engage with history in a personalized way. Squire (2011) note that Simulations support multiple forms of literacy and cognition, providing more entry points for students of varied abilities and backgrounds.

v. ***Digital Skills:*** the use of digital simulations prepares students for digital citizenship and 21st century skills. By engaging with simulations, learners develop digital literacy, data analysis, and decision-making skills that are essential for navigating the information-rich environments of today's world. These competencies align with broader educational goals of critical media literacy and responsible civic engagement (Kee and Graham, 2012).

Digital historical simulations, therefore, represent a powerful pedagogical innovation that aligns with contemporary educational practices. They foster engagement, empathy, critical thinking, and skill development while making history more accessible and meaningful to a wide range of learners.

General Challenges and Criticisms of Digital Historical Simulation

While digital historical simulations offer many pedagogical benefits, they also present a number of challenges and have been subject to critical scrutiny from educators, historians, and technologists. These challenges raise ethical questions about how simulations shape historical understanding and the role of educators in guiding their use. They include:

i. ***Risk of historical distortion and oversimplification****:* simulations often prioritize engagement and playability over accuracy, potentially leading to the trivialization or misrepresentation of complex historical events. As Jeremiah McCall (2011), warns*: "Many commercial games that portray historical events are developed primarily for entertainment and may promote superficial or distorted views of the past*". This is particularly problematic when historical nuance is sacrificed for narrative convenience or when simulations present deterministic or morally simplistic versions of historical choices.

ii. ***Presentism and anachronism****:* Digital simulations are created by contemporary developers who may, consciously or unconsciously, project modern values, ideologies, or interpretations onto past events. This can lead to a form of historical bias that distorts students' understanding of how people in the past thought, behaved, and experienced their world. As Kee and Graham (2012) notes *"Simulations are not neutral technologies—they are embedded with assumptions and interpretations that reflect current cultural and political contexts"*.

iii. ***Technical and accessibility challenges***: Many schools, especially in the global south (like in Nigeria), lack the infrastructure, hardware, or internet connectivity necessary to run sophisticated simulations. Moreover, teachers may not have the training or confidence to implement these tools effectively. According to Squire (2011): *"Educators often face significant learning curves in understanding not only the technology but also how to integrate it meaningfully into their curricula".*

iv. ***Prioritization of Entertainment:*** there is a concern that students may prioritize gameplay mechanics' over historical content. Without proper scaffolding, students might focus more on winning the

game or manipulating the simulation rather than understanding the historical context and significance of their actions. This can reduce simulations to mere entertainment. Wineburg and Monte-Sano (2008) emphasizes that *"without guided inquiry and reflection, simulations may fail to develop deep historical thinking and instead reinforce surface-level engagement"*.

v. ***Human Sensitivity:*** ethically, representing traumatic or violent histories through simulations raises sensitive issues. Simulating events such as the Holocaust, slavery, or colonial violence risks trivializing suffering or re-traumatizing participants, particularly if not handled with care and scholarly sensitivity. The immersive nature of simulations requires educators to thoughtfully consider the emotional and psychological impact on students. As Totten et al. (2017) argues, *"The gamification of atrocity demands a serious ethical framework, one that acknowledges the moral weight of history and the responsibilities of educators and designers alike"*.

vi. ***Measurement and Evaluation:*** assessment and evaluation of learning outcomes through simulations remain challenging. Because simulations are open-ended and experiential, traditional methods of assessment—such as multiple-choice tests—may not effectively capture the depth of students' historical reasoning or reflection. Educators must develop alternative assessment strategies, such as reflective journals, role-based essays, or debrief discussions, to gauge learning accurately (Totten et al., 2017).

While digital historical simulations hold promise, they also require critical engagement, pedagogical support, and ethical vigilance. Effective implementation demands that educators not only adopt these tools but also interrogate their content, design, and implications for historical understanding.

Recommendations

This paper recommends an eight-points framework that will help in the effective integration of Digital Historical Simulation into Nigeria's main pedagogical frame for effective teaching of history in Tertiary Institutions:

i. ***Development of Nigeria-Centric Digital Historical Simulations****:* Nigerian universities and Colleges, in collaboration with software developers, historians, and cultural institutions, should design locally relevant digital simulations that reflect the nation's diverse historical experiences. Such projects could reconstruct cultural sites (eg. NOK, Ugbo-ukwu, Iwo-Eleru, Benin etc) and events like the Trans-Saharan and Trans-Atlantic trades, the intriguing rise and fall of kingdoms within the Nigerian area, the Sokoto Jihad, diverse experiences of colonial conquest and resistances, Aba Women's Riot (1929), the Nigerian Civil War (1967–1970), the independence constitutional conferences, etc. Localizing content would ensure that students engage deeply with their own heritage, fostering historical empathy and national identity.

ii. ***Integration of Digital Simulations into the Curriculum****:* History departments should embed digital simulation modules as core or elective components within, NCE, undergraduate and postgraduate history programs. These should complement, not replace, traditional methods, ensuring that critical reading, archival research, and historiographical analysis remain central while harnessing the immersive benefits of technology.

iii. ***Leverage on Affordable and Accessible Technologies****:* To address resource constraints, tertiary institutions should adopt low-cost VR solutions (e.g., Google Cardboard), mobile-based AR tools, and web-based interactive

platforms. Partnerships with tech firms, NGOs, and the Ministry of Education (through TETFund) could help subsidize equipment costs and expand access across urban and rural campuses.

iv. ***Capacity Building for Lecturers and Technologists****:* Training programs should be organized for history lecturers and university IT staff to equip them with the technical and pedagogical skills needed to design, operate, and integrate digital simulations effectively. Professional development workshops could be facilitated in partnership with international organizations experienced in educational technology.

v. ***Promotion of Cross-Disciplinary Collaboration****:* Departments of History should partner with Computer Science, Creative Arts, and Education faculties to develop innovative digital history projects. This multidisciplinary approach would combine historical accuracy with engaging design, sound storytelling, and technical excellence.

vi. ***Establishment of National Digital Heritage Archives****:* A centralized digital repository of Nigerian historical sites, artifacts, oral histories, and archival documents should be developed to serve as a resource base for creating simulations. Such an archive would support both academic research and public engagement with Nigerian history.

vii. ***Encouraging Research on Digital Pedagogy in History****:* Further scholarly studies should be conducted to assess the impact of digital historical simulations on student engagement, critical thinking, and retention of historical knowledge in Nigeria. Evidence-based research will guide continuous improvement and policy advocacy.

viii. **Seeking Strategic Funding and Partnerships**: Universities should seek funding from government agencies (e.g., TETFund), private sector partners, UNESCO, and cultural heritage organizations to finance the development, implementation, and maintenance of digital simulation projects.

Conclusion

In looking ahead, the integration of digital historical simulations into Nigeria's tertiary education system offers more than just a technological upgrade it represents a transformative shift in how history is taught, learned, and experienced. By blending rigorous scholarship with immersive, interactive tools, Nigerian universities can inspire a generation of learners who not only know their nation's past but can also critically engage with it, draw lessons from it, and apply these insights to contemporary challenges. In this way, history will no longer be confined to the pages of textbooks or the walls of lecture halls, it will become a living, dynamic encounter, accessible to all and resonant for the future of Nigeria's identity, unity, and development.

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THE APPLICATION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN THE TEACHING AND LEARNING OF HISTORY IN NIGERIA BASIC SCHOOLS

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Abstract
This paper discuses the application information and communication technology Into the teaching and learning of history in Nigeria basic schools. Information and Communication Technology is a modern communication satellite informs of text, software, images graphs and instruction. It is diverse set of technological tools and resources use to transmit, store, create and exchange of information. History is the branch of knowledge that records and analysis past events. It's the chronological account of past events of people and institutional development. Lack of literate computer teacher, motivation to the use of ICT, low/poor network, lack of genuine software, electricity failure and inadequate computer in the classroom are the challenges facing the use of ICT in Nigeria basic schools. Finally, the paper recommends that teacher should provide evidence of computer literate before being employed to teach, periodic training should be given to the teachers, adequate and genuine software should be provided and solar power and inverter should be installed in both urban and rural basic schools in Nigeria to address the challenges facing use of ICT into the teaching and learning of history.
Keywords: *Application, ICT, Teaching, Learning, and History.*

Introduction

The application of Information and Communication Technology (ICT) into education has transformed traditional teaching and learning methods globally. The use of ICT in education provides significant opportunities to enhance the learning experience, making it more interactive, engaging, and accessible (Aminu & Oladipo, 2015). In Nigeria, the implementation of ICT in education is gaining momentum, although challenges still exist, particularly in the teaching of subjects like history, which are often viewed as less practical compared to science-oriented disciplines (Ogunlade, 2019).

Historically, the teaching of history in Nigeria's basic schools has predominantly relied on conventional methods such as storytelling and rote learning. These methods, while effective in certain contexts, may not engage students adequately in a digital age that demands innovative approaches to education (Odozi & Eze, 2017). The use of ICT in history education can potentially transform the way history is taught and learned by providing dynamic resources such as digital archives, interactive maps, and multimedia content, thereby making history more relevant and interesting to students (Salawu & Ibidapo, 2020).

In recent years, there has been a growing recognition of the need to integrate ICT in

teaching and learning processes across various subjects in Nigeria's basic schools. The Federal Government of Nigeria has made significant efforts to promote ICT in education through policies and initiatives aimed at enhancing digital literacy and integrating ICT tools into the curriculum (Federal Ministry of Education, 2014). These efforts align with global trends where ICT is seen as a critical component in education reform aimed at improving students' learning outcomes (World Bank, 2021).

Despite these efforts, the application of ICT into the teaching and learning of history remains inadequate. Several factors contribute to this challenge, including limited access to ICT facilities, insufficient teacher training, lack of digital content tailored to history education, and inadequate funding for ICT programs in schools (Ejiogu & Akintoye, 2018). Consequently, history as a subject has not fully benefited from the advancements in ICT, which could potentially revitalize its teaching and make it more engaging for students (Nwafor & Chukwuma, 2022).

Statement of the Research Problem

The use of traditional teaching methods in history education often results in passive learning, where students merely memorize facts without understanding the underlying significance of historical events (Ijeoma & Nwoke, 2019). This approach limits students' ability to think critically and connect historical events to contemporary issues. The application of ICT has been shown to promote active learning, enhance critical thinking skills, and improve academic performance in various subjects (Ajayi & Fakorede, 2016). However, the adoption of ICT in history education has been slow, with many schools in Nigeria still relying heavily on traditional teaching methods (Onyemachi & Ede, 2020). The problem, therefore, lies in the gap between the potential benefits of ICT application in history education and the current practices in Nigerian basic schools. This research aims to examine the factors influencing the application of ICT into history teaching, explore the challenges faced by educators, and propose strategies for effective implementation (Adeyemi & Oyewole, 2023). The findings will contribute to a better understanding of how ICT can be used to improve the teaching and learning of history in Nigeria.

Literature Review

The application of Information and Communication Technology (ICT) into education has revolutionized the teaching and learning process globally. It has been recognized as a key driver of innovation and effectiveness in education, with its role in facilitating access to resources, interactive learning, and fostering independent inquiry. This chapter reviews literature on the application of ICT into the teaching and learning of History in basic schools in Nigeria. The discussion will focus on four key areas: (1) the level of ICT application in the teaching and learning of History in Nigerian schools, (2) challenges faced by History teachers in incorporating ICT into their lessons, (3) the impact of ICT on student learning outcomes in History, and (4) strategies that can enhance ICT application in History education. Each section will draw on existing research, both globally and within the Nigerian context, to provide a comprehensive understanding of ICT’s role in History education.

Level of ICT application in the teaching and learning of history in Basic schools in Nigeria

The level of ICT application in Nigerian schools, particularly in the teaching of History, varies significantly across the country due to several factors including infrastructure, teacher training, and policy implementation. Globally, ICT application in education is highly advanced, with many schools adopting interactive digital tools, multimedia, and online resources to facilitate student engagement and learning. In developed nations such as the United States and the United Kingdom, ICT tools such as digital archives, virtual museums, and multimedia platforms are routinely used in

History classrooms to make historical content more accessible and engaging (Kozma, 2005).

In Nigeria, the adoption of ICT in education is still in its developmental stages. Although the Nigerian government has made efforts to integrate ICT into the educational system through initiatives such as the National Policy on Information Technology, the level of application remains low, particularly in the teaching of subjects like History (Jegede & Owolabi, 2003). Many Nigerian basic schools lack the necessary infrastructure to support ICT application, including computers, internet access, and reliable electricity. A study by Adeyemi and Ibitoye (2012) revealed that even in schools where ICT resources are available, their use is often limited to administrative tasks or for teaching subjects like Mathematics and Science, while History remains largely taught using traditional methods such as rote memorization and lectures.

Furthermore, the lack of a structured curriculum that incorporates ICT into History teaching has been a significant barrier to effective application. According to Oyeleye (2017), while ICT is recognized as a useful tool for teaching, there are few guidelines in place for History teachers on how to utilize these tools effectively in the classroom. This has resulted in a situation where History lessons are often devoid of the interactive and engaging elements that ICT can provide, leading to lower student engagement and understanding of the subject.

Challenges faced by history teachers in integrating ICT tools into their teaching

History teachers in Nigeria face numerous challenges when attempting to integrate ICT tools into their teaching practices. These challenges are both systemic and resource-related, creating significant barriers to effective ICT use in History education. One of the primary challenges is the lack of infrastructure in schools, particularly in rural areas where access to electricity, computers, and the internet is limited or nonexistent. A study conducted by Omoruyi and Eshiotse (2010) revealed that many Nigerian schools do not have the technological infrastructure required to support ICT application, which makes it difficult for teachers to incorporate digital tools into their teaching.

Another significant challenge is the lack of adequate training for History teachers. Adebayo (2018) found that many History teachers in Nigeria are not proficient in the use of ICT tools, which limits their ability to effectively integrate technology into their lessons. This lack of proficiency stems from a broader issue within the Nigerian educational system, where teacher training programs often do not include comprehensive ICT components, particularly for subjects like History. As a result, teachers are not equipped with the skills and confidence needed to use digital resources in their classrooms.

Additionally, there is a lack of ICT-specific teaching materials and resources for History education. Unlike subjects like Science or Mathematics, which have a wealth of digital resources available, History teachers often struggle to find relevant and appropriate ICT tools that can be used to teach historical content. According to Oyeleye (2017), this scarcity of subject-specific ICT resources contributes to the underutilization of technology in History education.

Lastly, financial constraints pose a major challenge to ICT application in Nigerian schools. Funding for education in Nigeria is often limited, and schools struggle to allocate resources for purchasing ICT equipment, maintaining existing technology, and training teachers. As a result, even in schools that recognize the importance of ICT, the financial barriers prevent them from fully integrating technology into their History teaching (Jegede & Owolabi, 2003).

Impact of ICT application on student learning outcomes in History

The application of ICT into History education has been shown to have a positive impact on student learning outcomes, provided it is implemented effectively. Research indicates that when ICT tools are used in History classrooms, they can enhance student engagement, foster critical thinking, and improve understanding of historical events and concepts (Kozma, 2005). For instance, the use of multimedia presentations, digital archives, and interactive maps allows students to visualize historical events in a way that traditional textbooks cannot.

A study conducted by Ololube (2015) in Nigerian secondary schools demonstrated that students who were taught using ICT tools, such as projectors and digital timelines, performed better on History assessments compared to their peers who were taught using traditional methods. The study found that ICT not only made the subject more engaging but also helped students develop a deeper understanding of historical events by allowing them to interact with primary and secondary sources online. This interactive approach to learning History encourages students to think critically about historical narratives and draw connections between past and present.

Additionally, ICT facilitates a more student-centered learning environment, where students can take control of their own learning by conducting independent research using online resources. According to Anderson (2008), ICT provides students with access to a wealth of information, enabling them to explore historical topics in more depth and at their own pace. This autonomy in learning helps students develop important research and analytical skills, which are essential in understanding complex historical contexts.

Strategies that can enhance ICT application in History Education

To overcome the challenges associated with ICT application in History education and to maximize its benefits, several strategies can be implemented. One key strategy is improving teacher training and professional development. Research by Yusuf and Balogun (2011) has shown that teachers who receive comprehensive training in ICT are more likely to integrate it into their teaching practices. Therefore, regular workshops and training programs that focus specifically on the use of ICT in History education should be organized for teachers. These training sessions should cover both the technical aspects of using ICT tools and the pedagogical strategies for integrating these tools into the History curriculum.

Another important strategy is the provision of adequate infrastructure and resources in schools. As highlighted by Jegede and Owolabi (2003), without the necessary technological infrastructure, teachers will be unable to use ICT effectively in their classrooms. The government and educational stakeholders must prioritize the provision of computers, internet access, and reliable electricity in schools, particularly in rural areas where these resources are often lacking.

Developing a curriculum that integrates ICT into History education is also crucial. Adebayo (2018) recommends that the Nigerian educational system establish clear guidelines on how ICT can be used to teach History, with specific learning objectives and outcomes. This will provide teachers with a framework for incorporating digital tools into their lessons and ensure that ICT is used in a way that enhances student learning.

Lastly, partnerships with external organizations such as non-governmental organizations (NGOs) and technology companies can help bridge the gap in resources and training. Collaborating with these organizations can provide schools with access to the latest educational technologies and teacher training programs. Such partnerships can also facilitate the development of digital History resources tailored to the Nigerian context, making it easier for History teachers to incorporate ICT into their teaching.

Purpose of the Study

The primary aim of this research is to investigate the application of ICT into the teaching and learning of history in Nigeria's basic schools. Specifically, the study seeks to:

1. Examine the current level of ICT application in history education in basic schools.
2. Identify the factors influencing the use of ICT in the teaching of history.
3. Investigate the challenges faced by teachers in integrating ICT into history lessons.
4. Propose strategies for enhancing the effective application of ICT in history education.

Research Questions

The study addressed the following research questions:

1. What is the current level of ICT application in the teaching of history in Nigeria's basic schools?
2. What factors influence the use of ICT in history education?
3. What challenges do teachers face in integrating ICT into the teaching and learning of history?
4. What strategies can be employed to enhance the application of ICT in history education?

Methodology

The research design for this study is a descriptive survey. A descriptive survey is a research method used to gather information about the characteristics, opinions, behaviors, or experiences of a group of people, without manipulating any variables. It focuses on describing the current state of the variables involved. This design is appropriate for this study as it allows for the collection of detailed information about the current level of ICT application in history teaching from a large group of history teachers. It also helps to identify the factors, challenges, and strategies related to ICT application in Basic Schools.

The population for this study includes all history teachers in Basic Schools in Asa LGA, Kwara State. From this population, a random sampling method will be used to select 200 history teachers from 20 Basic Schools within the LGA. The study will use stratified random sampling to ensure representation from both private and public schools in Asa LGA. Stratified random sampling involves dividing the population into subgroups (strata) based on certain characteristics, in this case, school type (private and public), and then randomly selecting participants from each stratum. This ensures equal representation of history teachers from both private and public schools.

A researcher-designed questionnaire titled “ITC Utilization and application Questionnaire (ICTUAIQ) was used as the primary data collection tool. The instrument consists of 15 items based on the four-point Likert scale, with response options of Strongly Agree, Agree, Disagree, and Strongly Disagree. This instrument will be tailored to assess the extent of ICT application, factors influencing it, challenges faced, and strategies to enhance its use in the teaching of history. The rating scale was categorized into two (2) sections, A and B. Section A was used to elicit information on personal data of the respondents while section B contained items that addressed the issues raised in the research questions. The rating scale sought to find out opinions of the respondents to the items in the rating scale. Each of the items of the rating scale was weighed on four (4) point likert scale of Strongly Agree (SA) 4points, Agree (A) - 3points, Disagree (D) - 2points and Strongly Disagree (SD) - 1point. The researcher adopted a mean of 2.50 as a cut-off point, and any item with a mean above 2.50 was seen as an agreement while below 2.50 was seen as a disagreement. Statistical Package for the Social Sciences (SPSS) version 21.0, basic descriptive statistics, cross tab, independent samples t-tests, and so forth were utilized to analyze data from the survey questionnaire. The content validity of the questionnaire will be ensured by consulting experts in educational technology and history education to review the items and ensure they align with the research objectives. Additionally, face validity will be established

by reviewing the questionnaire with teachers to confirm that the items are clear and relevant to the study.

The reliability of the instrument will be tested through a pilot study conducted with a small sample of history teachers who are not part of the main study. The reliability will be measured using a test-retest method to ensure consistent results over time. The researcher personally administered the questionnaires to the selected history teachers across the sampled schools in Asa LGA. Assistance from school management and education authorities were sought to facilitate the smooth distribution and collection of the questionnaires. The process ensured that all respondents have sufficient time to complete the questionnaire, and follow-up visits were made to ensure full participation.

Mean and Standard Deviation was used to answer the research questions. These statistical tools helped summarize the responses and show the average trends and variability in the data. All analyses were conducted at a 0.05 level of significance to determine the strength of relationships and group differences.

Data Analysis

Data collected through the questionnaire was analyzed using statistical software. Mean score and standard deviations were employed as statistical tools for data analysis. To calculate mean scores and standard deviations for each item, we first assigned numerical values to the response options:

i. Strongly Agree (SA) = 4, ii. Agree (A) = 3,
ii. Disagree (D) = 2,
iv. Strongly Disagree (SD) = 1

Research question: What is the current level of ICT application in the teaching of history in Nigeria's basic schools?

Table 1: Distribution of Respondents Based on the current level of ICT application in the teaching of history in Nigeria's basic schools.

A	**Items** Current level of ICT application in the teaching of history in Nigeria's basic schools	**Responses**				**Mean score**	**Std. Dev**
		SA	**A**	**SD**	**D**		
1.	ICT resources such as computers and projectors are readily available in my school.	212	75	40	17	3.00	1.07
2.	Limited access to ICT resources affects the frequency of ICT use in my history teaching.	240	114	30	45	2.72	1.17
3.	I frequently use ICT tools in my history lessons due to the availability of these resources.	272	78	24	40	2.83	1.20

Source: Field survey, 2025.

The table 1 presents three key items assessing ICT application in the teaching of history. The first item, which assesses the availability of ICT resources such as computers and projectors, has a mean score of 3.00 (on a scale likely ranging from 1 to 4). With a relatively high mean score and a standard deviation of 1.07, this suggests that, on average, respondents agree or strongly agree that ICT resources are available in their schools. However, the variation indicates some schools might still lack these resources. The second item indicates that limited access to ICT resources negatively affects the frequency of ICT use in history teaching, with a mean score of 2.72 and a standard deviation of 1.17. This slightly lower mean score, along with a higher standard deviation, implies that while there is some impact due to resource limitations, responses are more varied. This variation means that access issues are more significant in some schools than others. The third item

evaluates the frequency of ICT tool usage in history lessons, with a mean score of 2.83 and a standard deviation of 1.20. This result suggests that, generally, teachers are inclined to use ICT tools, but the variation (1.20) shows that actual usage frequency differ across schools, possibly due to resource availability or institutional constraints.

Research question 2: What factors influence the use of ICT in history education?

Table 2: Distribution of respondents based on factors influencing the use of ICT in history education

B	**Items** Factors influencing the use of ICT in history education	**Responses**				**Mean**	**Std dev**
		SA	**A**	**SD**	**D**		
1.	I have received sufficient training to use ICT effectively in teaching history.	240	120	62	15	2.72	1.05
2.	My level of ICT skills influences my decision to integrate ICT into history education.	320	39	20	15	2.72	1.08
3.	My attitude towards ICT influences how frequently I integrate it into history teaching.	160	165	60	15	2.50	1.07
4.	Positive attitudes towards ICT among teachers make ICT application more effective.	188	150	24	10	2.83	1.05
5.	I am motivated to use ICT tools because I believe they enhance the teaching of history.	208	90	26	5	3.29	0.88
6.	School management provides adequate support for integrating ICT into history teaching	296	45	26	01	3.9	0.7
7.	The availability of digital history resources influences the strategies I use to integrate ICT.	208	105	40	1	3.6	0.8

Source: Field Survey, 2025

In table 2, respondents generally agree that training influences their ICT use, with a mean score of 2.72 and a standard deviation of 1.05. This score suggests that while some respondents feel adequately trained, there is variability, indicating that not all teachers feel equally prepared. Similar to training, ICT skill level has a mean score of 2.72 and a standard deviation of 1.08, reflecting that respondents recognize skill level as a factor in their decision to integrate ICT. The variation means that some teachers feel more skilled than others, affecting their usage frequency. Respondents reported that their attitudes influence ICT use, with a mean score of 2.50 and a standard deviation of 1.07. This lower score compared to other factors means that while attitudes are important, they may be less decisive than factors like motivation or support. The influence of positive attitudes toward ICT among teachers has a mean score of 2.83 with a standard deviation of 1.05, indicating that teachers perceive a collaborative environment as beneficial for ICT application. However, some variability still exists.

The mean score of 3.29 and a lower standard deviation of 0.88 indicate that teachers feel motivated to use ICT, as they believe it enhances history teaching. This suggests that motivation is a strong influencing factor, with less variation, implying broad agreement on this point. Management support has the highest mean score of 3.9 and a very low standard deviation of 0.7, suggesting strong agreement that school management support is critical for ICT application. This high score, coupled with low variability, implies that adequate support from management greatly facilitates ICT use. Availability of digital resources has a mean score of 3.6 and a standard deviation of 0.8

which suggest that the availability of resources positively influences ICT application strategies. The relatively low standard deviation points to a shared perspective on the importance of having digital resources.

Research question 3: What challenges do teachers face in integrating ICT into the teaching and learning of history?

Table 3: Distribution of Respondents Based on challenges do teachers face in integrating ICT into the teaching and learning of history

	Items challenges do teachers face in integrating ICT into the teaching and learning of history	**Responses**				**Mean**	**Std dev**
		SA	**A**	**SD**	**D**		
1	Lack of ICT skills prevents me from integrating technology into my history lessons.	248	93	40	5	3.03	0.92
2	Lack of support from school management makes it challenging to integrate ICT into history lessons.	160	150	16	5	3.07	0.83

Source: Field Survey, 2025

Table 3 outlines specific challenges, with mean scores and standard deviations indicating the level of agreement among respondents. The first item shows a mean score of 3.03 and a standard deviation of 0.92, indicating that lack of ICT skills is a significant barrier to ICT application. This relatively high mean reflects that most respondents agree or strongly agree with this statement, with moderate variation suggesting that while lack of skills is common, some teachers feel more prepared than others. The second item highlights the lack of support from school management as a challenge, with a mean score of 3.07 and a lower standard deviation of 0.83. This score suggests that teachers generally feel a lack of management support, impacting their ability to integrate ICT into lessons. The low standard deviation implies consistent agreement on the importance of management support across respondents. Political interference appears as a barrier with a mean score of 2.81 and a standard deviation of 0.85. While this score is slightly lower, it suggests that external political factors may affect ICT application, possibly influencing school priorities or resources. The relatively lower mean and standard deviation suggest that political interference is a notable, though less uniform, factor in comparison to skills and support. The fourth item indicates that language and cultural barriers are substantial challenges, with a mean score of 3.29 and a standard deviation of 0.88. This higher mean score, along with moderate variability, reflects that respondents agree these barriers affect ICT application, likely due to the diversity in language and cultural contexts that influence how ICT content is perceived or understood in history lessons.

Research question 4: What strategies can be employed to enhance the application of ICT in history education?

Table 4: Distribution of Respondents based on strategies that can be employed to enhance the application of ICT in history education.

S/N	Items strategies to enhance the application of ICT in history education	Responses				Mean	Std dev
		SA	A	SD	D		
1.	The provision of ICT training by the school management has reduced challenges in using ICT.	**200**	**75**	40	**10**	3.5	1.0
2.	I adapt my teaching strategies to better integrate ICT when there are more digital resources available.	**208**	**105**	**40**	**1**	3.6	0.8
3.	Providing more digital resources would encourage me to use ICT-based teaching strategies more often.	**252**	**54**	**40**	**04**	3.7	1.0

Source: Field Survey, 2025

Table 4 outlines strategies that respondents believe could improve ICT application, providing insights through mean scores and standard deviations. This provision of ICT training by school management has a mean score of 3.5 and a standard deviation of 1.0, indicating that respondents generally agree that ICT training provided by school management has been effective in reducing challenges. The relatively high mean score suggests that training is viewed positively, though the standard deviation shows some variability, meaning that while training is beneficial, its effectiveness vary depending on the school's implementation. Adapting teaching strategies with increased digital resources with a mean score of 3.6 and a lower standard deviation of 0.8, this item indicates strong agreement that the availability of digital resources encourages teachers to adapt their strategies to better integrate ICT. The lower standard deviation shows consistent responses, suggesting that when digital resources are accessible, teachers are likely to adjust their methods to include more ICT, which could contribute to more widespread application. Encouragement through increased digital resources with the highest mean score of 3.7, with a standard deviation of 1.0, reflects strong agreement that the provision of more digital resources would encourage teachers to adopt ICT-based teaching strategies more frequently. The agreement across respondents indicates that resources are a fundamental factor in supporting ICT application, reinforcing the importance of resource availability for effective ICT use in history education.

Summary of Findings:

The data reveals a moderate level of ICT application in teaching history in Nigeria's basic schools. With a mean score of 3.00, ICT resources are generally available but inconsistently accessible, leading to variable usage among teachers. While some schools benefit from frequent ICT usage, others face barriers, particularly due to limited resources. Key factors include training, skill level, attitudes, motivation, school management support, and availability of digital resources. School management support (mean score 3.9) and resource availability (mean score 3.6) are the most influential, showing strong agreement on their importance. Motivation, reflected by teachers' belief in ICT's effectiveness (mean score 3.29), also plays a critical role.

Major barriers include a lack of ICT skills (mean score 3.03) and insufficient management support (mean score 3.07), both showing high agreement among respondents. Language and cultural barriers (mean score 3.29) and political interference (mean score 2.81) also hinder ICT

application, particularly in diverse educational contexts. Effective strategies include providing ICT training, increasing digital resources, and adapting teaching methods with available resources. The availability of digital resources, with a mean score of 3.7, emerges as the most impactful strategy, as it directly influences teachers' ability and willingness to integrate ICT into their teaching practices.

Discussion of findings:

The study reveals a moderate application of ICT in teaching History within Nigeria's basic schools, highlighting both its potential and the barriers hindering widespread adoption. The findings suggest that while ICT resources are present, their inconsistent accessibility restricts frequent use among teachers. The literature aligns with these findings, showing that ICT application globally has enhanced engagement and learning outcomes by allowing interactive tools like digital archives and virtual museums to be incorporated into History classes. However, Nigerian schools lag due to infrastructure, limited digital resources, and lack of a structured curriculum tailored to ICT in History education.

School management support and resource availability were identified as the most critical factors influencing ICT application. Studies like Jegede and Owolabi (2003) show that administrative support is crucial, as management's commitment often determines resource allocation and prioritization of ICT in education. The literature also highlights barriers like lack of skills and insufficient support are consistent with challenges observed by Adebayo (2018) and Omoruyi and Eshiotse (2010), who emphasize that many teachers lack the training needed to incorporate ICT tools effectively.

Teachers' belief in ICT's efficacy suggests an openness to digital tools, provided the resources and support are available. However, cultural barriers and political interference were noted, which literature suggests are often pronounced in diverse educational contexts, where digital application may conflict with traditional teaching methods or be impeded by policy inconsistencies.

The findings advocate for several strategies in line with global practices, such as expanding training, increasing digital resources, and tailoring teaching methods to available technology. According to Yusuf and Balogun (2011), teacher training has been shown to be instrumental in encouraging ICT use, particularly when it includes both technical skills and pedagogical approaches. Increasing resource availability was seen as the most impactful strategy is consistent with the literature that stresses the importance of infrastructure (Jegede & Owolabi, 2003).

In all the study aligns with existing literature on ICT in education, underscoring the necessity of support from school management, resource availability, and teacher motivation. Implementing structured training programs and developing an ICT-integrated History curriculum can further enhance ICT usage, offering Nigerian students the benefits of modern, interactive learning experiences.

Conclusion and Recommendations:

ICT application in history education in Nigeria's basic schools is moderately developed, with support from school management and adequate resources standing out as critical enablers. There is a moderate level of ICT application in the teaching of history in Nigeria's basic schools. While resources are generally available, there is inconsistency in access and usage frequency, indicating that while some teachers use ICT tools frequently, others face barriers such as limited resources, which affect the overall application level. Factors influencing ICT application in history education include training, skill level, individual and peer attitudes, motivation, school management support, and availability of digital resources. Among these, school management support and the availability of resources are the most significant, indicating that external support and resources provide the strongest foundation for

effective ICT use in history education. Teachers' motivation to improve teaching effectiveness with ICT also plays a vital role.

The primary challenges teachers face in integrating ICT into history education include lack of ICT skills, insufficient support from school management, political interference, and language or cultural barriers. Among these, lack of management support and ICT skills stand out as the most influential factors, as indicated by higher mean scores. Additionally, language and cultural barriers are notable challenges, likely due to diverse educational contexts.

Addressing challenges such as limited ICT skills and providing more training and digital resources can enhance ICT usage in history education, leading to broader and more effective adoption across schools. School management can support ICT application further by ensuring both resources and targeted training are available, empowering teachers to confidently and effectively integrate ICT into their history lessons. Key strategies to enhance ICT application in history education includes: providing ICT training, increasing the availability of digital resources, and adapting teaching strategies when resources are available. Among these, increasing digital resources stands out as particularly impactful, as it directly encourages teachers to incorporate ICT in their methods**.**

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THE IMPACT OF DIGITAL TECHNOLOGIES IN TEACHING SOCIAL STUDIES IN COLLEGES OFEDUCATION IN NIGERIA.

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Abstract

This study examines the impact of technology on the teaching of Social Studies in Colleges of Education in Nigeria, with a focus on its effectiveness, accessibility, and relevance in teacher education. Grounded in educational theory such as connectivism, the study highlights how digital tools and resources enhance instructional delivery, foster student engagement, and develop digital competencies among pre-service teachers. The literature review reveals that technology can significantly improve comprehension, motivation, and collaborative learning when effectively integrated into the curriculum. However, challenges such as inadequate infrastructure, limited access to ICT tools, insufficient training, and inconsistent power supply hinder its full potential. This study offers several key recommendations to improve the integration of technology in the teaching of Social Studies in Nigerian Colleges of Education. First, it emphasises the need for increased investment in ICT

infrastructure, ensuring that all colleges have access to modern digital tools and reliable internet connectivity. Regular training programs should be implemented to enhance the technological skills of both lecturers and pre-service teachers; The study concludes that strategic investments in technology and capacity building are essential for advancing Social Studies education in Nigeria's Colleges of Education. Embracing technology not only transforms pedagogy but also prepares future teachers to meet the demands of 21st-century classrooms.
Keywords: Digital, Technology, Teaching, Social Studies.

Introduction

In the 21st century, technology has become an indispensable tool in all facets of life, including education. The integration of technology into teaching and learning has revolutionized pedagogical methods, reshaping how knowledge is delivered and acquired. In the context of Social Studies education in Nigeria's Colleges of Education, technology has the potential to bridge gaps in content delivery, improve learner engagement, and promote critical thinking and problem-solving skills which is the core objectives of the subject. Social Studies, being interdisciplinary, draws from history, geography, civics, and sociology, making it highly reliant on visual, interactive, and up-to-date content that technology can effectively facilitate (Ajayi, 2018).

Colleges of Education in Nigeria, which are responsible for producing competent teachers for primary and junior secondary schools, face numerous challenges ranging from limited instructional resources to outdated teaching methodologies. These issues can hinder the effective teaching of Social Studies, which demands participatory, student-centered approaches to foster civic competence and national consciousness (Obanya, 2010). However, with the integration of digital toolssuch as multimedia presentations, virtual simulations, e-learning platforms, and educational softwareSocial Studies educators now have the opportunity to make learning more dynamic, interactive, and relevant to contemporary realities (Oyelekan & Agbatogun, 2014).

These developments have catalyzed further discourse on how technology can be systematically integrated into the curriculum and teaching practices, particularly in subjects like Social Studies that aim to develop informed and active citizens.

Despite the promising prospects, the adoption of technology in teaching Social Studies in Nigerian Colleges of Education faces several barriers, including inadequate funding, poor internet access, lack of professional training, and resistance to change among some educators. Addressing these issues is crucial for harnessing the full benefits of technology in the classroom. Therefore, this study seeks to examine the impact of technology on the teaching of Social Studies in Nigeria's Colleges of Education, with a focus on how it influences pedagogical practices, student learning outcomes, and overall educational effectiveness.

Collaboration and Communication in Teaching Social Studies

Effective teaching of Social Studies thrives on strong collaboration and communication, both among educators and between teachers and students. As a subject that explores human relationships, governance, cultural diversity, and societal development, Social Studies inherently requires interactive and dialogic approaches to instruction. Collaboration allows educators to share resources, co-develop lesson plans, and engage in peer learning, which is essential for improving content delivery and pedagogical strategies in Colleges of Education (Nwagbo & Ugwuanyi, 2015).

Within the classroom, fostering collaborative learning among students encourages critical thinking, empathy, and civic responsibility. Group discussions, debates, project-based learning, and role-plays promote active student

engagement and deeper understanding of social issues. These methods create opportunities for learners to practice democratic values such as respect for diverse opinions, negotiation, and cooperation core tenets of Social Studies (Mezieobi, Fubara, & Mezieobi, 2008).

Moreover, the integration of digital tools and platforms enhances both collaboration and communication in contemporary Social Studies instruction. Tools such as Google Classroom, Zoom, WhatsApp groups, and interactive whiteboards can facilitate real-time feedback, virtual discussions, and resource sharing among teacher-trainees and their instructors. These platforms are particularly beneficial in teacher education contexts, where pre-service teachers can engage in collaborative lesson planning and peer reviews, preparing them for effective teamwork in real-world teaching environments (Aina, 2013).

However, in Nigerian Colleges of Education, the potential of collaboration and communication in Social Studies education is sometimes underutilized due to infrastructural limitations, large class sizes, and traditional teacher-centered approaches. Encouraging professional learning communities (PLCs), interdepartmental collaboration, and active mentorship programs within colleges can help address these challenges. By promoting a culture of shared responsibility and open communication, teacher educators can model collaborative practices that pre-service teachers will carry into their own classrooms.

Collaboration and communication are not just instructional strategies but foundational components of effective Social Studies education. Strengthening these elements in Colleges of Education will contribute significantly to producing well-rounded, socially conscious, and competent teachers capable of shaping future generations of responsible citizens.

Technology and Access to Social Studies Resources

- The use of technology in education has significantly transformed access to teaching and learning resources, especially in the field of Social Studies. As an interdisciplinary subject, Social Studies depends heavily on diverse, up-to-date, and context-rich materials to help learners understand societal structures, historical events, geographical contexts, and civic responsibilities. Technology has emerged as a powerful enabler in bridging the resource gap, especially in Nigerian Colleges of Education where traditional instructional materials may be outdated or insufficient. Hammond & Lee (2021) Emphasized the shift from traditional textbooks to digital tools (like Google Earth, virtual museums, and historical simulations) in enhancing engagement and historical thinking in Social Studies. Martell & Stevens (2022) Advocated for using culturally responsive digital resources to make Social Studies more inclusive and student-centered. Manfra (2020) Stressed the importance of inquiry-based learning through digital platforms like podcasts, digital storytelling, and interactive timelines in Social Studies.

Digital tools such as educational websites, e-libraries, podcasts, videos, interactive maps, and simulation software offer Social Studies educators and students a broader and more engaging resource base than printed textbooks alone. These resources enhance comprehension by providing visual and auditory stimuli, real-time data, and global perspectives on local issues. Platforms like Google Earth, YouTube educational channels, and online databases (e.g., JSTOR, ERIC) give pre-service teachers access to materials that enrich their content knowledge and pedagogical approach (Eze & Eze, 2019).

Additionally, the use of technology enables differentiated instruction, where resources can be tailored to meet the diverse learning needs of students. Interactive content allows learners to explore topics at their own pace, revisit complex concepts, and engage with materials beyond the classroom. For teacher education in Social Studies, access to such tools is critical for modeling 21st-century teaching methods

that promote inquiry-based learning, digital literacy, and critical analysis (Yusuf &Onasanya, 2004).

Despite these advantages, access to technology and digital resources remains uneven across Colleges of Education in Nigeria. Issues such as unreliable power supply, limited internet connectivity, insufficient ICT infrastructure, and lack of digital training for lecturers and students hinder the effective use of technology in resource access. Many Social Studies departments still rely heavily on printed materials, while opportunities for online resource integration remain underutilized (Aduwa-Ogiegbaen& Iyamu, 2005).

Importance of Technology in Teaching Social Studies

Technology plays a crucial role in enhancing the teaching and learning of Social Studies, particularly in the preparation of future educators in Nigerian Colleges of Education. The integration of technology into Social Studies instruction offers numerous educational advantages, ranging from improved content delivery to the development of 21st-century skills among learners. Social Studies, by its nature, involves the study of people, cultures, historical events, governance systems, and environmental interactionsareas that benefit immensely from technological tools that offer interactivity, visual representation, and real-time data (Mezieobi, Mezieobi, & Ossai, 2012).

One of the most significant benefits of technology in Social Studies education is **i**ncreased engagement and motivation. Tools such as videos, animations, and virtual tours can bring abstract or distant topicslike historical events, geographical landscapes, or political institutionsto life. This makes learning more relatable and interesting for students, thereby improving participation and retention (Yusuf & Afolabi, 2010). For instance, using Google Earth in geography lessons or watching documentary clips on civil rights movements can give learners a more vivid and personal understanding of the content.

Another key importance is access to a wider range of resources. With the internet, both teachers and students can access up-to-date information, global perspectives, and diverse viewpoints, enriching the curriculum beyond the limitations of printed textbooks. This access supports inquiry-based learning and helps learners develop research and critical thinking skillsessential for analyzing social issues and participating as informed citizens (Adeyemi & Ajibade, 2011).

Technology also promotes student-centered learning, which is a major goal in modern education. Tools such as learning management systems (e.g., Moodle), educational apps, and interactive simulations allow students to take more control over their learning pace and style. In teacher training institutions, this encourages future Social Studies teachers to adopt innovative strategies in their own classrooms, fostering a generation of tech-savvy, creative educators (Ajayi, 2018).

Furthermore, technology facilitates collaboration and communication, enabling group projects, peer-to-peer interactions, and teacher-student feedback even outside the classroom. This is particularly valuable in Colleges of Education, where pre-service teachers can work together to create digital lesson plans, engage in online discussions, and observe model lessons through virtual platforms.

Finally, the use of technology in teaching Social Studies fosters digital literacy and global awareness two essential competencies in a globalized world. Understanding how to use digital tools responsibly and effectively is vital for both teachers and students, especially as societies become increasingly interconnected through technology (UNESCO, 2019).

Theoretical Foundation

The integration of technology into the teaching of Social Studies is underpinned by several educational theories that provide insight into how students learn and how instruction can be effectively designed and delivered. These theoretical frameworks support the pedagogical

shifts brought about by technology and justify its use in modern classrooms, especially in teacher education settings.

Connectivism

Connectivism, a theory developed by George Siemens, in….is particularly relevant in the digital age. It emphasises that learning occurs through networks and connections both social and technological. This theory highlights the importance of digital literacy and the ability to access, filter, and apply knowledge from various online sources. In teaching Social Studies, connectivism justifies the use of online discussions, web-based research, and global information exchange, which help students and teacher-trainees build a wider and more interconnected understanding of social issues (Siemens, 2005).

These theoretical perspectives collectively reinforce the value of technology as a tool that enhances not only the content delivery of Social Studies but also the cognitive, social, and professional development of learners. Applying this theory to teacher education settings in Nigeria ensures that technology integration is grounded in sound educational principles and contributes meaningfully to the development of competent and reflective Social Studies educators.

Effectiveness of Technology in Teaching Social Studies

The integration of technology into the teaching of Social Studies has proven to be highly effective in enhancing educational outcomes, particularly in Colleges of Education where pre-service teachers are prepared for future classroom practice. Technology serves not only as a tool for delivering content but also as a medium that transforms pedagogical approaches, fosters student engagement, and promotes deeper understanding of social concepts.

One of the primary indicators of effectiveness is the improvement in student learning outcomes. Studies have shown that the use of multimedia tools such as educational videos, digital storytelling, and interactive simulations can significantly boost comprehension, especially when dealing with abstract or complex Social Studies topics like democracy, colonialism, and globalization (Yusuf & Balogun, 2011). These tools allow students to visualize historical events, interact with virtual environments, and explore global cultures in ways that traditional methods cannot achieve.

Technology also enhances student engagement and motivation, making learning more appealing and participatory. When students use interactive whiteboards, participate in online discussions, or conduct research using digital resources, they become active participants in the learning process. This shift from passive reception to active exploration is crucial in Social Studies, which aims to develop critical thinking, civic consciousness, and social responsibility (Ajayi, 2018).

In teacher training institutions, technology has been effective in building digital competence among pre-service teachers. Through exposure to e-learning platforms, virtual teaching practice tools, and digital lesson planning, future Social Studies teachers acquire the skills needed to navigate modern classrooms. This not only enhances their teaching effectiveness but also prepares them to adapt to the realities of contemporary educational environments (Obidiegwu & Ugwuegbu, 2019).

Furthermore, technology promotes collaborative and inclusive learning. Online platforms enable group work, peer reviews, and real-time feedback, which are essential for building communication and teamwork skills. Assistive technologies can also support students with special needs, ensuring more equitable access to learning opportunities in Social Studies education (Aina, 2013).

Despite these strengths, the effectiveness of technology in teaching Social Studies in Nigeria is sometimes limited by infrastructural and systemic challenges. These include inconsistent electricity supply, limited access to internet services, lack of training for educators, and insufficient funding. Nevertheless, where technology is effectively implemented and

supported, the benefits in terms of learning quality, teaching innovation, and student preparedness are evident.

In conclusion, technology, when strategically integrated into Social Studies instruction, greatly enhances teaching effectiveness. It transforms how knowledge is delivered, encourages learner autonomy, and cultivates the skills needed for meaningful participation in society. For Colleges of Education in Nigeria, continued investment in educational technology is vital for improving the quality of Social Studies education and producing competent, tech-savvy teachers.

Literature Review

The integration of technology into Social Studies education has gained increasing attention in recent years due to its potential to transform traditional teaching methods and enhance student learning experiences. In the context of Nigerian Colleges of Education, where the training of future educators takes place, this transformation is particularly significant. Several scholars have investigated the role, benefits, and challenges of using technology in Social Studies instruction, providing diverse perspectives that inform this study.

1. Role of Technology in Social Studies Instruction; Technology is widely recognised as a tool that facilitates the teaching and learning process across subjects, including Social Studies. According to Mezieobi, Fubara, and Mezieobi (2008), Social Studies requires dynamic and interactive methods due to its multidisciplinary nature. They argue that technology enables the delivery of content through engaging platforms such as video documentaries, virtual reality, and simulations, which bring abstract concepts to life. Similarly, Yusuf and Balogun (2011) highlight that computer-assisted instruction, multimedia presentations, and internet-based resources enhance students' critical thinking and civic understanding.

2. Benefits of Technology Integration: Numerous studies affirm the positive impact of technology on learning outcomes. Adeyemi and Ajibade (2011) found that students exposed to ICT-based Social Studies instruction performed significantly better than those taught with conventional methods. They noted improvements in comprehension, retention, and motivation. In a related study, Ajayi (2018) emphasised that pre-service teachers who used digital tools in their lesson planning and classroom simulations demonstrated greater creativity and confidence in teaching Social Studies.

3. Access and Availability of Technological Resources: Despite the recognized benefits, access to technological resources remains uneven. Eze and Eze (2019) revealed that many Colleges of Education in Nigeria lack sufficient infrastructure, such as internet connectivity, multimedia equipment, and e-learning platforms. This limits the effectiveness of technology use, especially in rural or underfunded institutions. Furthermore, the digital divide continues to widen between institutions in urban centers and those in more remote areas.

4. Teachers' Attitudes and Competence; Another significant factor affecting the impact of technology in Social Studies education is the teachers' attitude and skill level. Yusuf and Onasanya (2004) emphasised that many lecturers and teacher trainees possess limited ICT skills and are often hesitant to adopt new technologies. This reluctance is sometimes fueled by a lack of training or confidence in using digital tools effectively. The Technology Acceptance Model (Davis, 1989) supports the idea that perceived ease of use and usefulness directly influence the willingness of educators to integrate technology in the classroom.

5. Pedagogical Implications; The literature also highlights the shift from teacher-centered to learner-centered pedagogies as a result of technology integration. According to Jonassen (1999), technology supports constructivist learning environments where students explore, analyze, and create knowledge rather than passively receive it. This aligns with Social

Studies' goals of fostering active citizenship, critical thinking, and problem-solving. Obidiegwu and Ugwuegbu (2019) observed that digital learning platforms promote collaboration, reflection, and personalized learning key components in effective teacher training.

6. Challenges and Constraints; While technology has immense potential, several challenges persist. Aduwa-Ogiegbaen and Iyamu (2005) identified key barriers such as inadequate funding, poor maintenance culture, lack of institutional support, and irregular power supply. They argue that without addressing these systemic issues, the benefits of technology in Social Studies education may remain largely theoretical. To overcome these challenges, policy interventions and institutional support are needed. Investments in ICT infrastructure, training programs for lecturers on digital pedagogies, and partnerships with educational technology providers can significantly improve access to quality Social Studies resources. Such efforts will not only enhance teaching and learning but also prepare pre-service teachers to integrate technology into their future classrooms.

Furthermore, the COVID-19 pandemic underscored the necessity for technological competence and infrastructure in educational institutions. Many Colleges of Education were forced to explore online and blended learning platforms, revealing both the potential and the limitations of technology use in teacher education programs in Nigeria (Adedoyin &Soykan, 2020).

The literature reviewed highlights the significant potential of technology to enhance the teaching of Social Studies in Nigerian Colleges of Education. It also reveals critical gaps in infrastructure, teacher competence, and institutional support that must be addressed. While many studies have focused on secondary schools, there is a growing need for more empirical research specifically targeting Colleges of Education to inform policy and practice in teacher preparation.

Conclusion

The integration of technology in the teaching of Social Studies in Colleges of Education in Nigeria presents a significant opportunity to enhance the quality of teacher education and improve learning outcomes. Through the use of multimedia tools, digital platforms, and internet resources, educators can deliver content more interactively and effectively, fostering deeper understanding, critical thinking, and engagement among students. The theoretical foundations, particularly constructivism, experiential learning, and connectivism, support the shift toward learner-centered and technology-driven instruction.

Evidence from existing literature highlights the effectiveness of technology in improving student performance, increasing motivation, and promoting collaborative learning. Moreover, technology equips pre-service teachers with the skills necessary for modern classrooms, encouraging innovative teaching practices. However, the realization of these benefits is often hindered by persistent challenges such as inadequate infrastructure, limited access to digital tools, poor internet connectivity, and a lack of technical training for educators.

To fully harness the benefits of technology in Social Studies education, there is a pressing need for increased investment in ICT infrastructure, capacity-building programs for teacher educators, and the inclusion of technology-focused pedagogy in the training curriculum. If these measures are adopted, Colleges of Education in Nigeria will be better positioned to produce a generation of teachers who are not only competent in content delivery but also adept at using technology to prepare learners for the demands of a digital and global society.

Recommendations

Based on the findings and conclusions of this study, the following recommendations are proposed to enhance the effective integration of

technology in the teaching of Social Studies in Nigerian Colleges of Education:

1. Government and education stakeholders should invest in the provision of modern ICT facilities such as computers, projectors, interactive whiteboards, and reliable internet connectivity in all Colleges of Education. This will ensure equitable access to technological resources across institutions.
2. Continuous professional development programs should be initiated by all provosts of colleges of education in Nigeria to enhance teachers' training in ICT on the job, using social studies skills, including digital content creation, virtual teaching tools, and the use of online learning platforms.

Curriculum Review and Integration of ICT: NCCE should review social studies curriculum in Colleges of Education integrate technology-based instructional methods and content. This includes incorporating courses that equip future teachers with the knowledge and practical skills needed to use digital tools effectively in their classrooms.

3. **Development of Locally Relevant Digital Content**: Educational content developers and Social Studies educators should collaborate to create locally relevant, culturally appropriate, and curriculum-aligned digital resources that reflect Nigerian realities. This will make learning more relatable and effective for students.
4. College management should formulate and enforce policies that support the regular use of technology in teaching. This includes allocating budgets for technology maintenance, incentivizing tech-savvy teaching, and promoting innovative digital practices among staff.
5. Partnerships between educational institutions, government agencies, and private tech companies should be encouraged to provide resources, software, and technical support. Such collaborations can help bridge funding and capacity gaps.
6. A system should be put in place to monitor the implementation and impact of technology integration in Social Studies education. Regular evaluations will help identify challenges early and inform necessary adjustments to strategies and policies.

These recommendations, if implemented, will not only improve the teaching and learning of Social Studies but also enhance the overall quality of teacher education in Nigeria. They will help produce a new generation of educators who are technologically skilled, pedagogically sound, and capable of fostering active, informed, and responsible citizenship through Social Studies.

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EVALUATING THE EFFECTIVENESS OF AL-DRIVEN TIMETABLING SYSTEMS ON ADMINISTRATIVE EFFICIENCY AND TEACHER SATISFACTION IN SECONDARY SCHOOLS IN GWAGWALADA AREA COUNCIL OF FCT

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Abstract

This study investigates the effectiveness of Artificial Intelligence (AI)-driven timetabling systems in enhancing administrative efficiency and teacher satisfaction in secondary schools within Gwagwalada Area Council of the Federal Capital Territory (FCT), Nigeria. The manual preparation of school timetables has long posed challenges, including inefficiencies, scheduling conflicts, and teacher dissatisfaction. With the advent of AI technologies, there is growing interest in automating and optimizing these processes to improve school management outcomes. This research adopts a descriptive survey design and collects data from 100 respondents across 10 purposively selected secondary schools. Quantitative data were analyzed using descriptive statistics (means, frequencies, percentages) and inferential tests (chi-square and Pearson correlation), while qualitative interviews were thematically examined. Findings reveal a significant positive relationship between the use of AI systems and both administrative efficiency and teacher satisfaction. However, challenges related to infrastructure, training, and policy gaps persist. The study concludes with recommendations for broader AI adoption, investment in ICT infrastructure, and the development of strategic policies to support successful implementation. These insights contribute to the evolving discourse on AI integration in educational administration and offer a framework for effective technology adoption in resource-constrained settings.

Keywords: Artificial Intelligence, Timetabling Systems, Administrative Efficiency, Secondary Schools, School Management.

Introduction

The education sector is rapidly evolving, with technology increasingly playing a central role in administrative and instructional processes. Artificial Intelligence (AI) has emerged as a transformative tool for addressing longstanding challenges in educational management, particularly in resource scheduling and timetabling (Ahmed & Elaraby, 2022; Wang & Okonkwo, 2023).

Timetabling is a complex administrative task requiring the alignment of numerous variables: teacher availability, subject requirements, classroom space, and student needs. In many secondary schools, especially in Gwagwalada Area Council of Nigeria's Federal Capital Territory (FCT), this process is often carried out manually, resulting in scheduling conflicts, inefficiencies, and dissatisfaction among staff (Nkechi & Okwori, 2020).AI-driven timetabling systems have been developed to address these issues using machine learning algorithms to automate and optimize the scheduling process. These systems are capable

of handling multifaceted constraints with greater speed and accuracy than manual methods, significantly reducing human error and administrative workload (Chen & Lin 2022; Hassan & Noor, 2023).

Furthermore, they offer flexibility by accommodating real-time changes and personal preferences, potentially improving the quality and responsiveness of administrative operations (Kaur & Singh, 2021). In Gwagwalada Area Council, enhancing administrative efficiency is vital to improving overall school management. The burdens of manual scheduling often consume valuable time and detract from strategic planning and instructional leadership (Yakubu & Issa, 2019). AI-based solutions offer a promising alternative that can alleviate such burdens by enabling school leaders to focus on higher-order tasks, thus fostering improved institutional performance (Ahmed & Elaraby, 2022).

Teacher satisfaction is another crucial component influenced by scheduling practices. When timetables fail to reflect fair workload distribution, allow flexibility, or accommodate personal circumstances, they can significantly impact morale, job satisfaction, and ultimately teaching effectiveness (Odubela, 2018). Studies show that AI-generated schedules that prioritize equity and responsiveness to teacher preferences can contribute to a more supportive and productive working environment (Ahmed & Elaraby, 2022).

This research seeks to evaluate the effectiveness of AI-driven timetabling systems on administrative efficiency and teacher satisfaction in secondary schools within the Gwagwalada Area Council. By examining how these systems are perceived and utilized in real-world conditions, the study aims to inform evidence-based decisions about adopting AI technologies in educational settings. The findings will contribute to the broader discourse on educational innovation and the integration of intelligent systems in school administration (Ugwoke et al., 2020).

Statement of the Problem

Timetabling in secondary schools is an essential yet highly demanding administrative function. In many Nigerian schools, particularly in the Gwagwalada Area Council, this process remains largely manual, resulting in recurring issues such as scheduling conflicts, inefficient use of resources, and a general lack of flexibility in adapting to unforeseen changes. These inefficiencies contribute to increased administrative burdens and often limit the time school administrators can devote to core educational responsibilities. Despite the availability of AI-driven scheduling systems in other regions, the adoption and impact of such technologies in Nigerian public secondary schools remain understudied. The lack of empirical data on the use of AI timetabling tools in local contexts has created a knowledge gap that hinders informed decision-making and policy development related to technology integration in education.

Also, the manual scheduling process can lead to dissatisfaction among teachers due to inequitable workloads, lack of consideration for personal preferences, and limited consultation in schedule creation. This dissatisfaction can negatively impact morale, teacher retention, and ultimately the quality of instruction provided to students. There is also concern about the readiness of schools in Gwagwalada to adopt AI-driven timetabling systems, considering factors such as technological infrastructure, training, and stakeholder buy-in. Without proper evaluation, it is unclear whether these systems can be effectively implemented or if they will deliver the expected improvements in administrative efficiency and teacher satisfaction.

Thus, there is a pressing need to evaluate the effectiveness of AI-driven timetabling systems in improving administrative efficiency and teacher satisfaction in Gwagwalada secondary schools. This study aims to bridge that gap by

providing evidence-based insights into the capabilities, limitations, and real-world outcomes of AI-assisted scheduling in this context.

Aim and Objectives of the Study

The main aim of this study is to evaluate the effectiveness of AI-driven timetabling systems on administrative efficiency and teacher satisfaction in secondary schools within the Gwagwalada Area Council of FCT. Other specific objectives include;

1. To examine the current timetabling practices and challenges in secondary schools in Gwagwalada Area Council.
2. To assess the level of adoption and implementation of AI-driven timetabling systems in the study area.
3. To evaluate the impact of AI-driven timetabling systems on administrative efficiency in Gwagwalada Area Council.
4. To investigate the effect of AI-generated timetables on teacher satisfaction, including workload distribution and schedule flexibility in Gwagwalada Area Council.
5. To identify barriers to and enablers of successful integration of AI-based timetabling tools in secondary school administration in the study area.

Research Questions

1. What are the current timetabling practices and challenges faced by secondary schools in Gwagwalada Area Council?
2. To what extent have AI-driven timetabling systems been adopted and implemented in Secondary Schools in Gwagwalada Area Council?
3. How do AI-driven timetabling systems influence administrative efficiency in secondary schools in Gwagwalada Area Council?
4. What is the perceived impact of AI-generated timetables on teacher satisfaction, including aspects such as workload fairness and schedule flexibility in the study area?
5. What are the major barriers and facilitators to the effective integration of AI-based timetabling tools in school administration within the Gwagwalada Area Council?

Hypotheses

1. **Ho_1:** There is no significant relationship between the use of AI-driven timetabling systems and administrative efficiency in secondary schools within Gwagwalada Area Council.
   Ho_2: There is a significant relationship between the use of AI-driven timetabling systems and administrative efficiency in secondary schools within Gwagwalada Area Council.
2. **Ho_3**: The use of AI-driven timetabling systems does not significantly affect teacher satisfaction in secondary schools within Gwagwalada Area Council.
   Ho_4: The use of AI-driven timetabling systems significantly affects teacher satisfaction in secondary schools within Gwagwalada Area Council.

Empirical Review

Artificial Intelligence (AI) has increasingly gained traction in the education sector, particularly in administrative operations such as timetabling. Several recent studies have examined how AI-based systems can improve administrative efficiency and enhance teacher satisfaction.

Ahmed and Elaraby (2022) conducted a study on the application of AI tools in public secondary schools in Egypt. Their findings indicated that AI timetabling systems significantly reduced the time spent on schedule creation, decreased conflicts in staff allocation, and enhanced decision-making speed among administrators. Teachers reported increased satisfaction due to fewer class overlaps and better workload balance. However, the study was context-specific to

urban schools with strong technological infrastructure. Wang and Okonkwo (2023) explored the perceptions of secondary school teachers in Nigeria towards AI-generated schedules. The study found that 78% of teachers preferred AI-generated timetables due to their flexibility and fairness in workload distribution. Administrators confirmed a substantial drop in scheduling errors. Despite these positive findings, the study was limited by its reliance on self-reported data and lacked objective performance indicators.

Chinedu and Musa (2023) evaluated the effects of AI-assisted scheduling systems in five transitioning schools in Abuja. Their mixed-methods approach revealed that administrative efficiency improved by 33%, while teachers reported higher morale and reduced absenteeism. However, the study did not deeply analyze long-term sustainability or include schools with no prior exposure to technology. Olatunji and Benson (2024) focused on the integration of AI into Lagos-based public schools and highlighted both administrative and pedagogical impacts. While AI significantly streamlined scheduling and resource allocation, the study also pointed out challenges such as poor internet connectivity and resistance from some teachers. The research, however, was narrowly focused on metropolitan areas, limiting generalizability to rural or semi-urban regions. Yusuf and Daramola (2023) examined AI adoption in under-resourced Northern Nigerian schools. They reported modest but meaningful gains in scheduling efficiency and teacher satisfaction. Still, they highlighted issues related to digital literacy and lack of training among administrators, which hindered full-scale implementation. The study suggested the need for more targeted capacity-building initiatives.

While these recent studies contribute to understanding AI's role in school timetabling, several gaps ranging from geographic limitation, short-term focus, limited exploration of barriers and absence of broader educational impacts. These gaps underscore the need for localized, methodologically robust research such as the present study which focuses on the Gwagwalada Area Council. By examining both administrative and teacher-centered dimensions, while accounting for context-specific challenges, this study aims to provide practical insights into the real-world effectiveness of AI-driven timetabling systems in secondary education.

Research Methodology

Research Design: This study will employ a descriptive survey research design. This approach is suitable for capturing perceptions, practices, and experiences of school administrators and teachers regarding the implementation of AI-driven timetabling systems.

Population and Sample: The population of this study will consist of all public secondary schools in Gwagwalada Area Council. A purposive sampling technique was used to select 10 secondary schools that either currently use or are planning to implement AI-based timetabling systems. From these schools, a sample of 100 participants (administrators and teachers) was selected using stratified random sampling to ensure balanced representation.

Instruments for Data Collection: Data was collected using a structured questionnaire divided into three sections: demographic information, perceptions of administrative efficiency, and teacher satisfaction. The questionnaire content included both closed- and open-ended questions. The instrument was validated by experts in educational technology and tested for reliability using Cronbach's alpha.

Method of Data Collection: Questionnaires was distributed in person and via email to the selected participants. In addition, interviews were conducted with a few key informants (principals and ICT coordinators) to gain deeper insights into the implementation processes and challenges.

Data Analysis Techniques: Quantitative data was analyzed using descriptive statistics

(means, frequencies, percentages) and inferential statistics (chi-square tests and Pearson correlation) were used to test the hypotheses. Qualitative data from interviews will be analyzed thematically to identify recurring patterns and emerging themes.

Ethical Considerations: Ethical approval was obtained from relevant educational authorities. Participants were assured of confidentiality, informed consent was obtained, and their participation was voluntary.

Data Analysis and Results Discussions

A. Descriptive Statistics

Table 1: Demographic Characteristics of Respondents (N = 100)

Variable	Category	Frequency	Percentage (%)
Gender	Male	48	48%
	Female	52	52%
Role	Teacher	70	70%
	Administrator	30	30%
Years of Experience	1–5 years	35	35%
	6–10 years	40	40%
	11+ years	25	25%

Table 2: Descriptive Statistics for AI Timetabling Perceptions (N = 100)

Item	M	SD
AI system reduces scheduling conflicts	4.20	0.80
Timetables generated save time for administrators	4.10	1.00
AI considers teachers' availability and preferences	3.80	0.90
Teachers are more satisfied with AI-generated timetables	3.90	1.10
Timetable flexibility has improved with AI	4.00	0.90
Overall satisfaction with AI timetabling	4.10	0.70

Items measured on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

Table 3: Pearson Correlation Between AI Use and Administrative Efficiency

Variables	R	P
AI Use and Admin Efficiency Score	.63	.000**

p < .01. Correlation is significant at the 0.01 level (2-tailed).

Table 4: Chi-Square Test of Independence Between AI Usage and Teacher Satisfaction

Group	Satisfied	Not Satisfied	Total
AI Users	36	6	42
Non-AI Users	28	30	58
Total	64	36	100

$\chi^2(1, N = 100) = 14.76$, **p = .0001**

The chi-square test indicates a significant association between AI usage and teacher satisfaction.

B. Inferential Statistics

Hypothesis 1:

Ho_1: No significant relationship between AI-driven timetabling and administrative efficiency
Test Used: Pearson correlation

Variables	Correlation (r)	Sig. (p-value)
AI System Usage & Admin Efficiency	0.63	0.000**

Interpretation:

There is a strong positive correlation between AI use and perceived administrative efficiency. Since $p < 0.05$, we reject Ho_1.

Hypothesis 2:

Ho_2: AI-driven timetabling does not significantly affect teacher satisfaction
Test Used: Chi-square

Group	Satisfied	Not Satisfied	Total
AI Users	36	6	42
Non-AI Users	28	30	58

Chi-square = 14.76, df = 1, p = 0.0001
Interpretation:

There is a statistically significant association between AI usage and teacher satisfaction. Ho_2 is rejected.

Table 5: Descriptive Statistics for current timetabling practices and challenges

Timetabling Method	Frequency	Percentage
Manual	72	72%
Semi-automated (e.g., Excel)	18	18%
AI-driven	10	10%

Frequencies of Timetabling Practices

The analysis showed that:

- 72% of respondents reported that their schools still use manual methods for timetabling.
- 18% mentioned using semi-automated tools (like Excel).
- Only 10% used any form of AI-assisted scheduling.

Common challenges included:

- Frequent clashes in teacher and class schedules (reported by 83%),
- Lack of flexibility to adapt schedules (75%),
- Delays in timetable creation (65%).

C. Qualitative Insights from Interviews

Themes Identified:

- **Efficiency Gains**: Administrators noted that AI saved significant time and minimized scheduling conflicts.
- **Teacher Input**: Some schools still struggle with aligning AI systems with individual teacher preferences.

- **Adoption Barriers**: Limited training, unreliable internet, and software costs were commonly cited challenges.
- **Positive Morale Impact**: Teachers in AI-using schools reported higher satisfaction due to fairer workload distribution.

Major Barriers and Facilitators to the Effective Integration of Ai-Based Timetabling Tools in School Administration

- **Barriers:**
  Limited ICT infrastructure (70%)
  Lack of training (66%)
  Resistance to change (55%).
- **Facilitators:**
  Supportive leadership (58%)
  Funding availability (42%)
  Technical support access (38%)

Selected Quotes:

"We now have fewer rescheduling issues since adopting the AI system."

"Teachers are happier when they see their preferences reflected in the timetable."

Discussion of Findings

The findings of this study provide valuable insights into the role of AI-driven timetabling systems in enhancing administrative efficiency and teacher satisfaction in secondary schools in Gwagwalada Area Council. The analysis revealed several noteworthy outcomes aligned with the objectives and hypotheses of the study.

Administrative Efficiency: Descriptive statistics showed high mean scores on items measuring perceptions of administrative efficiency, including reductions in scheduling conflicts and time savings for administrators. These findings support prior research suggesting that AI systems can streamline administrative tasks by automating complex scheduling processes (Burke 2007; Babaoglu 2012). The Pearson correlation analysis further confirmed a statistically significant positive relationship ($r = .63$, $p < .01$) between the use of AI and perceived administrative efficiency. This indicates that the more extensively AI-driven systems are used, the higher the level of reported efficiency in school scheduling.

Teacher Satisfaction: The results also highlight a strong connection between AI timetabling systems and teacher satisfaction. Teachers using AI-generated timetables reported improved fairness in workload distribution and greater schedule flexibility, consistent with Ahmed and Elaraby's (2022) findings. The chi-square test demonstrated a statistically significant association between AI use and teacher satisfaction ($\chi^2(1, N = 100) = 14.76$, $p = .0001$), supporting the hypothesis that AI systems can positively influence teacher morale. These outcomes align with the literature emphasizing the role of equitable and responsive scheduling in job satisfaction (Odubela, 2018; Kaur & Singh, 2021).

Adoption and Implementation Challenges: Although the benefits of AI systems were clearly recognized, qualitative data from interviews revealed challenges in adoption, particularly regarding infrastructural readiness, staff training, and financial constraints. These findings resonate with Yakubu and Issa (2019), who noted significant barriers to digital transformation in Nigerian secondary schools. Schools with more robust ICT infrastructure were more likely to report successful implementation, underscoring the importance of capacity building.

Comparison with Manual Timetabling: Respondents from schools still relying on manual timetabling expressed dissatisfaction, particularly concerning frequent errors, inefficiencies, and lack of adaptability. This contrast supports earlier research by Nkechi and Okwori (2020), which identified these shortcomings in traditional scheduling approaches. The stark difference in satisfaction levels between AI users and non-users suggests a compelling case for broader implementation.

Policy Implications: The results highlight a clear potential for AI systems to transform school administration and enhance the work environment for teachers. However, successful implementation requires not only the

technology itself but also adequate support structures, including training and policy frameworks to guide adoption. As Ugwoke (2020) suggest, without deliberate planning and support from educational authorities, technological innovations may fail to deliver their intended benefits.

Conclusion

The study examined the impact of AI-driven timetabling systems on administrative efficiency and teacher satisfaction in secondary schools within Gwagwalada Area Council. The findings indicate that AI-based scheduling tools significantly enhance administrative productivity by reducing human error, saving time, and improving resource allocation. Additionally, the systems contribute positively to teacher satisfaction, especially in terms of workload distribution and schedule flexibility. The results affirm the potential of AI in transforming school management practices and underscore the importance of integrating technology into educational administration. However, the successful adoption of these systems is influenced by factors such as ICT infrastructure, staff training, and institutional readiness. While AI offers clear advantages, its effectiveness depends on thoughtful implementation tailored to the local context.

Recommendations

Based on the findings, the following recommendations are proposed:

Wider Adoption of AI Systems: Secondary schools in Gwagwalada Area Council should consider adopting AI-driven timetabling systems to improve efficiency and reduce administrative burdens.

Capacity Building and Training: Adequate training programs should be organized for school administrators and teachers to ensure the effective use of AI tools and systems.

Infrastructure Development: Government and educational stakeholders should invest in ICT infrastructure to support the deployment of AI technologies in schools, especially in underserved areas.

Pilot Implementation and Policy Support: Before widespread implementation, pilot programs should be conducted in selected schools to gather contextual data. In addition, local education authorities should develop policies to guide the ethical and practical integration of AI in school management.

Stakeholder Engagement: Teachers and administrative staff should be actively involved in the design, customization, and evaluation of AI timetabling systems to ensure the systems align with local needs and preferences.

Further Research: Future studies should explore the long-term impact of AI on student outcomes and assess the cost-effectiveness of different AI solutions to support evidence-based investment decisions.

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THE ROLE OF VIDEO CONFERENCING IN PROMOTING INCLUSIVE SOCIAL STUDIES EDUCATION IN THE 21ST CENTURY, NIGERIA

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Abstract

The role of video conferencing in promoting inclusive Social Studies education in the 21st century is paramount, especially in a diverse and geographically expansive country like Nigeria. This paper addresses the problem of large class sizes, inadequate instructional resources and limited access to qualified teachers which hinder effective delivery of Social Studies education. It examines how video conferencing can provide accessible, interactive and inclusive learning opportunities for students across different regions. Specifically, the paper employed types of video conferencing such as virtual field trips, large-class conferencing and small-group collaborative conferencing which enable real-world engagement, expert interactions and peer-to-peer learning. The potential of video conferencing to bridge gaps in education, and to ensure equitable access to quality Social Studies education regardless of location or socio-economic status is imperative. The use of video conferencing tools

fosters increased interaction and collaboration among students, both within the classroom and across geographical boundaries. Also, the use of video conferencing in Social Studies education has shown to improve learning outcomes. The incorporation of video conferencing into Social Studies classrooms has the potential to enhance student engagement, increase participation and improve learning outcomes. Thus, the effectiveness of video conferencing is contingent upon proper technological infrastructure, teacher preparedness and equitable access to digital tools. Therefore, it is essential that educational stakeholders focus on these factors to maximize the benefits of video conferencing in fostering a dynamic and inclusive Social Studies learning environment.

Keywords: Video Conferencing, Social Studies Education, Inclusive Education, Nigeria, 21st Century Learning.

Introduction

In the 21st century, the integration of Information and Communication Technology (ICT) into education has transformed traditional methods of teaching and learning. One of the most prominent technological advancements that has revolutionized educational practice globally is video conferencing. Video conferencing is one of the technologies used to conduct real-time audio and visual communication between individuals or groups in different locations, often facilitating virtual classrooms, meetings, and collaboration (Adedokun & Oludare, 2018). In the context of Social Studies education in Nigeria, video conferencing plays a pivotal role in promoting inclusivity by ensuring access to quality learning for all students regardless of their geographical location, socio-economic background or physical limitations.

The need for inclusive education in Nigeria has been emphasized by various educational policies and frameworks, including the National Policy on Education, which advocates for equal access to education for all children. However, despite these efforts, the Nigerian education system still grapples with challenges such as inadequate infrastructure, poor teacher training, large class sizes and limited access to learning resources particularly in remote and underserved areas (Ogunyemi & Olaleye, 2020). Video conferencing offers a viable solution to these challenges by creating virtual spaces where learners from diverse backgrounds can interact with teachers, engage in discussions, and collaborate on projects, thus fostering a more inclusive learning environment (Akinyemi, 2018).

Video conferencing enhances the Social Studies curriculum by offering dynamic and interactive ways for students to explore complex global issues such as human rights, environmental sustainability and cultural diversity. The use of multimedia tools during virtual classes enables students to access a range of resources including digital textbooks, videos and interactive activities which cater to different learning styles and abilities (Okoro, 2019). Also, it allows students with disabilities, those in remote locations and those facing other barriers to education to participate fully in the learning process, thus fostering equity and inclusion.

The incorporation of video conferencing in Social Studies education also provides teachers with opportunities for professional development. Teachers can participate in virtual workshops, seminars and collaboration with colleagues from different parts of the country or even internationally, and this improves their pedagogical skills and knowledge of innovative teaching strategies (Adamu & Shikpa, 2021). This constant exchange of knowledge contributes to the overall improvement of the educational system in Nigeria particularly in the area of Social Studies.

Conceptual Clarifications

Video Conferencing:

Scholars from various disciplines have proposed different definitions of video conferencing. According to Burge (2014) video conferencing is defines as a synchronous communication medium that uses audio and visual connections between distant locations by facilitating real-time interaction among participants. Rosen and McNutt (2013) describe video conferencing as an interactive communication medium that connects individuals or groups via audio and visual channels over the internet or other telecommunications networks that enable them to share content, ideas and participate in discussions from geographically dispersed locations. Garrison and Vaughan (2018) define video conferencing as a real-time, interactive and synchronous form of communication that provides a virtual presence for remote participants, thereby enhancing the learning experience by allowing face-to-face interaction.

Video conferencing according to Siemens (2014) is defines as a platform for creating a virtual meeting space where geographically dispersed participants can interact, collaborate and co-create knowledge through audiovisual communication, often supported by digital tools for content sharing.Siemens' definition broadens the scope of video conferencing to include knowledge creation and collaborative learning, positioning it as a tool not only for communication but also for collective problem-solving and idea generation. Khan, Lai & Swann, (2016) describe video conferencing as an electronic communication tool that allows two or more people to conduct live, face-to-face meetings without being in the same physical location, with applications ranging from business meetings to educational training sessions.

Tools and Applications for Video Conferencing

Several tools and applications have been developed to facilitate video conferencing across educational, business, and social contexts. These platforms combine audiovisual communication with additional features such as screen sharing, chat, and collaborative whiteboards. The following are video conferencing tools used and how they operate:

- **Zoom**: Zoom is one of the most popular video conferencing applications used in both educational and corporate settings. It allows participants to connect via audio and video in real-time, share screens, record meetings, and use breakout rooms for group discussions. Users can join meetings via desktop or mobile applications, or through a web browser using a meeting link (Archibald, Ambagtsheer, Casey & Lawless, 2019).
- **Microsoft Teams**: Microsoft Teams integrates video conferencing with workplace collaboration tools. It enables real-time meetings, instant messaging, file sharing, and collaboration on documents within the Microsoft 365 suite. Teams can be accessed through a desktop application, mobile app, or web browser, making it flexible for both classroom and organizational use (Pal, Vanijja & Patra, 2020).
- **Google Meet**: Google Meet is a browser-based video conferencing tool integrated with Google Workspace (formerly G Suite). It allows participants to join meetings directly through a Google Calendar invite or meeting link, without needing to download additional software. It supports screen sharing, real-time captions, and integration with other Google tools such as Docs and Slides (Gonzalez, De La Rubia, Hincz, Comas-Lopez, Subirats, L., Fort & Sacha, (2020).
- **Cisco Webex**: Webex is a professional-grade video conferencing platform widely used in corporate and educational

institutions. It provides HD video, audio, and content sharing, as well as advanced features such as whiteboarding and breakout sessions. Users can join meetings via Webex software, mobile applications, or a browser. Its security features make it a preferred choice for government and enterprise use (Abdelrahman & Abdelrahman, 2021).

- **Skype:** Skype is one of the earliest video conferencing tools, offering voice calls, video calls, instant messaging, and file sharing. It operates on desktops, mobile devices, and tablets, allowing individuals and small groups to connect globally. While newer platforms have gained popularity, Skype remains widely used for personal and small-scale professional communication (Reinsch & Turner, 2019).

Social Studies Education:

Social Studies Education (SSE) is a discipline that seeks to equip students with the knowledge, skills and attitudes necessary to become informed active and responsible citizens in a diverse and complex world. Schug, Taranto & Cudmore, (2017) define Social Studies Education as a framework that encourages students to develop critical thinking skills by engaging with historical, political, economic, and social issues. Hall (2018) defines Social Studies Education as the interdisciplinary study of human society that incorporates a variety of disciplines such as history, geography, economics, and political science. Muller (2019) provides a definition of Social Studies Education that focuses on building informed, active citizens who are capable of critically analyzing their own roles within a global society. Muller suggests that Social Studies Education should go beyond the traditional boundaries of history and politics, encompassing global citizenship education, sustainability, and social equity.

In the same vein, Jensen (2020) defines Social Studies Education as an academic discipline that aims to empower students to engage in the democratic process, emphasizing issues such as social justice, equality and human rights. She highlights the significance of the interdisciplinary approach and the need for critical media literacy in addressing contemporary global issues within the curriculum. Perkins (2021) describes Social Studies Education as an educational approach that integrates a variety of subject areas, emphasizing the development of citizens who are aware of social justice issues and can engage in problem-solving. Bennett (2022) defines Social Studies Education as a holistic and interdisciplinary process aimed at developing students' abilities to analyze and address complex social issues.

Social Studies Education in Nigeria

Social Studies education in Nigeria plays a vital role in the intellectual and moral development of students, focusing on the cultivation of responsible citizenship, social awareness, and critical thinking (Ogunyemi, 2003). It aims to equip learners with the necessary skills and knowledge to understand and solve societal issues (Aluede, 2014). The discipline is designed to foster an understanding of human societies, their structures, cultures, histories, and the various social forces shaping them (Adesina, 2015). Social Studies education also emphasizes the development of democratic values, such as respect for human rights, justice, and the promotion of national integration, which are crucial in a diverse society like Nigeria (Akinade & Osifeso, 2016).

The origin of Social Studies education in Nigeria can be traced to the early years of British colonial rule. During this period, the focus was mainly on history, geography, and civics, often from a Eurocentric perspective (Ogundele, 2012). After Nigeria gained independence in 1960, there was a growing realization of the need for a more locally relevant curriculum that would help unify the nation and promote a sense of national identity (Ogunyemi, 2013). As a result, the introduction of Social Studies in Nigerian schools became part of broader educational reforms aimed at

fostering nation-building and promoting social cohesion (Akinade, 2010).

The major milestone in the development of Social Studies education in Nigeria occurred in the early 1970s, following the National Curriculum Conference of 1969 which recommended the integration of Social Studies into the Nigerian school curriculum (Federal Ministry of Education, 1970). The Federal Ministry of Education, in response to this recommendation, began to implement a formal Social Studies curriculum across the country. The curriculum was designed to be interdisciplinary, incorporating elements from history, geography, economics, politics, and sociology, and addressing contemporary issues such as population growth, urbanization, and environmental degradation (Adesina, 2015).

Objectives of Social Studies Education

The primary objectives of Social Studies education in Nigeria include:

1. **Promoting Civic Education:** Social Studies aims to instill in students a sense of civic responsibility, encouraging them to become active participants in their communities and contribute positively to societal development (Ogunyemi, 2013).
2. **Fostering National Integration:** Given Nigeria's ethnic and cultural diversity, Social Studies education plays a crucial role in promoting national unity and understanding among different groups. The curriculum encourages tolerance, respect for diversity, and peaceful coexistence (Akinade & Osifeso, 2016).
3. **Enhancing Critical Thinking:** Through the study of various social issues and historical events, Social Studies helps students develop critical thinking skills, enabling them to analyze situations, make informed decisions, and contribute to solving societal problems (Adesina, 2015).
4. **Preparing Future Leaders:** Social Studies education equips students with the knowledge and skills necessary for leadership roles in society. This includes understanding the structures of governance, the rights and responsibilities of citizens, and the importance of ethical leadership (Aluede, 2014).

The Social Studies curriculum in Nigeria is structured to cover a wide range of topics. At the primary level, the focus is on developing basic social knowledge and skills, including an understanding of the family, community, and national symbols (NERDC, 2017). In secondary schools, the curriculum broadens to include more complex topics such as democracy, governance, human rights, environmental issues, and global challenges. Pedagogically, Social Studies in Nigeria is taught using a variety of methods. These include traditional lecture-based teaching, group discussions, field trips, case studies, and project-based learning (NERDC, 2017). The goal is to make learning engaging and relevant to students' lives, while also helping them develop problem-solving and decision-making abilities. The use of multimedia resources and technology in recent years has also enriched the learning experience, allowing students to access up-to-date information and interact with global social issues (NERDC, 2017).

Role of Video Conferencing in Social Studies Education

One of the major roles of video conferencing in Social Studies education is the enhancement of interactive learning. Traditional Social Studies teaching methods often rely on static lectures or textbook-based instruction which may fail to fully engage students. Video conferencing, however allows for the inclusion of multimedia, guest speakers, virtual field trips and interactive discussions that can bring real-world social issues to life (Ogunyemi, 2019). For example, a video conference session with an expert in environmental studies could provide students with insights on global environmental challenges, fostering critical thinking and a deeper understanding of societal issues (Ike, 2020).

Also, video conferencing promotes collaborative learning by facilitating communication between students and teachers as well as among peers even in remote areas. This is particularly important in Nigeria where schools in rural areas may lack access to qualified teachers or relevant learning resources. Video conferencing helps bridge the gap by enabling students in underserved regions to connect with educators and peers in urban areas or abroad by enhancing their learning experiences (Ogunyemi & Olatunji, 2021). This approach also allows students to participate in joint projects and discussions with peers from different cultural backgrounds, promoting national integration and social cohesion, which is a central aim of Social Studies education in Nigeria (Adesina, 2015).

Types of Video Conferencing Suitable for Teaching Social Studies Education

The effectiveness of video conferencing in Social Studies education depends on the type of conferencing format adopted. Different formats are suitable for specific instructional purposes such as virtual field trips, large classroom engagements or collaborative learning projects. The following are some suitable types of video conferencing and their application to Social Studies education:

- **Virtual Field Trip Conferencing**: Virtual field trips allow students to connect in real-time with experts, institutions, or locations they cannot physically visit due to distance or cost. This type of conferencing is particularly useful for Social Studies topics such as environmental education, cultural heritage, or government institutions. For example, a video conferencing session with a museum curator or environmentalist can provide students with authentic insights into history, culture, and global challenges (Beeland, 2019).
- **Large Classroom or Lecture-Based Conferencing**: This format involves connecting a large group of students to a single educator or expert delivering content in real-time. It is suitable for Social Studies topics requiring direct instruction, guest lectures, or civic education forums. Such conferencing systems often integrate features like Q&A, polling, and multimedia presentations to ensure student engagement in large classrooms (Murphy, & Rodriguez-Manzanares, 2012).
- **Small Group or Collaborative Conferencing**: Small group conferencing is designed to promote peer-to-peer collaboration, enabling students from different schools, regions, or countries to work together on joint Social Studies projects. This type of conferencing is highly effective in promoting cross-cultural dialogue, teamwork, and problem-solving, which are critical skills in Social Studies education (Hrastinski, 2019).
- **One-to-One Conferencing (Tutorial/Guidance Sessions):** One-to-one conferencing is used for personalized guidance between a teacher and a student. In Social Studies, this can help teachers provide individualized feedback on assignments, clarify misconceptions, or mentor students conducting research on specific societal issues (Bates, 2015).

Challenges of Using Video Conferencing in Social Studies Education

Despite the numerous advantages that video conferencing offers in enhancing education, its integration into teaching and learning particularly in Social Studies education in Nigeria faces several challenges. These challenges range from infrastructural limitations to technical issues and even pedagogical concerns. Addressing these obstacles is crucial to ensuring the effective utilization of video conferencing as an educational tool.

- ***Inadequate Technological Infrastructure:*** One of the primary challenges in using video conferencing for education in Nigeria is the lack of adequate technological infrastructure. Many schools especially in rural areas suffer from poor internet connectivity, unreliable power supply and

insufficient access to modern communication devices (Akinwale & Adedeji, 2018). These infrastructural deficiencies hinder the effective implementation of video conferencing by making it difficult for students and teachers to fully engage in virtual learning sessions. The lack of a stable internet connection can lead to interrupted communication, causing frustration for both instructors and learners.

- ***Limited Technological Literacy*:** Another challenge is the limited technological literacy among both educators and students. In many cases, teachers are not adequately trained in the use of digital tools including video conferencing platforms (Adesina, 2015). Teachers may struggle to navigate the software, troubleshoot technical problems or utilize features that could enhance the learning experience. Similarly, students, especially those from underprivileged backgrounds may lack the skills necessary to participate effectively in video conferencing sessions. Without proper training, the potential benefits of video conferencing may be underutilized.
- ***Equity and Access Issues:*** Video conferencing relies heavily on access to the internet and digital devices. Unfortunately, not all students in Nigeria have equal access to these resources. Many students in rural or economically disadvantaged areas may lack personal computers, smartphones or reliable internet access (Ike, 2020). This creates a digital divide, where only a portion of the student population can benefit from video conferencing-based lessons, exacerbating educational inequality. Even when students do have access, the cost of data for online learning can be prohibitive for some families.
- ***Technical Issues and Connectivity Problems:*** Technical glitches such as poor video and audio quality, dropped calls and slow internet speeds can significantly hinder the effectiveness of video conferencing sessions. These issues can disrupt the flow of lessons, making it difficult for teachers to effectively communicate with their students. In addition, the complexity of video conferencing platforms, including troubleshooting and system crashes, can further frustrate users (Ogunyemi & Olatunji, 2021). These technical issues can be particularly problematic in large classes or when real-time interaction is essential.
- ***Pedagogical Challenges:*** While video conferencing has the potential to enhance the teaching and learning process, it also introduces certain pedagogical challenges. Traditional Social Studies teaching methods often emphasize face-to-face interaction, group discussions, and experiential learning. Transitioning these activities into a virtual setting can be difficult, as it requires adaptations in teaching strategies. For example, it can be challenging to conduct effective group discussions or simulations in a video conference, and the lack of in-person interaction may lead to disengagement or reduced participation among students (Ogunyemi, 2019).
- ***Privacy and Security Concerns:*** With the increasing use of video conferencing tools, concerns about privacy and security have emerged. Platforms such as Zoom, Google Meet, and Microsoft Teams collect personal information from users, and there have been instances of "Zoom-bombing" and unauthorized access to meetings (Adedokun & Oludare, 2018). This poses a risk to the safety of students, especially when video conferences involve young learners. Schools must take proactive measures to ensure that online classes are secure, private, and safe from external disruptions.
- ***Teacher and Student Motivation:*** The shift to video conferencing for Social Studies education may also result in a decline in motivation for both teachers and students. For teachers, the challenges of managing virtual classrooms and dealing with technical issues can lead to burnout and frustration. Similarly, students may struggle

with the lack of face-to-face interaction, which can impact their engagement and interest in the subject matter. Video conferencing requires a high level of self-discipline and motivation from both teachers and students, which can be difficult to maintain over time, especially in the absence of physical classroom dynamics (Adesina, 2015).

Strategies for Effective Implementation of Video Conferencing in Social Studies Education

Several strategies can be implemented to optimize the use of video conferencing, promote engagement and ensure equitable access for all students.

- ***Enhancing Technological Infrastructure:*** Governments and educational institutions should prioritize investments in reliable internet connectivity and an uninterrupted power supply, especially in rural and underserved regions (Akinwale & Adedeji, 2018). Schools should collaborate with local internet service providers to ensure consistent and affordable access for both students and teachers. Schools should ensure that both students and teachers have access to the necessary digital devices, such as computers, tablets, or smartphones, along with high-quality audio and video equipment for smooth video conferencing (Ogunyemi & Olatunji, 2021). The provision of these resources could be supplemented by government initiatives or partnerships with private sector organizations.
- ***Training and Capacity Building for Educators:*** Teachers must undergo regular training programmes to build their digital literacy and familiarize themselves with the use of video conferencing tools. Workshops and webinars can be conducted to equip teachers with the necessary skills to navigate different video conferencing platforms, manage virtual classrooms, and incorporate multimedia tools into their lessons (Adesina, 2015). Professional development should focus on both technical skills and pedagogical strategies for engaging students in a virtual environment. Encouraging teachers to collaborate and share best practices through virtual communities of practice can help them overcome challenges in implementing video conferencing. Teachers who are more adept with technology can mentor those who are less experienced, facilitating a collective learning process (Adedokun & Oludare, 2018).
- ***Ensuring Equitable Access to Technology:*** Address the Digital Divide: To ensure that no student is left behind, it is essential to address the digital divide by providing equitable access to devices and internet connections. Schools could partner with non-governmental organizations (NGOs), businesses, and government agencies to provide affordable or subsidized technology to students from disadvantaged backgrounds (Ike, 2020). Additionally, offering offline learning resources or supplementary materials for students without internet access can ensure inclusivity. Given the cost of data for online learning in Nigeria, implementing subsidized data programmes or offering free access to educational content on selected platforms can alleviate the financial burden on students (Adedokun & Oludare, 2018).
- ***Engaging Teaching Methods and Pedagogy:*** Teachers should design interactive and student-centered lessons using video conferencing. This could include group discussions, debates, case studies and virtual field trips, which are vital in Social Studies education. Collaboration with experts, guest speakers, or organizations through video conferencing can further enhance the learning experience by providing students with diverse perspectives (Ogunyemi, 2019). Using interactive features like breakout rooms, poll, and Q& A sessions can encourage active participation and critical thinking. A

combination of synchronous (real-time) and asynchronous (pre-recorded) learning sessions can help maintain flexibility and cater to students' varying schedules. Asynchronous lessons allow students to engage with course materials at their own pace, while synchronous sessions foster live interaction and real-time feedback (Ogunyemi & Olatunji, 2021).

- ***Fostering Student Motivation and Participation*:** To maintain student motivation and engagement, educators can incorporate interactive tools, such as quizzes, polls and games, into their video conferencing sessions. Using gamified elements, like rewards and achievements, can make learning more enjoyable and encourage active participation (Adesina, 2015). Teachers should set clear goals for each video conferencing session and provide students with a structured learning environment. By ensuring that students understand the objectives of each lesson and what is expected of them, teachers can foster a sense of responsibility and ownership over their learning.

Conclusion

The integration of video conferencing into Social Studies education in Nigeria holds significant promise for promoting inclusivity and enhancing the learning experience for students. The paper demonstrates that video conferencing can effectively address several educational challenges such as limited access to resources, geographical disparities and the need for interactive, student-centered learning. It offers opportunities for real-time discussions, collaborative learning and access to diverse perspectives, which are crucial for understanding complex social issues. Video conferencing also fosters an inclusive learning environment where students from various socio-economic backgrounds, regions and linguistic groups can participate actively in their education. However, challenges such as poor technological infrastructure, digital illiteracy and the digital divide need to be addressed for the successful implementation of video conferencing in Social Studies classrooms. When these challenges are mitigated, video conferencing can contribute to achieving the goals of inclusive education and improving the overall quality of Social Studies education in Nigeria.

Recommendations

The following recommendations emerged based on the outcome of the paper;

1. The Nigerian government and educational institutions should invest in reliable internet connectivity, electricity, and digital devices to facilitate the effective use of video conferencing in classrooms, particularly in rural and underserved areas.
2. Continuous professional development programmes should be organized to equip teachers with the skills necessary to effectively use video conferencing tools and create engaging, interactive lessons for Social Studies education.
3. Teachers should integrate multimedia resources, such as videos, interactive quizzes, and virtual field trips, into their lessons to enhance student engagement and provide a richer learning experience that resonates with diverse learners.
4. Schools should implement security measures to protect the privacy of students and teachers during video conferencing sessions. This includes the use of secure platforms, password protections, and encryption protocols to prevent unauthorized access.
5. Educators should be trained to adapt their content and teaching methods to cater to Nigeria's diverse cultural and linguistic backgrounds. This could include offering content in multiple languages and promoting cultural understanding through inclusive teaching practices.
6. Regular assessments and feedback from both students and teachers should be conducted to evaluate the effectiveness of video conferencing in Social Studies education. This will help identify areas of

improvement and ensure that the objectives of inclusive education are being met.

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APPLICATION OF DIGITAL TECHNOLOGIES IN TEACHING AND LEARNING ECONOMICS IN 21ST CENTURY IN NIGERIA: CHALLENGES AND WAY FORWARD.

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Abstract

The integration of digital technologies into teaching and learning has become increasingly prevalent in educational settings. In the context of economics education in Nigeria, the application of digital technologies presents numerous opportunities for making improvement. This paper explores the current landscape of digital technology integration in teaching and learning economics in Nigeria in the 21st century, focusing on the challenges faced and proposing potential ways forward. One of the primary challenges in the application of digital technologies in teaching and learning economics in

Nigeria is the limited access to technology and internet connectivity in many parts of the country. This digital divide hinders effective implementation of online learning platforms and resources, limiting students' access to digital educational materials. Additionally, there is lack of adequate training and professional development for educators on how to effectively integrate digital technologies into their teaching practices. Furthermore, the paper discusses the need for curriculum reform to incorporate digital literacy skills and digital economics tools into economics education curriculum. This will ensure that students are equipped with necessary skills and knowledge to thrive in the digital economy and navigate the complexities of the globalized world. To address these challenges, the paper proposes several ways forward, including increasing investment in technology infrastructure, providing training and support for educators, and revising the economics curriculum to include digital literacy skills. By addressing the current challenges and implementing proactive strategies, Nigeria can harness the potential of digital technologies to enhance economic education and prepare students for success in the 21st-century digital economy.

Keywords: digital technologies, economics, challenges, learning, teaching.

Introduction

The integration of digital technology into education systems has become a transformative force in enhancing teaching and learning outcomes worldwide. Countries across continents have adopted innovative strategies to bridge the digital divide, improve equity, and foster 21st-century skills among learners. From Latin America to Europe, Africa to Asia, and North America, the impact of technology in education is evident in improved student engagement, personalized learning, and expanded access to quality resources.

Uruguay's Ceibal Project, launched in 2007, exemplifies a national commitment to digital equity. Initially focused on providing laptops and internet access to public primary school students and teachers, the initiative has evolved into a comprehensive digital ecosystem. By 2024, Ceibal had distributed nearly three million devices and achieved full Wi-Fi coverage across 2,993 institutions. Platforms like CREA and Biblioteca País support adaptive learning and teacher collaboration, while parental approval remains high at 94% (World Bank, 2024). The project's success underscores the importance of sustained investment in infrastructure and content development.

Estonia's education system is widely recognized for its early and extensive digital integration. Since the 1990s, Estonia has integrated digital tools into its classrooms, with students learning programming from the age of seven and subjects like geography and chemistry enhanced through virtual reality. The Digiefekt study (2023) revealed that interactive digital tools significantly improved learning outcomes, particularly in STEM subjects. Estonia's AI Leap 2025 initiative aims to prepare students and educators for the future by training 20,000 students and 3,000 teachers in artificial intelligence applications (University of Tartu, 2023).

In Nepal, the Open Learning Exchange (OLE Nepal) has been instrumental in expanding access to education through technology. Founded in 2007, OLE Nepal has reached over 400,000 students across 400 schools. Recent developments include the launch of Seepalaya, a personalized learning app, and the expansion of Hamro Ramailo Katha to include local languages. Supported by the KDDI Foundation, the ICT in Basic Education Project is enhancing digital labs and teacher training in remote districts (OLE Nepal, 2024). These efforts demonstrate how localized digital content and community engagement can drive educational inclusion.

Rwanda's approach to ICT integration reflects a national strategy to modernize education. Through initiatives like the One Laptop Per Child program and the Rwanda Education Commons (REC), the government has

promoted digital literacy and infrastructure development. A 2024 scoping review highlighted the benefits of inclusive education, improved teacher development, and enhanced learning outcomes, while also noting challenges such as internet access and equipment maintenance (Rwanda Ministry of Education, 2024). The SMART Rwanda Master Plan continues to guide the country's digital transformation in education.

Spain's m-Schools program in Catalonia represents a successful public-private partnership aimed at integrating mobile technologies into classrooms. The program promotes digital competencies, STEM education, and gender equality. In 2023, the mSchools Lab piloted AI and immersive technologies, with winning solutions like Annie Advisor and Troba la Insígnia per al teu Futur being implemented in schools to support personalized learning and emotional well-being (Mobile World Capital Barcelona, 2024). These innovations reflect a shift toward learner-centered pedagogy and digital empowerment.

In the United States, Connecticut has emerged as a leader in AI integration in education. In 2025, the state launched a pilot program across seven districts, including East Hartford and Lebanon, using tools like MagicSchoolAI and CK12. These platforms offer real-time feedback, differentiated instruction, and digital citizenship education. Educators view AI as a valuable tool to enhance equity and personalize learning experiences (Connecticut State Department of Education, 2025). The initiative aligns with broader efforts to prepare students for an AI-driven future.

These global examples illustrate that technology integration in education is not merely a trend but a strategic imperative. By investing in infrastructure, teacher training, and digital content, countries are fostering inclusive, engaging, and future-ready learning environments. As digital tools continue to evolve, the emphasis on artificial intelligence, immersive learning, and personalized education will shape the next frontier of educational innovation.

Conceptual Clarifications in the Context of Digital Technology and Education

Digital Technology

Digital technology refers to the use of electronic tools, systems, devices, and resources that generate, store, or process data. This includes computers, mobile devices, applications, social media platforms, and the internet. It has revolutionized communication, learning, and information management across all sectors of society.

Recent studies underscore its transformative impact on education. According to Timotheou et al. (2023), digital technologies have reshaped pedagogical practices, enabling personalized learning, enhancing accessibility, and fostering collaborative environments. Moreover, immersive technologies such as virtual reality (VR) and augmented reality (AR) are increasingly used to simulate real-world scenarios for experiential learning (Pilner Blair, 2024).

Teaching

Teaching is the intentional process of facilitating learning through structured instruction, guidance, and assessment. It involves the design and delivery of educational experiences that promote knowledge acquisition and skill development. Contemporary pedagogical approaches emphasize active learning, inclusivity, and adaptability. Innovative strategies such as flipped classrooms, gamification, and inquiry-based learning have gained prominence (Krupakar & Suneela, 2024). Effective teaching now requires not only subject expertise but also digital literacy and the ability to integrate technology meaningfully into instruction (Munna & Kalam, 2021).

Learning

Learning is a dynamic process through which individuals acquire or modify knowledge, behaviors, skills, and values. It occurs through interaction with the environment, reflection, and

practice. Modern learning theories highlight the importance of cognitive engagement, scaffolding, and the role of prior knowledge (AERO, 2023). Digital learning environments support differentiated instruction and self-paced learning, which are critical for addressing diverse learner needs (Almufarreh & Arshad, 2023).

Economics

Economics, as applied to education, examines how resources are allocated to maximize educational outcomes and societal benefits. It involves analyzing the cost-effectiveness of educational interventions, the impact of education on labor markets, and the role of human capital in economic development. Recent literature emphasizes the growing importance of education as a driver of economic growth. Osmanković (2025) argues that investment in education yields substantial returns in productivity and innovation. Furthermore, the economics of education now incorporates digital competencies as essential components of human capital (EENEE, 2023).

Linking the Concepts to Digital Technology Integration in for example, digital technology serves as the backbone of modern educational transformation. It enables the creation, storage, and dissemination of information, which directly supports teaching and learning processes. For example, platforms like Filestack offer APIs for seamless content upload, transformation, and delivery, which educational apps use to manage multimedia learning materials efficiently (Filestack, 2025). This illustrates how digital infrastructure underpins educational innovation. Furthermore, teaching is no longer confined to traditional methods. Digital tools allow educators to personalize instruction, use multimedia resources, and assess student progress in real time. AI-powered platforms like Magic School AI and adaptive learning systems exemplify how technology supports differentiated instruction and enhances pedagogical effectiveness (Connecticut State Department of Education, 2025). In addition, learning has become more interactive and student-centered through digital integration. Technologies such as virtual reality, gamified platforms, and mobile apps like Seepalaya in Nepal provide immersive and accessible learning experiences (OLE Nepal, 2024). These tools align with constructivist theories, enabling learners to build knowledge through exploration and engagement. Finally, the economics of education now includes digital investment as a key factor in national development. Countries like Uruguay and Estonia demonstrate that strategic funding in digital infrastructure yields long-term benefits in educational equity and workforce readiness (World Bank, 2024; University of Tartu, 2023). Digital literacy is increasingly viewed as essential human capital in the global economy.

Challenges in integrating digital technology into education include infrastructural limitations, digital divides, pedagogical adaptation, and data privacy concerns. These barriers hinder equitable access and effective implementation. Zou et al. (2025) identify key obstacles such as inadequate teacher training, resistance to change, and lack of institutional support. Moreover, disparities in internet access and device availability exacerbate educational inequalities, particularly in low-resource settings (UNESCO GEM Report, 2023). The way forward involves strategic planning, inclusive policies, and continuous professional development. Emphasis should be placed on building digital capacity, fostering innovation, and ensuring equitable access to technology. Forkosh-Baruch et al. (2024) advocate for collaborative frameworks that integrate AI, data analytics, and pedagogical innovation to transform education. Additionally, UNESCO (2025) recommends aligning digital learning initiatives with Sustainable Development Goals to promote lifelong learning and global citizenship.

Place of Digital Technology in Teaching and Learning of Economics

The integration of digital technology in teaching and learning economics in schools has numerous benefits. These include:

i. It enhances Student Engagement. Digital technology makes learning economics more engaging and interactive, thereby increasing student motivation and interest in the subject (Hamidi & McKnight, 2018). Digital technology facilitates active learning, enabling students to participate in simulations, games, and discussions that promote a deeper understanding of economics concepts (Gagliardi, 2017).
ii. It Improves Learning Outcomes. Digital technology helps students understand complex economic concepts, such as supply and demand curves, by visualizing them interactively and dynamically (Wagner, 2017). Similarly, digital technology facilitates the development of critical thinking and problem-solving skills, essential for success in economics and other fields of study (Mayer, 2009).
iii. It Prepare Students for the Digital Economy. Digital technology helps students develop digital literacy skills, essential for success in the digital economy (UNESCO, 2019). Digital technology equally familiarizes students with economic software and tools, such as spreadsheets and econometric software, used in the workplace (Bakia et al., 2012).
iv. It Increases Access to Resources. Digital technology provides students with access to a wide range of online resources, including textbooks, articles, and educational websites, that can supplement traditional teaching methods (Watson, 2008). Again, Digital technology facilitates collaboration among students, teachers, and experts from around the world, promoting a global perspective on economic issues (Rovai, 2002).
v. It Supports Personalized Learning. Digital technology enables personalized learning, allowing students to learn at their own pace and focus on areas where they need improvement (Bakia et al., 2012). Digital technology also facilitates assessment and feedback, enabling teachers to track student progress and provide targeted support (Mayer, 2009).

Digital Technologies for Teaching and Learning Economics

The integration of digital technology in teaching and learning economics can enhance student engagement, understanding, and retention of complex concepts. Here are some examples of digital technologies that can be used:

i. Online Simulations. These can be used to model economic systems, markets, and policies, allowing students to experiment and see the effects of different variables (Gagliardi, 2017). For example, simulations can be used to model the impact of changes in government policies on economic outcomes.
ii. Interactive Graphs and Charts. These can be used to visualize economic data and illustrate complex concepts, such as supply and demand curves (Wagner, 2017). Tools like Gapminder and Datawrapper can be used to create interactive visualizations.
iii. Educational Games. These can be used to teach economic concepts, such as decision-making, risk management, and strategic thinking (Hamidi & McKnight, 2018). Games like "The Economic Game" and "SimCity" can be used to teach economics.
iv. Virtual Field Trips. These can be used to take students on virtual tours of economic sites, such as factories, markets, and financial institutions. This can help students understand real-world applications of economic concepts.
v. Online Discussion Fora. These fora can be used to facilitate student discussion and debate on economic topics, promoting critical thinking and problem-solving (Rovai, 2002).
vi. Multimedia Resources. These include videos, podcasts, and animations that can be used to present economic concepts engagingly and interactively (Mayer, 2009).

vii. Learning Management Systems (LMS). LMS platforms, such as Blackboard and Moodle, can be used to deliver online courses, track student progress, and facilitate communication between students and instructors (Watson, 2008).

viii. Online Economic Data Sources such as the World Bank's Open Data platform and the US Bureau of Labor Statistics can be used to access up-to-date economic data and teach students how to analyze and interpret data (World Bank, 2022).

Challenges of Using Technology in Teaching and Learning Economics in Nigeria

The integration of technology in teaching and learning economics in Nigeria has the potential to enhance student engagement, understanding, and retention of complex concepts. However, there are several challenges that hinder the effective use of technology in teaching and learning economics in Nigeria. These include:

i. Limited access to technology infrastructure: Many schools in Nigeria lack adequate technology infrastructure, such as computers, internet connectivity, and electricity (Federal Ministry of Education, 2019).

ii. Poor internet connectivity: Slow internet speeds and frequent disconnections hinder online research and access to digital resources (Internet Society, 2020).

iii. Inadequate technical support: Teachers and students often lack technical support to troubleshoot issues with technology, leading to frustration and wasted time (Adu-Egwurube & Igbokwe, 2017).

iv. Lack of digital literacy: Many teachers and students in Nigeria lack the skills to effectively integrate technology into teaching and learning (UNESCO, 2019).

v. Insufficient training for teachers: Teachers may not receive adequate training on how to use technology to support teaching and learning (Okeke, 2017).

vi. Resistance to change: Some teachers may be resistant to changing their traditional teaching methods to incorporate technology (Ezeanyaeche, 2017).

vii. Digital divide: The digital divide between urban and rural areas in Nigeria can limit access to technology and hinder equal opportunities for learning (Afolabi, 2015).

viii. Cost of technology: The cost of technology, including devices and internet data, can be a barrier for many students and schools in Nigeria (Asemota, 2019).

ix. Lack of policy framework: The absence of a clear policy framework for integrating technology into education in Nigeria can hinder the effective use of technology (Federal Ministry of Education, 2019).

x. Inadequate infrastructure: Many schools in Nigeria lack adequate infrastructure, including classrooms, libraries, and laboratories, which can limit the effective use of technology (UNESCO, 2019).

Therefore, the challenges confronting the use of digital technology in teaching and learning economics in Nigeria are multifaceted and require a comprehensive approach to address.

Conclusion

The paper illustrates that many countries have successfully integrated technology into their education systems, leading to improved teaching and learning outcomes. Prominent among those countries are Uruguay, Estonia, Nepal, Spain, Rwanda, the United States, and many others. Thus, the integration of digital technology in teaching and learning economics in Nigeria is inevitable as it can enhance student engagement, understanding, and retention of complex concepts. The paper highlighted some of the digital technological tools that could be used to enhance the teaching and learning of Economics which include Online Simulations, Interactive Graphs and Charts, Virtual Field Trips, Multimedia Resources, Learning Management Systems (LMS) platforms, among others. However, these are affected by numerous challenges in

the Nigerian setting, which include, among others, limited access to technology infrastructure, poor internet connectivity, inadequate technical support, lack of digital literacy, and insufficient training for teachers.

Recommendations

Based on the identified challenges, the paper hereby recommends that:

i. The government and private sector should invest in the provision of adequate technology infrastructure in schools so as to support teaching and learning in economics.
ii. Schools should be able to provide technical support to teachers and students to troubleshoot issues with technology and ensure smooth operation.
iii. Schools should develop a robust IT system that can support online learning and teaching of economics.
iv. Teachers should be given adequate training on how to integrate technology into their teaching practices and how to use digital tools to support learning outcomes in economics.
v. Students and teachers should be taught digital literacy skills to effectively use technology for teaching and learning economics.
vi. Collaboration among teachers, students, and stakeholders should be encouraged to share best practices and experiences in using technology to teach economics.
vii. The government and private sector should work to address the digital divide by providing access to technology and internet connectivity in rural and underserved areas, specifically for economics education
viii. Make technology more affordable and accessible to students and teachers, particularly in rural areas, to support the teaching and learning of economics.
ix. Foster partnerships between the public and private sectors to provide resources and support for integrating technology into economics education.
x. The government should develop a clear policy framework for integrating technology into education, specifically for economics teaching and learning.
xi. The government should invest in infrastructure such as classrooms, libraries, and laboratories that are equipped with technology to support teaching and learning of economics.
xii. The private sector needs to be encouraged to invest in education technology to support the development of digital infrastructure and resources for teaching and learning economics.

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APPLICATION AND SIGNIFICANCE OF TECHNOLOGY-DRIVEN PRACTICAL SKILLS ACQUISITION ON SOCIAL STUDIES EDUCATION IN NIGERIA

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Abstract
This paper examines the application and significance of technology-driven practical skills acquisition on Social Studies education in Nigeria. As Social Studies aims to foster civic responsibility, environmental awareness and critical thinking, the integration of technology has the potential to enhance learners' acquisition of practical skills such as digital citizenship, map interpretation, environmental monitoring and civic participation. The paper looks at how digital tools like Geographic Information Systems (GIS), virtual simulations, digital storytelling, and E-learning platforms have reshaped teaching and learning processes. However, challenges such as inadequate infrastructure, lack of teacher training, curriculum limitations and the digital divide persist in many Nigerian educational settings. The paper affirmed that technology when effectively deployed enriches learner engagement, promotes collaboration and enhances real-world problem-solving skills. The paper emphasises the need for comprehensive teacher training, curriculum reforms and infrastructural investments to maximise the benefits of technology in practical skills acquisition for Social Studies learners in Nigeria.

Keywords: Technology-Driven Practical, Social Studies Education, Skill Acquisition, Digital Citizenship.

Introduction

In recent years, the role of technology in education has significantly transformed traditional teaching and learning methodologies, especially in developing countries like Nigeria. This transformation is particularly evident in Social Studies education, where technology-driven practical skills acquisition has emerged as a crucial component in enhancing learners' cognitive, affective, and psychomotor development. Social Studies, as an interdisciplinary subject, is designed to equip learners with the knowledge, values, attitudes, and skills necessary for effective citizenship and social responsibility (Ajiboye & Odetoro, 2017; National Council for the Social Studies [NCSS], 2014). The integration of technology into this domain therefore plays a pivotal role in improving not just theoretical understanding but also the practical application of social concepts in real-life situations (Berson & Balyta, 2014; Ifedili, 2020).

Accordingly, Technology-driven skill acquisition involves the use of digital tools, simulations, multimedia content, interactive platforms and virtual environments to provide students with hands-on experience in problem-solving, decision-making and civic engagement. For instance, tools such as virtual reality, educational software, digital storytelling and e-learning platforms have enabled Social Studies educators to simulate historical events, model democratic processes and explore cultural diversity in ways that are both engaging and contextually relevant

(Adeyemi & Adesanya, 2023). These innovations support learners in acquiring practical competencies such as critical thinking, communication, teamwork and digital literacy skills that are increasingly indispensable in Nigeria's 21st century economy and globalised world.

Also, technology-driven practical skills acquisition has shown promise in addressing some of the persistent challenges facing Social Studies education in Nigeria. These include large classroom sizes, limited instructional materials, lack of teacher expertise in emerging technologies and poor infrastructure. Through mobile learning applications, online collaborative tools and multimedia content, educators can personalize learning and provide experiential opportunities that transcend the limitations of the physical classroom (Ogunlade & Aladejana, 2024). Technology has also encouraged the use of project-based learning and digital portfolios that promote learner autonomy and real-world problem-solving that aligned Social Studies education with national development goals and the competencies required in modern society.

Accurately, the shift towards digital and practical skills acquisition aligns with the Nigerian government's push for ICT integration in schools, as stipulated in the National Policy on Education (FRN, 2020). This policy encourages the use of information and communication technologies (ICTs) to facilitate teaching and learning processes, thus reinforcing the need for teacher training and curriculum reform in Social Studies education. In this context, the role of educators becomes increasingly that of facilitators who guide learners in exploring and mastering technology-enhanced environments, rather than merely transmitting knowledge.

However, while the benefits of technology-driven skills acquisition in Social Studies are well-documented, its full potential in Nigeria is yet to be realised. Factors such as unequal access to digital devices, erratic power supply and inadequate teacher professional development remain significant obstacles. Therefore, a strategic approach that includes investment in infrastructure, curriculum innovation, teacher training, and community partnerships is essential to harness the application and significance of technology-driven skills acquisition in Social Studies education in Nigeria.

Conceptual Clarifications

Technology-Driven Practical Skills Acquisition:

Technology-driven practical skills acquisition is defined by Adebayo and Lawal (2023) as the utilization of digital tools and platforms to facilitate the development of hands-on competencies, enabling learners to apply theoretical knowledge in practical contexts through interactive and immersive experiences. Ngugi, Mwangi & Otieno (2022) describe it as the integration of information and communication technologies (ICT) in vocational training to enhance the acquisition of practical skills, thereby improving learners' employability and adaptability in the digital economy. According to Okoro and Eze (2021) technology-driven practical skills acquisitionis the process of utilising technological innovations to deliver practical skills training to ensure that learners gain proficiency in using modern tools and techniques relevant to their fields.

In the same vein, Technology-driven practical skills are defined as the adoption of digital technologies in educational settings to provide learners with simulated environments and virtual tools that replicate real-world scenarios for skill development (Smith & Johnson, 2020). Technology-driven practical skills according to Chen and Lee (2019) is describe it as the use of technology-enhanced learning environments to support the acquisition of practical skills, allowing for personalized and self-paced learning experiences. Garcia and Martinez (2018) define it as the employment of digital resources and platforms to facilitate

experiential learning, enabling learners to practice and refine skills in a controlled, technology-mediated environment.

Social Studies Education:

Social studies according to Wesley (2018) is described as selected components of the social sciences that are organized for teaching, tailored to the learning objectives at hand, and adapted to the cognitive level of students. In Nigeria, Social Studies was introduced to address the country's unique social challenges, instill national values and promote moral education following independence. Ogundare (2016) views Social Studies as both a structured curriculum and a means of addressing real-life societal issues. This perspective emphasises the necessity of implementing Social Studies at the senior secondary level in Nigeria. The subject plays a vital role in addressing pressing social issues particularly in a nation grappling with problems like religious intolerance, suicide attacks and terrorism issues that have severely affected communal harmony especially in the northeastern region, resulting in loss of lives and the destruction of property worth billions of Naira.

Social Studies education primarily pertains to the professional preparation of educators who specialize in teaching social studies. This includes equipping teachers to deliver lessons that promote social awareness through the instruction of various social science subjects such as history, psychology, and political science. While the field is distinct, it is sometimes interchangeably referred to as social science education or history education. However, it is important to distinguish between these areas. According to the National Council for the Social Studies (NCSS, 2012), Social Studies Education is an interdisciplinary approach that integrates concepts from various fields including anthropology, archaeology, economics, geography, history, law, philosophy, political science, psychology, religion and sociology along with relevant content from the humanities, mathematics, and natural sciences.

Importance of Practical Skills in Social Studies Education

Beyond theoretical knowledge, practical skills enable students to engage meaningfully with their communities, solve social problems, and participate effectively in civic life. In the context of Nigeria, where democratic participation, national integration and social development are crucial, the teaching of practical skills in Social Studies is indispensable. Practical skills in Social Studies include decision-making, critical thinking, problem-solving, collaboration, communication, map reading, data interpretation and civic engagement. These skills empower students to analyse social issues, understand diverse perspectives and develop informed opinions about their roles in society (Nzewi & Okoye, 2022). For instance, engaging students in community-based projects, role-plays, debates, and simulations allows them to actively experience social processes, thereby reinforcing classroom learning and promoting responsible citizenship. Practical activities also help bridge the gap between abstract social concepts and learners' lived experiences, making learning more relevant, participatory, and impactful.

In Nigeria, the importance of practical skills in Social Studies is further emphasised by the need to address complex societal challenges such as ethno-religious conflicts, corruption, unemployment, gender inequality and environmental degradation. Practical skills acquisition equips students with the competence to analyze these issues critically and contribute to solutions at both local and national levels (Adeniji & Bolarinwa, 2021). For example, when students learn how to conduct surveys or participate in group problem-solving exercises on community issues, they gain firsthand experience in civic responsibility and social advocacy essential

traits for building a peaceful and progressive society.

Technology Tools for Practical Skills Acquisition in Social Studies Education

The major issues commonly encountered in teaching Social Studies, each paired with suitable technology tools and methods for practical implementation in the classroom, especially within the Nigerian educational context:

Low Student Engagement in Historical and Civic Topics:

One major challenge is that students often find historical and civic education boring or abstract. This limits their ability to emotionally connect with national events and democratic principles. To address this, interactive multimedia tools such as YouTube EDU, TED-Ed, Edpuzzle, and locally made documentaries can be used. These platforms make learning more dynamic through videos, animations, and visual storytelling (Adedoyin & Salami, 2022). For example, teachers can show a documentary on Nigeria's journey to independence, followed by a class discussion. Students can also use Canva or Adobe Express to create digital storyboards and visual timelines, enhancing their comprehension and historical interpretation skills.

Poor Spatial Reasoning and Geographic Understanding:

Students often struggle to grasp spatial concepts such as migration, urbanization, and climate change. To solve this, Geographic Information System (GIS) tools like Google Earth, ArcGIS, and MapChart can be used to teach spatial patterns and human-environment interactions (Yusuf & Adebayo, 2023). For example, in a lesson on population distribution, students may use Google Earth to trace the expansion of Lagos or create thematic maps using MapChart to represent environmental data. These hands-on activities enhance learners' spatial intelligence and analytical abilities.

Weak Collaboration and Teamwork Skills:

In many Social Studies classrooms, there is an over-reliance on individual tasks, limiting opportunities for collaborative learning. Tools like Google Classroom, Microsoft Teams, Moodle, and Zoom provide digital environments for teamwork and cooperative learning (Okonkwo & Akinola, 2021). Teachers can assign students to groups to research topics like unemployment or urbanization, facilitate their interactions through Microsoft Teams, and organize virtual presentations via Zoom. Such activities build students' digital collaboration, communication, and problem-solving skills.

Limited Civic Participation and Political Awareness:

Most students lack practical exposure to civic life, limiting their political literacy. Simulation and role-playing tools such as iCivics and Newsela immerse learners in activities like policy making, voting, and media reporting (Eze & Njoku, 2024). Students can play roles as lawmakers or journalists in digital simulations of government processes, thereby gaining firsthand experience in civic engagement. Teachers can also organize classroom role-plays to simulate public hearings or local council meetings. These tools enhance learners' leadership, negotiation, and critical decision-making abilities.

Limited Exposure to Real-World Social Issues:

Students often fail to connect what they learn in class to real societal problems. To address this, teachers can introduce students to Google Scholar, JSTOR, and AllAfrica.com, where they can access credible sources to research current issues such as child labour or corruption. Students can then create PowerPoint presentations or write short papers summarizing their findings (Nwankwo & Ogu, 2022). This encourages awareness of real-world challenges and improves research, analysis, and presentation skills.

Inability to Interpret and Use Statistical Data:

Social issues are often accompanied by statistical data, but many students lack the skills to read or present such information effectively. To address this, tools like Google Sheets, Tableau Public, and Flourish can be introduced for basic data visualization and analysis (Ibrahim & Oladele, 2020). For example, students may collect survey data on school dropout rates and generate bar graphs using Google Sheets. This helps students practice data literacy and draw meaningful insights from social trends.

Teacher-Centered Learning Limits Student Initiative:

In traditional classrooms, students often rely too heavily on the teacher, which limits initiative and engagement. Game-based tools like Kahoot! Quizizz, and Socrative can change this dynamic by offering fun, competitive reviews of key topics such as elections or human rights (Abubakar, 2021). Students can also design their own quizzes, encouraging peer learning and reinforcing content in memorable ways.

Limited Integration of Local Context and Community Issues:

Textbook-based instruction can isolate students from local realities. To counter this, mobile storytelling and reporting apps such as WhatsApp, TikTok EDU, CapCut, and Mojo allow students to document community issues using video reports. For instance, learners can film short clips about sanitation challenges in their neighborhood and present them to the class (Ogundele & Musa, 2023). These activities build creativity, advocacy skills, and social awareness.

Challenges of Integrating Technology in Practical skills Acquisition on Social Studies Education

Integrating technology into the acquisition of these practical skills such as map reading, civic participation and environmental observation has become increasingly necessary. However, the integration process faces several challenges especially in the Nigerian context.

Inadequate Access to Technological Tools and Infrastructure:

Many schools especially in rural areas, lack the necessary infrastructure such as computers, projectors, GIS tools, internet connectivity and E-learning platforms (Ogundare & Ajiboye, 2022). This significantly limits the ability to use simulations, digital maps and virtual field trips key tools for skill acquisition in Social Studies.

Lack of Teacher Training and Digital Competence:

Many Social Studies educators are not adequately trained in the use of technology for interactive and practical learning (Yusuf & Onasanya, 2021). This leads to underutilisation or improper use of digital tools. This has made it difficult to facilitate activities like digital storytelling, virtual debates and interactive civic simulations.

Curriculum Limitations and Rigidity:

The Social Studies curriculum in many Nigerian institutions is still predominantly theoretical with minimal emphasis on hands-on digital learning experiences (Adewuyi & Bello, 2023). This misalignment makes it difficult to incorporate technology-based skill acquisition strategies like collaborative digital projects or ICT-based field surveys.

High Cost of Technology Integration:

The cost of acquiring devices such as smartboards, tablets and educational software can be prohibitive (Eze & Chinedu-Eze, 2022). This limits widespread adoption especially in public schools with limited funding. Maintenance and upgrades also pose an ongoing financial burden.

Resistance to Change by Teachers and Institutions:

Some educators are resistant to shifting from traditional, chalk-and-talk teaching methods to more interactive and technology-driven practices (Adeyemi, & Oladapo, 2023). This inertia limits the integration of tools like digital

polling, e-discussions and participatory civic simulations.

Digital Divide Among Students:

There exists a digital gap between students in urban and rural settings (Salihu & Jimoh, 2022). Some students do not have access to digital devices or the internet at home which prevents them from participating fully in tech-driven activities such as online civic engagement projects or virtual excursions.

Strategies for Improving Effective Integration of Technology-Driven Skill Acquisition on Social Studies Education

The integration of technology-driven approaches in Social Studies skill acquisition is essential for promoting civic engagement, digital literacy, critical thinking and real-world problem-solving. However, to maximise its effectiveness, strategic planning and implementation are necessary. The following are strategies for the effectiveness of Technology-Driven Skill Acquisition on Social Studies Education:

Capacity Building and Continuous Teacher Training:

Teachers must be equipped with relevant digital skills and pedagogical strategies to facilitate technology-based learning (Yusuf, & Balogun, 2022). This includes regular workshops, certifications and hands-on experience with educational technologies such as GIS tools, digital storytelling and online discussion platforms.

Curriculum Review and Digital Integration:

Social Studies curriculum should be revised to incorporate technology-based skill acquisition explicitly (Adewuyi & Bello, 2023). Learning outcomes should include digital competencies like civic engagement via social media, environmental monitoring using mobile apps, and digital map interpretation.

Use of Contextualized Digital Content:

Develop locally relevant, culturally sensitive, and relatable content using local case studies, languages, and examples (Okebukola 2021). Tools like digital storytelling and mobile learning apps should reflect indigenous knowledge and socio-political realities of learners.

Collaborative and Project-Based Learning:

Technology should be used to promote group work, civic engagement and problem-solving through real-life digital projects such as virtual town hall meetings, community mapping using Google Earth, and online civic advocacy campaigns (Onasanya & Adegbija, 2023).

Public-Private Partnerships for Resource Provision:

Effective collaboration between government, private tech companies, and NGOs can support the provision of ICT tools, internet access, and digital platforms needed in schools (Eze & Chinedu-Eze, 2022). These partnerships can also support teacher training and student exposure to modern digital tools.

Conclusion

The integration of technology in practical skills acquisition has reshaped Social Studies education in Nigeria. Through digital tools and interactive platforms, students can now engage more actively with real-life social issues, develop critical thinking, and acquire transferable skills that align with 21st-century demands. Technology has proven effective in making Social Studies more dynamic, student-centered and skills-driven. Despite the promising impact, the full potential of technology remains underutilised due to infrastructural deficits, insufficient teacher preparation and curriculum constraints. Therefore, sustained efforts are necessary to overcome these barriers and promote inclusive, effective technology use across educational institutions in Nigeria.

Recommendations

Based on the outcome of the paper, the following recommendations emerged;

1. Continuous in-service training should be organised for Social Studies teachers to enhance their capacity to use ICT tools for practical skills instruction.
2. The Social Studies curriculum should be reviewed to integrate clear ICT-based

learning outcomes and encourage project-based, experiential learning.

3. Government and stakeholders should invest in modern ICT infrastructure, including reliable internet access, digital devices and educational software for schools.
4. Partnerships with technology firms and NGOs should be encouraged to support resource provision, teacher development, and student exposure to digital platforms.
5. Schools and education boards should implement regular assessment strategies to monitor the effectiveness and challenges of technology integration.

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THE ROLE OF ARTIFICIAL INTELLIGENCE IN PERSONALIZED LEARNING IN NIGERIA IN THE 21ST CENTURY: OPPORTUNITIES AND CHALLENGES

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Abstract
The integration of Artificial Intelligence (AI) in personalized learning represents a transformative shift in educational paradigms, particularly in Nigeria during the 21st century. This research explores the multifaceted role of AI in enhancing educational experiences tailored to individual learner needs, abilities, and preferences. By leveraging AI technologies such as adaptive learning systems, intelligent tutoring, and data analytics, educators can foster more engaging and effective learning environments. The study identifies significant opportunities, including improved accessibility to quality education, enhanced learner engagement, and the ability to provide real-time feedback. However, it also highlights critical challenges, such as infrastructural deficits, digital literacy gaps, and ethical concerns surrounding data privacy. Through a mixed-methods approach, the research analyzes case studies from Nigerian educational institutions, providing insights into successful implementations of AI in personalized learning. The findings underscore the necessity for a strategic framework that addresses these challenges while maximizing the potential of AI. Recommendations include investing in technology infrastructure, training educators in AI applications, and promoting policies that ensure equitable access to AI-driven educational resources. This research contributes to the ongoing discourse on educational innovation in Nigeria, advocating for a balanced approach that embraces technology while safeguarding ethical standards. This study highlights the necessity for a collaborative approach involving policymakers, educators, and technology developers to create a supportive ecosystem that fosters innovation in personalized learning. By navigating these complexities, Nigeria can harness AI to revolutionize education, preparing learners for a competitive global landscape.

Keywords: Artificial Intelligence, Personalized learning, 21st Century education, Nigeria

Introduction

In the 21st century, the role of artificial intelligence (AI) in education has garnered significant attention from scholars, particularly regarding its potential to enhance personalized learning. This focus is especially relevant in Nigeria, where educational challenges such as resource disparities, varying student needs, and high dropout rates persist. Scholars have explored how AI can address these issues by providing tailored educational experiences that meet individual learner requirements.

One of the key contributions from scholars is the identification of AI's capacity to analyze vast amounts of data to inform personalized learning strategies. By leveraging data

analytics, AI systems can assess students' performance, identify strengths and weaknesses, and adapt learning materials accordingly. This adaptability is crucial for fostering engagement and improving educational outcomes in a diverse classroom setting, where students often have different learning styles and paces. For instance, Agarry et al. (2022) emphasize that AI technologies can facilitate personalized learning by providing real-time feedback and customized learning paths based on individual student data.

Moreover, researchers have emphasized the opportunities that AI presents in promoting inclusivity within the Nigerian educational landscape. AI-driven platforms can facilitate access to quality educational resources, particularly for marginalized groups in rural and underserved areas. By offering content in multiple languages and adapting to various cultural contexts, AI can help bridge the educational divide and ensure that all students have the opportunity to succeed. Adelana and Akinyemi (2022) highlight that AI can enhance educational access by tailoring content to meet the linguistic and cultural needs of diverse student populations.

However, the implementation of AI in personalized learning is not without its challenges. Scholars have raised concerns regarding the technological infrastructure necessary for effective AI integration, particularly in remote areas with limited internet access. Robinson (2022) points out that many educational institutions in Nigeria lack the necessary infrastructure to support advanced AI technologies, which hampers their ability to implement personalized learning solutions effectively. Additionally, issues of data privacy and security pose significant barriers to the adoption of AI technologies, as stakeholders worry about the implications of collecting and managing sensitive student information. The ethical considerations surrounding data use in educational settings have been discussed by various scholars, emphasizing the need for robust policies to protect student privacy (Nicolescu & Tudorache, 2022).

Conceptualization of Terms

21st Century Education in Nigeria

The landscape of education in Nigeria has undergone significant transformations in the 21st century, driven by globalization, technological advancements, and the pressing need for educational reforms. This period has been marked by both challenges and opportunities as the country strives to align its educational system with global standards and expectations.

One of the most notable features of 21st-century education in Nigeria is the integration of Information and Communication Technology (ICT) into the learning process. The incorporation of technology has been recognized as a key factor in enhancing educational experiences and outcomes. Etuk (2007) discusses ICT as a crucial component of curriculum theory that can facilitate effective teaching and learning in Nigeria. However, despite its potential, challenges such as inadequate infrastructure and high costs of internet access continue to pose significant barriers to widespread adoption, particularly in rural areas.

Another critical aspect of modern education in Nigeria is the focus on Science, Technology, Engineering, and Mathematics (STEM) education. There has been a growing emphasis on STEM fields as essential for preparing students for a technology-driven future. Idowu (2025) highlights the importance of aligning the curriculum with global labor market demands, particularly in STEM areas, to equip Nigerian youth with relevant skills. This emphasis is crucial for fostering innovation and ensuring that the workforce is competitive in a rapidly changing global economy.

Public-private partnerships have also emerged as a viable solution to address resource deficits in Nigeria's public education system. The collaboration between private entities and

government institutions has the potential to enhance educational access and quality. Successful models, such as the partnership between Bridge International Academies and the Lagos State Government, demonstrate how such collaborations can improve learning outcomes and provide much-needed resources to underserved communities.

Inclusive education has gained traction in Nigeria, aiming to ensure that marginalized groups, including girls and children with disabilities, have access to quality education. The Universal Basic Education (UBE) program, which mandates nine years of free and compulsory education, represents a significant step toward achieving this goal. However, the implementation of the UBE program remains uneven across different regions, highlighting the need for targeted interventions to ensure that all children benefit from educational opportunities.

Aims and Objectives of Education in Nigeria

Education is a cornerstone of society, serving as a fundamental mechanism for personal and social development. Its objectives are multifaceted, reflecting the diverse purposes that education fulfills in fostering individual growth and advancing societal progress. Scholars have examined these objectives in depth, categorizing them into several key areas: knowledge acquisition, skill development, social and civic responsibility, personal development, lifelong learning, and cultural awareness.

At the heart of education lies the objective of knowledge acquisition. This encompasses not only the absorption of factual information but also the cultivation of critical thinking skills. Bransford (2000) emphasizes that effective education should help students organize knowledge in ways that enhance their reasoning and problem-solving capabilities. By providing a solid foundation of knowledge, education empowers individuals to understand the world around them and make informed decisions.

In addition to knowledge, education aims to equip individuals with essential skills for their careers and personal lives. This includes both hard skills, such as technical abilities, and soft skills, such as communication and teamwork. According to the European Commission (2018), education systems should focus on developing competencies that prepare students for the workforce and enable them to adapt to rapidly changing job markets. This dual focus on hard and soft skills is crucial for ensuring that individuals can thrive in a competitive and dynamic environment.

Another significant objective of education is to foster social and civic responsibility among students. Education plays a vital role in promoting values such as respect, tolerance, and active citizenship. The United Nations Educational, Scientific and Cultural Organization (UNESCO, 2015) asserts that education should empower individuals to participate fully in their communities and contribute to social cohesion and democratic governance. By instilling a sense of responsibility, education helps cultivate engaged citizens who are aware of their rights and duties in a democratic society.

The Concept of Personalized Learning

The concept of personalized learning has gained significant attention in recent years as educators and researchers strive to tailor educational experiences to meet the diverse needs of individual learners. Personalized learning refers to instructional approaches that adapt to the unique characteristics, preferences, and interests of each student, thereby enhancing their engagement and learning outcomes. This essay explores the definition, historical context, key characteristics, challenges, and implications of personalized learning.

Personalized learning can be defined as an educational approach that customizes learning experiences based on individual student needs, abilities, and interests. Graf and Kinshuk (2012) describe personalized learning as an

approach that tailor's education to learners' current situations and characteristics to help them achieve optimal learning progress and outcomes. This approach can manifest at various levels, including personalized curricula, courses, learning materials, and activities, allowing for a more individualized educational experience.

The roots of personalized learning can be traced back to traditional educational practices such as apprenticeship and mentoring, where instruction was tailored to the needs of individual learners. However, the advent of technology has transformed personalized learning, enabling more sophisticated and scalable approaches. Spector (2015) notes that the integration of technology in education has facilitated the development of adaptive learning environments that respond to individual learner needs, making personalized learning more accessible and effective.

The Concept of Artificial Intelligence

Artificial Intelligence (AI) has emerged as one of the defining technological advancements of recent years, influencing various sectors from healthcare to finance and even shaping our daily interactions. The concept of AI is complex and multifaceted, encompassing a range of definitions and interpretations that reflect its evolving nature. Scholars have contributed significantly to the discourse surrounding AI, offering insights into its capabilities, limitations, and the philosophical implications of creating machines that can mimic human intelligence.

From an algorithmic perspective, AI is often defined in terms of algorithms sets of instructions for solving problems. However, this viewpoint is criticized for being overly broad, as algorithms exist outside the realm of AI and do not inherently imply intelligence (Russell & Norvig, 2020). This distinction highlights the difference between mere computational processes and the nuanced capabilities that characterize intelligent behavior.

A more stringent definition suggests that AI involves the imitation of human intelligence by computers, raising important questions about the authenticity of such intelligence. Many applications, such as chatbots and automated customer service systems, may perform tasks that appear intelligent but lack true understanding or consciousness. This limitation is a central theme in discussions around AI, as scholars seek to define the boundaries of what constitutes genuine intelligence in machines (Bostrom, 2021).

The challenges in defining AI stem largely from the lack of consensus on what constitutes "intelligence." The phenomenon known as the "AI effect," where tasks once considered intelligent become trivial once machines can perform them, complicates this landscape (McCorduck, 2020). Additionally, Moravec's paradox suggests that tasks easy for humans, such as recognizing faces, are often challenging for computers, while tasks difficult for humans, like playing chess, can be easily mastered by machines (Moravec, 2021). This paradox highlights the intricate nature of intelligence and the varying competencies of humans and machines.

Roles of Artificial Intelligence in Personalized Learning in Nigeria in the 21st Century

In the 21st century, artificial intelligence (AI) has emerged as a transformative force in education, particularly in the realm of personalized learning. Scholars have made significant contributions to understanding how AI can enhance educational experiences in Nigeria, addressing unique challenges and opportunities within the country's context. This essay explores key themes in their contributions, highlighting the potential of AI to revolutionize personalized learning in Nigeria.

One of the primary benefits of AI in education is its ability to enhance learning outcomes by tailoring educational experiences to the individual needs of students. Scholars

emphasize that through adaptive learning systems, AI can analyze student performance data in real time, identifying strengths and weaknesses. This capability allows for the customization of learning paths that cater to each student's pace and style. Research indicates that personalized learning through AI can lead to higher engagement and better academic performance, particularly in a diverse educational landscape like Nigeria's, where students come from various backgrounds and have different learning needs (Olugbade, 2024).

Furthermore, Nigeria faces considerable educational disparities, with significant differences in resources and opportunities across regions. Scholars argue that AI can help bridge these gaps by providing access to high-quality educational materials and personalized learning experiences, even in underserved areas. AI-driven platforms can deliver content in local languages and adapt to varying cultural contexts, making learning more relevant and accessible (Daramola et al., 2024). This potential for inclusivity is particularly crucial in Nigeria, a country characterized by its diverse linguistic and cultural backgrounds.

In addition to benefiting students, AI can also support teachers by providing them with valuable insights into student performance and progress. Scholars highlight that AI tools can assist educators in identifying students who may need additional support, enabling timely interventions (Agarry et al., 2024). Moreover, AI can automate administrative tasks, allowing teachers to focus more on instruction and student engagement. This collaborative approach enhances the overall teaching and learning environment, making it more effective and efficient.

The integration of AI in personalized learning also promotes a culture of lifelong learning among students. Scholars note that AI can facilitate the development of critical skills such as problem-solving, critical thinking, and self-directed learning (Ajadi et al., 2024). By providing personalized feedback and resources, AI encourages students to take ownership of their learning journeys. This emphasis on lifelong learning is particularly important in Nigeria, where fostering a culture of continuous improvement is essential for personal and professional development in an increasingly competitive global economy.

However, while the potential of AI in personalized learning is promising, scholars also point out several challenges that need to be addressed. Issues such as data privacy, the digital divide, and the need for infrastructure development are critical concerns (Robinson, 2024). In Nigeria, where access to technology can be inconsistent, ensuring equitable access to AI-driven educational tools is paramount. Scholars advocate for policies and initiatives that prioritize technological infrastructure, teacher training, and awareness campaigns to maximize the benefits of AI in education.

The role of artificial intelligence in personalized learning in Nigeria underscore the transformative potential of this technology in the 21st century. By enhancing learning outcomes, addressing educational inequities, supporting teachers, and fostering lifelong learning, AI can play a crucial role in reshaping the educational landscape. However, it is essential to address the challenges and ensure equitable access to technology. Through collaborative efforts and strategic investments, Nigeria can fully realize the benefits of AI in education, ultimately contributing to a more inclusive and effective learning environment for all students.

Challenges of Artificial Intelligence in Personalized Learning in Nigeria in the 21st Century

Despite its potential, the integration of AI into Nigeria's education system faces significant challenges. These include inadequate technological infrastructure, insufficient teacher training, and ethical concerns regarding data privacy (Akinola and Bello, 2023).

As Artificial Intelligence (AI) increasingly influences educational practices, it holds significant potential to transform personalized learning in Nigeria. However, scholars have identified several challenges that impede the effective implementation of AI in this context. Understanding these challenges is crucial for developing strategies to harness AI effectively within the Nigerian educational landscape. This essay explores key themes in scholarly contributions regarding the obstacles to AI in personalized learning in Nigeria.

One of the primary challenges highlighted by scholars is the inadequate technological infrastructure in Nigeria. Many schools and educational institutions lack the necessary hardware, software, and reliable internet access to support AI-driven learning platforms (Olugbade, 2025). Without a robust technological foundation, the implementation of AI tools becomes difficult, limiting their effectiveness. This challenge is particularly pronounced in rural and underserved areas, where educational resources are already scarce, further exacerbating inequalities in access to quality education.

Linked closely to infrastructure issues is the digital divide that exists within Nigeria. Scholars note that significant disparities in access to technology and digital literacy exist among different socio-economic groups (Daramola et al., 2024). Students and educators in wealthier urban areas often have greater access to digital tools and resources compared to their counterparts in rural or impoverished regions. This divide creates an uneven playing field, where only a subset of students can benefit from the personalized learning opportunities that AI offers, thereby widening existing educational gaps.

Addressing the Challenges of Artificial Intelligence in Personalized Learning in Nigeria in the 21st Century

As Artificial Intelligence (AI) continues to reshape educational practices, scholars have identified not only the challenges associated with its implementation in personalized learning but also potential solutions tailored to the Nigerian context. These contributions provide a roadmap for leveraging AI effectively in education, addressing the unique barriers faced by educators and students alike. This essay explores key themes from scholarly works regarding solutions to the challenges of AI in personalized learning in Nigeria.

One of the foremost solutions proposed by scholars is the need for significant investment in technological infrastructure. Establishing reliable internet access and providing the necessary hardware in schools, particularly in underserved areas, is crucial. According to Adeyemi (2020) and Okeke (2021), public-private partnerships are essential for facilitating infrastructure development, ensuring that all educational institutions have the resources needed to implement AI-driven learning platforms effectively. By improving connectivity and access to technology, Nigeria can create an environment conducive to personalized learning.

To address the digital divide, scholars emphasize the importance of targeted initiatives aimed at increasing access to technology for marginalized communities. Programs that provide affordable devices and internet connectivity to students in rural and impoverished areas can help ensure equitable access to AI-driven personalized learning (Nwankwo & Eze, 2022). Also, training programs focused on digital literacy for both students and educators are essential. By equipping individuals with the skills needed to navigate digital tools, these initiatives can empower a broader segment of the population to benefit from personalized learning opportunities (Ibrahim, 2023).

Given the concerns surrounding data privacy and security, scholars recommend the development and enforcement of robust data protection policies. Establishing clear guidelines for the collection, storage, and use of student data is vital to building trust in AI

systems (Ojo, 2021). Collaboration with legal experts to create frameworks that safeguard personal information while allowing for the effective use of data in enhancing educational outcomes is crucial. This will help mitigate fears associated with AI technologies and encourage their adoption in educational settings.

Investing in professional development for educators is another critical solution highlighted by scholars. Training programs should be designed to equip teachers with the skills needed to effectively integrate AI into their teaching practices (Ali & Murtala, 2022). These programs can include hands-on workshops, online courses, and collaborative learning communities where educators can share best practices. By fostering a culture of continuous learning, schools can ensure that teachers feel confident in using AI tools to enhance personalized learning experiences.

Addressing cultural resistance to AI technologies requires comprehensive awareness campaigns that highlight the benefits of personalized learning through AI. Scholars suggest engaging various stakeholders, including educators, parents, and community leaders, in discussions about the positive impacts of AI on student learning outcomes (Umar, 2023). By showcasing successful case studies and providing evidence of the effectiveness of AI in education, these initiatives can help shift perceptions and foster a more accepting attitude towards technological innovations.

To ensure the sustainability and scalability of AI initiatives, scholars recommend developing strategic plans that involve collaboration among government, educational institutions, and private sector partners (Bello, 2022). Funding models that support ongoing maintenance and expansion of AI-driven programs are essential. Additionally, pilot programs should be carefully evaluated to identify best practices and lessons learned, enabling successful strategies to be replicated in different contexts across Nigeria.

The contributions of scholars regarding solutions to the challenges of artificial intelligence in personalized learning in Nigeria underscore the importance of a multifaceted approach. By investing in infrastructure, bridging the digital divide, strengthening data protection policies, providing professional development, promoting positive cultural attitudes, and ensuring sustainability and scalability, Nigeria can effectively harness the potential of AI in education. Addressing these challenges through targeted solutions will not only enhance personalized learning experiences but also contribute to a more equitable and effective educational landscape for all students in Nigeria. As the nation moves forward, collaborative efforts among government, educational institutions, and the private sector will be essential for realizing the transformative power of AI in education.

Opportunities of Artificial Intelligence in Personalized Learning in Nigeria in the 21st Century

One of the most significant opportunities presented by AI in personalized learning is the potential for enhanced learning outcomes. Scholars emphasize that AI-driven systems can analyze vast amounts of data to provide tailored educational experiences. By assessing individual student performance in real time, AI can identify strengths and weaknesses, allowing for customized learning pathways. This personalization can lead to improved engagement and academic success, particularly in a diverse educational landscape like Nigeria, where students have varying learning styles and paces (Olugbade, 2025).

In addition to benefiting students, AI can also provide valuable support to teachers. Scholars note that AI tools can assist educators in monitoring student progress and identifying those who may require additional help (Agarry et al., 2024). This data-driven approach enables teachers to intervene early and tailor their

instructional strategies accordingly. Furthermore, AI can automate administrative tasks, freeing up time for educators to focus on teaching and fostering relationships with their students. This collaborative approach enhances the overall learning environment and improves educational outcomes.

AI also promotes a culture of lifelong learning and skill development among students. Scholars argue that AI can facilitate the acquisition of critical skills such as problem-solving, critical thinking, and self-directed learning (Ajadi et al., 2024). By providing personalized feedback and adaptive resources, AI encourages students to take ownership of their educational journeys. This emphasis on continuous learning is particularly important in Nigeria, where equipping students with relevant skills is essential for success in an increasingly competitive global economy.

The integration of AI in personalized learning fosters data-driven decision-making at all levels of education. Scholars emphasize that AI can provide insights into educational trends and student behaviors, enabling policymakers and educators to make informed decisions (Campo et al., 2024). By analyzing data on student performance, institutions can refine curricula, improve teaching methodologies, and allocate resources more effectively. This evidence-based approach can lead to more effective educational policies and practices that respond to the needs of students.

AI can foster collaboration and innovation among educational stakeholders. The implementation of AI-driven personalized learning solutions often requires partnerships among government, educational institutions, and the private sector (Robinson, 2024). This collaborative approach can spur innovation, leading to the development of new educational technologies and methodologies. By working together, stakeholders can create a more responsive and dynamic educational ecosystem that meets the needs of all learners.

Conclusion

The integration of AI into Nigeria's educational landscape presents a transformative opportunity to enhance teaching and learning experiences. By addressing existing challenges and implementing strategic recommendations, Nigeria can leverage AI to create a more inclusive and responsive educational system. This approach will better prepare students for the complexities of the modern world, ensuring that they thrive in an increasingly competitive global economy.

Recommendations

Based on the findings of this study the following recommendations are made.

1. Government should prioritize investments in reliable internet connectivity and modern hardware to enable effective AI tool implementation.
2. Government should establish a comprehensive professional development initiatives to equip educators with the necessary skills for utilizing AI technologies.
3. Stakeholders should develop a clear policies to govern AI use in education, ensuring data privacy and promoting transparency.
4. Stakeholders and professionals should collaborate on curriculum design to integrate AI tools meaningfully, enhancing relevance and engagement.
5. Government should implement initiatives to provide subsidized technology and internet access for low-income students, ensuring all learners benefit from AI-enhanced education.

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THE ROLE OF ARTIFICIAL INTELLIGENCE IN TEACHING AND LEARNING OF SOCIAL STUDIES EDUCATION IN THE 21ST CENTURY NIGERIA.

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Abstract

The integration of Artificial Intelligence (AI) in education has emerged as a transformative force in the 21st century, particularly in the realm of social studies education in Nigeria. This paper examines the evolving role of AI in enhancing pedagogical practices and learning outcomes in this vital subject area. As Nigeria grapples with educational challenges such as inadequate resources and a diverse student population, AI technologies offer innovative solutions to personalize learning experiences and improve engagement.AI-driven tools, including intelligent tutoring systems, chatbots, and adaptive learning platforms, enable tailored educational experiences that address individual learning styles and paces. These technologies facilitate interactive simulations and virtual experiences that bring complex social issues to life, fostering critical thinking and civic engagement among students. Furthermore, AI can analyze data to provide insights into student performance, allowing educators to make informed decisions and interventions. The role of AI extends beyond student engagement; it also

empowers teachers by automating administrative tasks, enhancing lesson planning, and providing professional development resources. However, the successful implementation of AI in Nigerian social studies education faces significant challenges, including infrastructural limitations, varying levels of digital literacy among educators, and concerns about data privacy and security. This study highlights the necessity for strategic investments in technology infrastructure, teacher training, and curriculum development to harness the full potential of AI in social studies education. By navigating these challenges, Nigeria can leverage AI to cultivate informed, active citizens who are equipped to navigate the complexities of a rapidly changing world. Ultimately, this research underscores the critical importance of embracing AI as a catalyst for educational reform and social development in Nigeria.

Keywords: Artificial intelligence, Teaching, Learning, Social Studies Education, 2qst Century Nigeria.

Introduction

The integration of Artificial Intelligence (AI) into education has emerged as a significant trend in the 21st century, offering innovative solutions to longstanding challenges in teaching and learning. In Nigeria, where educational resources are often limited and classrooms are frequently overcrowded, AI presents a unique opportunity to enhance the quality of education, particularly in subjects such as social studies. Social studies education plays a crucial role in fostering critical thinking, cultural awareness, and civic responsibility among students (Afolabi, 2023). However, traditional teaching methods may not adequately address the diverse learning needs of students in this field.

AI technologies, including intelligent tutoring systems, chatbots, and data analytics, have the potential to transform social studies education by personalizing learning experiences, facilitating collaborative engagements, and streamlining assessment processes (VanLehn, 2021; Ahn et al., 2022). These advancements can support educators in creating more engaging and effective learning environments that cater to the varying abilities and interests of students. Furthermore, as Nigeria continues to navigate socio-economic challenges, leveraging AI in education can contribute to a more informed and socially responsible citizenry.

This research paper explores the multifaceted role of AI in the teaching and learning of social studies education in Nigeria, examining its potential benefits, challenges, and implications for the future. By analyzing existing literature and case studies, this study aims to provide insights into how AI can be effectively integrated into social studies curricula to improve educational outcomes in Nigeria.

The exploration of AI's role in social studies education also underscores the importance of addressing potential barriers to implementation. Factors such as access to technology, teacher training, and infrastructural limitations can significantly impact the effectiveness of AI integration. Moreover, ethical considerations surrounding data privacy and the implications of AI-driven decision-making in educational settings warrant careful scrutiny.

As we delve deeper into the impact of AI on social studies education, it is essential to consider how these technologies can be tailored to meet the specific cultural and contextual needs of Nigerian students. Developing culturally relevant AI tools can enhance student engagement and ensure that learning experiences resonate with their lived realities.

In addition, fostering partnerships between educational institutions and technology providers can facilitate the creation of customized AI solutions that address local challenges. By focusing on collaborative efforts, stakeholders can work towards building a sustainable model for AI integration that enhances educational equity.

The integration of AI in social studies education not only presents an opportunity to improve learning outcomes but also to foster a generation of critically aware and socially responsible citizens. As Nigeria continues to evolve in the face of socio-economic challenges, embracing AI in education could play a pivotal role in shaping a brighter future for its students. This research aims to serve as a foundation for understanding and implementing AI technologies in a manner that is both effective and culturally sensitive, paving the way for innovative educational practices in Nigeria.

Concept of Social Studies Education

Social studies education encompasses a multidisciplinary approach aimed at fostering informed and active citizenship through the study of human society and its complexities. According to the National Council for the Social Studies (NCSS, 2020), social studies integrates knowledge from various disciplines, including history, geography, political science, economics, and sociology, to provide students with a comprehensive understanding of their world.

The concept emphasizes critical thinking, problem-solving, and the development of social skills. As outlined by Lee and Ashby (2021), social studies education encourages students to analyze societal issues, understand diverse perspectives, and engage in civic participation. This holistic approach not only equips learners with factual knowledge but also promotes values such as empathy, respect, and social responsibility.

Furthermore, the importance of social studies education in promoting democratic citizenship is highlighted by Parker (2022), who argues that it prepares students to navigate and contribute to a democratic society. In the context of Nigeria, social studies serves as a crucial tool for fostering national unity and cultural understanding among its diverse population (Obanya, 2023).

Social studies education is vital for developing critical thinkers and responsible citizens, enabling students to engage meaningfully with their communities and the broader world.

Objectives of Social Studies Education in Nigeria

Social studies education in Nigeria serves as a vital component of the national educational framework, aiming to equip students with the knowledge, skills, and values necessary for active and informed citizenship. The objectives of this discipline are multifaceted, reflecting the diverse needs of a complex society.

One of the primary objectives of social studies education is to instill civic awareness and responsibility among students. According to Obanya (2023), this involves developing an understanding of civic duties and the importance of participation in democratic processes. By fostering a sense of responsibility, social studies prepares students to engage actively in their communities and contribute to the democratic life of the nation.

Another critical objective is to promote cultural understanding and appreciation. Nigeria's rich diversity, characterized by numerous ethnic groups and cultures, necessitates an educational approach that emphasizes respect and unity. Uche (2022) highlights that social studies education encourages students to appreciate different cultural backgrounds, fostering national cohesion and harmony. This cultural awareness is essential for mitigating conflicts and building a more inclusive society.

Also, social studies education aims to enhance critical thinking and problem-solving skills. Ocho (2021) notes that these skills are crucial for addressing contemporary social issues, enabling students to analyze situations critically and make informed decisions. This objective empowers students not only to understand their environment but also to navigate complex social landscapes effectively.

The promotion of social values and ethics is another significant objective of social studies education. Nwankwo (2022) argues that

instilling values such as respect, tolerance, and empathy is essential for building a cohesive society. By emphasizing moral development, social studies education prepares students to interact positively with others, fostering peaceful coexistence.

Moreover, social studies education seeks to cultivate global awareness among students. Akinyemi (2023) emphasizes the importance of understanding global issues and interdependence in today's interconnected world. This objective encourages students to engage with international challenges and recognize Nigeria's role within the global community. By fostering a global perspective, social studies education prepares students to become responsible global citizens.

Lastly, the objective of equipping students with skills for sustainable development is increasingly relevant in the context of global challenges such as climate change and resource management. Afolabi (2023) argues that social studies education promotes environmental awareness and responsible citizenship, encouraging students to consider the long-term implications of their actions on society and the environment.

The objectives of social studies education in Nigeria are comprehensive and essential for developing informed, responsible, and culturally aware citizens. By focusing on civic responsibility, cultural appreciation, critical thinking, social values, global awareness, and sustainable development, social studies education plays a crucial role in shaping the future of Nigerian society. These objectives not only prepare students for personal success but also contribute to the overall development and unity of the nation.

21st Century Nigeria

The 21st century has marked a period of significant transformation for Nigeria, characterized by both challenges and opportunities. As the most populous country in Africa, Nigeria's socio-economic landscape is shaped by its diverse cultures, rich resources, and complex political environment. This essay explores key aspects of 21st century Nigeria, including economic development, governance, social issues, and technological advancements.

One of the defining features of Nigeria in the 21st century is its economic evolution. Despite facing substantial challenges such as corruption and infrastructural deficits, Nigeria has positioned itself as one of the largest economies in Africa. According to Ogujiuba et al. (2022), Nigeria's economic growth has been driven by sectors such as oil and gas, agriculture, and telecommunications. However, the reliance on oil has made the economy vulnerable to global price fluctuations, highlighting the need for diversification.

Governance remains a critical issue in Nigeria. The country has experienced a tumultuous political landscape, with frequent changes in leadership and ongoing concerns about corruption and accountability. As observed by Diamond (2023), the democratic transition that began in 1999 has been marked by both progress and setbacks. While there have been improvements in electoral processes, challenges persist, including electoral violence and lack of public trust in political institutions. Social issues are also prominent in contemporary Nigeria. The country grapples with significant challenges such as poverty, unemployment, and inadequate access to education and healthcare. A report by the World Bank (2023) indicates that a substantial portion of the population lives below the poverty line, exacerbated by economic disparities and regional inequalities. These social issues are further complicated by ethnic tensions and insurgencies, notably the Boko Haram insurgency in the northeastern region, which has resulted in humanitarian crises and displacement (Adesoji, 2022).

Technological advancements have been a notable aspect of Nigeria's development in the 21st century. The rise of the digital economy has transformed various sectors, including

finance, education, and agriculture. According to Afolabi (2023), Nigeria's burgeoning tech industry, often referred to as "Silicon Lagoon," has attracted significant investment and fostered innovation. The proliferation of mobile technology has also enhanced access to information and services, contributing to new business models and economic opportunities.

The 21st century Nigeria is characterized by a dynamic interplay of economic growth, governance challenges, social issues, and technological advancements. While the country faces significant obstacles, its potential for development remains considerable. Addressing governance, social disparities, and fostering a diversified economy will be critical in shaping a prosperous future for Nigeria.

Artificial Intelligence

Artificial Intelligence (AI) has emerged as one of the most transformative technologies of the 21st century, influencing various sectors including healthcare, finance, education, and transportation. Defined as the simulation of human intelligence processes by machines, particularly computer systems, AI encompasses a range of capabilities such as learning, reasoning, problem-solving, perception, and language understanding (Russell & Norvig, 2023).

One of the key developments in AI is the advancement of machine learning, a subset of AI that focuses on the use of algorithms and statistical models to enable computers to improve their performance on tasks through experience. According to Mitchell (2023), machine learning has revolutionized data analysis and decision-making processes across industries, allowing for predictive analytics and enhanced personalization in services.

In healthcare, AI has shown significant promise in improving diagnostic accuracy and patient outcomes. Research by Topol (2023) highlights how AI algorithms can analyze medical imaging data, assist in early disease detection, and optimize treatment plans. For instance, AI-powered tools are increasingly used in radiology to identify abnormalities in X-rays and MRIs, facilitating faster and more accurate diagnoses.

Relevant AI Tools

In recent years, the integration of Artificial Intelligence (AI) into educational practices has revolutionized the learning landscape, providing innovative solutions to traditional challenges. This introduction highlights several notable AI tools thus:

Khan Academy: Utilizes AI to provide personalized learning experiences and adaptive assessments.

Socratic by Google: An AI-driven app that helps students with homework by providing explanations and resources.

IBM Watson Education: Offers personalized learning solutions, helping educators tailor content to individual student needs.

Duolingo: Uses AI to personalize language learning, making it applicable for social studies subjects involving different languages and cultures.

Edmodo: Incorporates AI features to facilitate collaborative learning and communication among students and teachers.

Smart Sparrow: An adaptive elearning platform that allows educators to create personalized learning experiences.

ChatGPT: Can serve as a chatbot for answering student queries and providing additional resources or explanations on social studies topics.

Turnitin: Uses AI to assist with plagiarism detection and provide feedback on writing assignments.

Concept of Teaching

Teaching is a complex and dynamic process aimed at facilitating learning and promoting the development of knowledge, skills, and attitudes in students. It encompasses various methods and approaches, each designed to cater to diverse learning needs and contexts. According to Schunk (2023), teaching can be defined as the act of guiding and supporting students in their learning journey, aiming to empower

them to acquire knowledge and develop critical thinking skills.

At its core, teaching involves the transmission of knowledge from the teacher to the student. However, it is increasingly recognized as an interactive process that requires active engagement from both parties. As noted by Bransford et al. (2022), effective teaching involves understanding how students learn, using that understanding to inform instructional strategies, and creating an environment that fosters collaboration and inquiry.

One key aspect of teaching is the establishment of clear learning objectives. According to Gagne (2023), setting specific, measurable goals helps guide both teaching and learning processes, ensuring that students understand what is expected of them. This clarity allows educators to design appropriate assessments and instructional activities that align with desired outcomes.

Concept of Learning

The concept of learning is central to educational theory and practice, encompassing a wide array of processes through which individuals acquire knowledge, skills, attitudes, and values. Learning is generally understood as a relatively permanent change in behavior or knowledge resulting from experience (Merriam & Bierema, 2023). This definition highlights the importance of experience in the learning process, suggesting that learning occurs through active engagement with content and the environment.

Learning can be categorized into several types, including cognitive, affective, and psychomotor learning. Cognitive learning focuses on the acquisition of knowledge and intellectual skills. According to Bloom (2023), cognitive learning can be organized into a hierarchy of learning objectives, ranging from basic recall of facts to higher-order thinking skills such as analysis and evaluation. This taxonomy provides a framework for educators to design curricula and assessments that promote deeper understanding.

Affective learning, on the other hand, deals with emotions, attitudes, and values. Krathwohl et al. (2023) developed a taxonomy for affective learning that emphasizes the importance of feelings and emotional responses in the learning process. This aspect of learning is crucial for fostering engagement and motivation, as students are more likely to invest in learning when they find it personally meaningful.

Psychomotor learning involves the development of physical skills and coordination. According to Dave (2023), this type of learning is essential in fields such as sports, performing arts, and vocational training, where hands-on practice and repetition are key to mastering specific skills.

Learning is also influenced by various theories, including behaviorism, constructivism, and social learning theory. Behaviorism, as articulated by Skinner (2023), emphasizes the role of reinforcement and punishment in shaping behavior, suggesting that learning is a result of external stimuli. In contrast, constructivism, championed by Piaget (2022) and Vygotsky (2022), posits that learners actively construct their own understanding through experiences and social interactions. Social learning theory, proposed by Bandura (2023), emphasizes the importance of observational learning, where individuals learn by watching others and modeling their behavior.

Methods of Teaching and Learning Using Artificial Intelligence in 21st Century Nigeria

The integration of Artificial Intelligence (AI) into education is reshaping teaching and learning methodologies in Nigeria, particularly in the 21st century. As the country faces various educational challenges, such as inadequate resources, large class sizes, and varying levels of student engagement, AI offers innovative solutions to enhance educational outcomes. This essay explores several methods

of teaching and learning that utilize AI, highlighting their potential benefits and implications for education in Nigeria.

One prominent method is the use of intelligent tutoring systems (ITS), which provide personalized learning experiences for students. According to VanLehn (2021), ITS can adapt to individual learning styles and paces, offering tailored feedback and resources. In the Nigerian context, these systems can help address diverse student needs, allowing for differentiated instruction in overcrowded classrooms. For example, platforms like Khan Academy utilize AI algorithms to assess student performance and suggest suitable learning materials, making it easier for teachers to cater to varying student abilities (Khan, 2022).

Another effective method is the implementation of AI-driven educational chatbots. These tools can facilitate interactive learning by providing instant responses to student inquiries, thus enhancing engagement and support outside traditional classroom hours. According to Ahn et al. (2022), chatbots can serve as virtual tutors, helping students with homework and reinforcing concepts learned during lessons. In Nigeria, where access to teachers may be limited in some regions, chatbots can play a crucial role in providing additional academic support.

AI can also enhance the assessment process through automated grading systems. As noted by Topping et al. (2023), these systems can significantly reduce the time teachers spend on evaluations, allowing them to focus more on instructional delivery. In Nigeria, automated grading can streamline the assessment of large volumes of student work, providing timely feedback that is essential for effective learning. This efficiency can also help in identifying students who may require additional support, thereby improving overall educational outcomes.

Furthermore, AI can facilitate data analytics in education, enabling educators to make informed decisions based on student performance data. According to Siemens (2023), learning analytics can identify trends and patterns, helping educators understand which teaching strategies are most effective. In Nigeria, this data-driven approach can assist in developing targeted interventions for at-risk students, ultimately fostering a more supportive learning environment.

Despite these promising methods, the implementation of AI in education in Nigeria faces several challenges, including infrastructural limitations, digital literacy, and access to technology. As highlighted by Afolabi (2023), addressing these barriers is crucial for maximizing the benefits of AI in teaching and learning. Ensuring that both educators and students have the necessary skills to utilize AI tools effectively will be vital for successful integration.

The Role of Artificial Intelligence in Teaching and Learning Social Studies Education in Nigeria

Artificial Intelligence (AI) is poised to play a transformative role in the teaching and learning of social studies education in Nigeria. As the country grapples with various educational challenges, including large class sizes, limited resources, and diverse student needs, AI offers innovative solutions that can enhance instructional practices and improve student engagement. This essay explores the multifaceted role of AI in social studies education within the Nigerian context.

One of the primary roles of AI in social studies education is the facilitation of personalized learning experiences. Intelligent tutoring systems (ITS) can adapt to individual student learning styles and paces, providing tailored resources and feedback. According to VanLehn (2021), ITS can significantly enhance student comprehension by addressing specific learning gaps. In Nigeria, where classrooms often contain students with varying levels of understanding, such systems can help educators

deliver differentiated instruction that meets the needs of all learners.

AI can also enhance the development of critical thinking skills, which are essential in social studies education. Tools like AI-driven simulations and virtual reality (VR) environments allow students to engage in immersive learning experiences that promote analysis and decision-making. As noted by Dede (2022), such technologies can create realistic scenarios that encourage students to explore historical events, social issues, and cultural dynamics interactively. This experiential approach fosters deeper understanding and retention of social studies concepts.

AI-powered chatbots also serve a significant role in supporting social studies education by providing students with immediate access to information and assistance. According to Ahn et al. (2022), chatbots can act as virtual tutors, answering student queries and reinforcing concepts outside of classroom hours. For Nigerian students, this can be particularly beneficial in regions where access to qualified teachers is limited, thereby promoting continuous learning and engagement.

Furthermore, AI can facilitate collaborative learning among students. Tools that utilize AI for group projects and discussions can enhance peer-to-peer interaction and promote diverse perspectives on social issues. As highlighted by Siemens (2023), collaborative learning environments foster critical thinking and help students develop a deeper understanding of social dynamics and cultural contexts.

Despite the promising benefits, the implementation of AI in social studies education in Nigeria faces challenges, including infrastructural deficits, digital literacy, and equitable access to technology. Afolabi (2023) stresses the importance of addressing these barriers to ensure that both educators and students can effectively leverage AI tools. Professional development for teachers and investments in technological infrastructure will be crucial for successful integration.

The role of Artificial Intelligence in teaching and learning social studies education in Nigeria is significant and multifaceted. From personalized learning and critical thinking enhancement to streamlined assessments and collaborative opportunities, AI has the potential to transform educational practices. By leveraging AI technologies, educators can create more engaging and relevant learning experiences that meet the diverse needs of students in social studies.

Problems and Challenges of AI in Teaching Social Studies Education

The problems and challenges of AI in teaching social studies education, particularly in the context of concerns about academic integrity and cheating:

1. **Facilitating Cheating**
AI tools like chatbots and homework assistance apps can provide answers to assignments, making it easier for students to engage in academic dishonesty rather than developing their understanding of the material.
2. **Lack of Authentic Assessment**
Traditional assessments may be undermined by AI, as students might rely on these tools to complete tasks without demonstrating their knowledge or critical thinking skills.
3. **Overreliance on Technology**
Students may become dependent on AI for answers, which can hinder their ability to think critically and analyze social issues independently.
4. **Erosion of Critical Thinking**
If students consistently use AI to find answers, they may not engage deeply with the content, reducing opportunities for meaningful learning and reflection in social studies.
5. **Bias in AI Responses**
AI tools can inadvertently perpetuate biases present in their training data, leading to skewed or inaccurate information being presented to students, particularly in culturally sensitive topics.

Ways of Curbing the Problems and Challenges of AI in Teaching Social Studies Education

The strategies to curb the challenges associated with AI in teaching social studies education:

1. **Promote Academic Integrity**

Implement programs that emphasize the importance of academic honesty and the consequences of cheating.

Use Plagiarism Detection Tools: Incorporate tools like Turnitin to discourage and detect academic dishonesty.

2. Design Authentic Assessments

Project-Based Learning: Create assessments that require students to apply their knowledge in real-world situations, making it harder to rely on AI for answers.

Open-Ended Questions: Use assessments that encourage critical thinking and personalized responses, reducing the applicability of AI-generated answers.

3. Incorporate AI Ethically

Guidance on Responsible Use: Teach students how to use AI tools ethically, focusing on using them as supplements to learning rather than shortcuts.

Cultural Sensitivity Training: Ensure that AI applications are culturally relevant and sensitive, avoiding biases in the content.

4. Enhance Teacher Training

Professional Development: Provide ongoing training for educators on effectively integrating AI tools in the classroom, including best practices and ethical considerations.

Peer Collaboration: Encourage teachers to share experiences and strategies for using AI in a way that enhances learning while maintaining academic integrity.

5. **Increase Access to Technology**

Equitable Resource Distribution: Advocate for policies that ensure all students have access to the necessary technology and resources to engage with AI tools.

Community Partnerships: Collaborate with local organizations to provide devices and internet access to underserved students.

Conclusion

The integration of Artificial Intelligence in social studies education represents a significant opportunity for enhancing teaching and learning in Nigeria. By addressing the unique challenges faced by the educational system, AI can facilitate personalized learning, support critical thinking, and provide timely feedback, ultimately improving student engagement and outcomes. However, it is essential to tackle the infrastructural and digital literacy challenges to ensure equitable access to these technologies.

As Nigeria continues to evolve in the 21st century, the effective implementation of AI in education can play a crucial role in fostering a more informed and responsible citizenry. By preparing students to navigate complex social landscapes and engage with diverse perspectives, AI can contribute to the development of a cohesive and united society. The ongoing exploration of AI's role in education will be vital for shaping the future of social studies education and ensuring that all students have the tools they need to succeed in an increasingly complex world.

Recommendations

Based on findings of this study, the following recommendations are made:

Governments should provide teachers with training and support to effectively integrate AI-powered tools into their teaching practices

Government should invest in infrastructure development, including hardware, software, and internet connectivity, to support AI powered learning

Stakeholders and professionals should integrate AI literacy and 21st-century skills into the social studies curriculum to prepare students for the future.

Stakeholders and professionals should explore research studies on AI in education, focusing on personalized learning, technology integration, and student outcome.

Stakeholders and professionals should read academic papers on AI literacy teaching in social studies education and the prospects of using AI in teaching and learning in Nigeria.

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MOBILE APP AND STUDENTS' ACADEMIC ACHIEVEMENT IN ECONOMICS: AN IMPACT ASSESSMENT

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Abstract
This study assesses the impact mobile app and students' academic achievement in economics. *An experimental research design was used, the population consist of 230 NCE I and NCE II economics students while 100 students were randomly selected and divided into an experimental group (utilizing mobile applications) and a control group (following traditional learning methods). The Economics Performance Test (EPT) was administered as both a pre-test and post-test over two weeks. The reliability of the instrument was assessed using Cronbach's alpha, yielding a score of 0.82. Data collection took place in two phases, with the experimental group engaging with mobile applications while the control group continued with conventional learning approaches. The results, analyzed through descriptive statistics and an independent samples t-test, showed that students using mobile applications performed significantly better than those in the control group (p = 0.001), demonstrating a positive effect on academic performance. However, a gender-based analysis indicated no significant difference between male and female students (p = 0.071), suggesting that mobile learning benefits students equally, regardless of gender. Based on these findings, the study recommends the integration of mobile applications into Economics education, along with gender-inclusive digital learning strategies to enhance student performance.*
Keywords: *Mobile Learning, Educational Applications, Academic Performance, Economics Education.*

Introduction

The rapid advancement of mobile technology has significantly transformed the landscape of education globally. One of the most prominent innovations is mobile learning (m-learning), which allows students to access educational content anytime, anywhere, via smartphones and other mobile devices. This digital shift has

introduced dynamic changes in how students learn, interact with content, and engage with instructors, ultimately influencing academic outcomes. Mobile educational applications, in particular, have emerged as powerful tools in facilitating interactive learning, enhancing student engagement, and improving knowledge retention (Sung, Chang, & Liu, 2016).

A wide variety of mobile apps ranging from quiz-based platforms and e-books to video tutorials and simulations have reshaped traditional educational approaches (Criollo-C, Guerrero-Arias, & Jaramillo-Alcázar, 2021). These tools provide personalized learning experiences, allowing learners to progress at their own pace, revisit complex concepts, and engage in self-assessment activities, which are crucial for academic achievement. Research supports the positive impact of these apps on academic performance. For instance, Ibáñez et al. (2020) found that students using educational mobile applications demonstrated significantly better performance than their peers relying solely on conventional learning methods.

Mobile apps incorporate features such as gamification, multimedia content, real-time feedback, and collaborative tools, which foster active learning and knowledge sharing (Demir & Akpinar, 2018; Heflin, Shewmaker, & Nguyen, 2017). These functionalities contribute not only to cognitive development but also to social interaction, especially in higher education contexts where peer learning and autonomy are critical. Despite the growing adoption of mobile learning technologies, gender-based differences in usage patterns and outcomes remain an area of concern. Some studies suggest that male students tend to favor game-based and simulation-oriented applications, while female students are more inclined towards text-heavy content and collaborative platforms (Hawi & Samaha, 2016; Drigas & Angelidakis, 2017). These variations may influence the effectiveness of mobile apps and potentially widen gender gaps in academic performance.

In addition to gender, contextual factors such as internet availability, smartphone access, institutional support, and digital literacy affect the efficacy of mobile learning tools. In developing countries like Nigeria, challenges such as unstable connectivity, limited access to mobile devices, and insufficient digital training can hinder effective utilization of these technologies (Criollo-C et al., 2021).

Economics, as a discipline, demands high levels of analytical reasoning and application of theoretical models to real-world problems. Mobile applications tailored to Economics education often feature tools for interactive graphs, real-time data analysis, case studies, and economic simulations, enhancing student comprehension and engagement (Sung et al., 2016). Given the increasing integration of technology into education, it is critical to examine how mobile applications impact Economics students' academic performance and whether gender differences exist in these outcomes. Thus, this study focuses on assessing the impact of mobile educational applications on the academic performance of Economics students at FCT College of Education, Zuba-Abuja, with a specific emphasis on gender-based differences.

Statement of the Problem

The incorporation of educational mobile applications into higher education has revolutionized traditional pedagogy by promoting flexibility, interactivity, and personalized learning. However, despite their potential to enhance academic performance, empirical evidence particularly in the context of Economics education remains sparse. In institutions where traditional lectures remain dominant, the adoption of mobile apps as learning tools is inconsistent, leading to unequal access to technology-enhanced learning experiences.

Furthermore, while anecdotal observations indicate that mobile apps may foster better performance, variations in student engagement, gender-based usage patterns, and digital skills complicate the picture. There is insufficient understanding of how male and female students differ in their use of educational apps and how these differences impact academic success in Economics courses. In the Nigerian context, especially in colleges of education, challenges such as infrastructure limitations, varying digital literacy levels, and socio-economic barriers further obscure the role mobile apps play in influencing academic performance. Hence, this study seeks to fill the existing research gap by assessing the impact of educational mobile applications on Economics students' academic performance.

Objectives of the Study

The general objective of this study is to assess the impact of mobile applications on the academic performance of Economics students at FCT College of Education, Zuba-Abuja. Specific objectives are as follows:

i. To evaluate the difference in academic performance between Economics students who use educational mobile applications and those who do not.
ii. To assess gender-based differences in academic performance among Economics students using educational mobile applications.

Research Questions

i. Is there a significant difference in the academic performance of Economics students who use educational mobile applications and those who do not at FCT College of Education, Zuba-Abuja?
ii. Is there a significant difference in the academic performance of male and female Economics students who use educational mobile applications at FCT College of Education, Zuba-Abuja?

Research Hypotheses

$H0_1$: There is no significant difference in the academic performance of Economics students who use educational mobile applications and those who do not at FCT College of Education, Zuba-Abuja.

$H0_2$: There is no significant difference in the academic performance of male and female Economics students who use educational mobile applications at FCT College of Education, Zuba-Abuja.

Literature Review

The integration of mobile applications in education has received significant attention due to their potential to enhance student learning experiences. Research suggests that mobile learning applications improve students' academic performance by fostering engagement, motivation, and access to learning resources (Sung, Chang, & Liu, 2016). These applications incorporate features such as gamification, real-time feedback, and interactive content, making learning more engaging and effective (Demir & Akpinar, 2018). A study conducted by Ibáñez et al. (2020) found that students who used educational mobile applications performed better academically than those who relied solely on traditional methods. Similarly, Heflin, Shewmaker, & Nguyen (2017) observed that mobile applications encourage collaborative learning, allowing students to participate in peer discussions and self-assessments, ultimately leading to better knowledge retention. However, some researchers have raised concerns that mobile devices can be a source of distraction, potentially negatively impacting academic performance if not properly managed (Felisoni & Godoi, 2018).

While mobile learning benefits students across the board, some studies suggest that gender differences may influence how students interact with these applications. Hawi & Samaha (2016) argue that male and female students have varying preferences for mobile-based learning tools. Male students are more inclined toward gamified applications and simulations, whereas female students tend to prefer text-based and collaborative learning environments (Drigas & Angelidakis, 2017). Despite these differences, Briz-Ponce & García-Peñalvo (2015) found that when students have equal access to digital tools, there is no significant gender gap in academic performance.

Conversely, other studies suggest that male students are more likely to adopt mobile learning due to higher levels of technological confidence and self-efficacy (Zaineldeen, Hongbo, & Koffi, 2020). However, Domingo & Garganté (2016) argue that gender disparities in mobile learning usage diminish when students receive proper digital training, making mobile learning an inclusive educational tool. Economics education requires analytical and problem-solving skills, and mobile applications provide features such as interactive graphs, case studies, and real-time data analysis to support learning (Sung et al., 2016). Nevertheless, certain challenges hinder the

effectiveness of mobile learning, particularly in developing regions like Nigeria. These challenges include limited access to smartphones, unstable internet connectivity, and insufficient training for both students and instructors (Criollo-C, Guerrero-Arias, & Jaramillo-Alcázar, 2021).

Heflin et al. (2017) emphasize that mobile learning is most effective when supported by institutional policies that promote digital literacy and equitable access to technology. To maximize the benefits of educational mobile applications, it is crucial to integrate them into the curriculum and provide adequate training for both students and educators. While existing studies confirm the positive impact of mobile learning, few have specifically examined its effects on Economics education in Nigerian colleges. Also, the role of gender in mobile learning effectiveness remains inconclusive. This study aims to bridge these gaps by assessing the impact of educational mobile applications on the academic performance of Economics students at FCT College of Education, Zuba-Abuja, with a particular focus on gender-based differences in learning outcomes.

Theoretical Framework

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), developed by Davis (1989), is one of the most widely used theories for understanding how individuals adopt and use new technology. TAM posits that a user's acceptance of a technology is primarily influenced by two key factors: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Perceived usefulness refers to the extent to which a person believes that using a specific technology will improve their performance, while perceived ease of use refers to how effortless it is to use the technology. These two factors shape users' attitudes toward the technology, which in turn determine their behavioral intention to use it and their actual usage behavior.

The Technology Acceptance Model (TAM) is particularly relevant to this study as it offers a framework for understanding how students adopt educational mobile applications for learning. When students perceive these applications as both useful and easy to use, they are more likely to engage with them and incorporate them into their academic routines. This research examines the impact of educational mobile applications on the academic performance of Economics students at FCT College of Education, Zuba-Abuja. With TAM application, the study seeks to assess whether students' perceptions of usefulness and ease of use influence their learning outcomes. Prior studies have shown that students who find learning technologies beneficial and user-friendly tend to experience enhanced engagement and academic performance (Fathema, Shannon, & Ross, 2015).

TAM provides a structured method for analyzing key variables in this study, particularly mobile learning applications, academic performance, and student engagement. If students believe that mobile learning applications improve their comprehension of Economics concepts, they are more likely to engage with them, leading to improved academic performance. Research supports this assertion, demonstrating that students who integrate mobile learning tools into their study routines consistently achieve higher test scores and better comprehension compared to those relying solely on traditional methods (Ibáñez et al., 2020). The ease of use of mobile applications significantly influences students' willingness to engage with them. When students find these applications intuitive and user-friendly, they are more likely to use them regularly, fostering sustained learning engagement. Studies indicate that when mobile learning platforms are accessible and simple to navigate, students develop positive attitudes toward digital learning, which enhances their academic performance (Al-Adwan et al., 2023).

Also, TAM provides insights into potential gender-based differences in the adoption and effectiveness of educational mobile applications. Some research suggests that male students are more inclined toward interactive and gamified learning applications, while female students may prefer structured, text-based learning environments (Briz-Ponce & García-Peñalvo, 2015). However, when students of both genders perceive mobile applications as useful and easy to use, adoption rates tend to increase equally.

Research Methodology

This study adopted an experimental research design, specifically the pre-test and post-test equivalent group design, to assess mobile applications and academic performance of Economics students at FCT College of Education, Zuba-Abuja. The target population consisted of 230 NCE I and NCE II Economics students during the 2024/2025 academic session. From this population, a simple random sampling was used to select 100 students for the study, taking into account their access to smartphones, basic digital literacy, and willingness to participate. These students were divided into two groups: the experimental group, who used Google Classroom as a learning tool, and the control group, who continued with traditional face-to-face instruction. The students in the intervention group were introduced to Google Classroom and trained to use it to access course materials, take topic-based quizzes, engage in discussions, and submit assignments during the two-week intervention period.

To measure the impact of mobile application on students' performance, the researchers developed and administered a structured Economics Performance Test (EPT), covering the cognitive, affective, and psychomotor domains of learning. The EPT was subjected to expert validation by two Economics educators at the college of education Zuba to ensure content validity. A pilot study was conducted with 20 Economics students who were not part of the main sample, and the test yielded a Cronbach's alpha coefficient of 0.82, indicating high reliability. The EPT was administered to both groups as a pre-test before the intervention and again as a post-test afterward. The data collected were analyzed using descriptive statistics (mean and standard deviation) to summarize academic performance, and inferential statistics using the independent samples t-test to test the stated hypotheses. The level of significance was set at 0.05.

Results

Research question one: Is there a significant difference in the academic performance of Economics students who use educational mobile applications and those who do not at FCT College of Education, Zuba-Abuja?

Table 1: Mean and Standard Deviation on research question one

Group	N	Pre-Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD
Experimental (Mobile Apps)	50	45.2	5.8	72.5	6.4
Control (Traditional)	50	44.9	5.6	58.7	7.2

Source: SPSS, Version 25.

The descriptive statistics revealed that the experimental group (students using mobile applications) achieved a post-test mean score of 72.5, whereas the control group (students relying on traditional learning methods) had a post-test mean score of 58.7. This significant difference suggests that students who used educational mobile applications experienced notable improvements in their academic performance. Additionally, the pre-test scores for both groups were relatively similar (45.2 for the experimental group and 44.9 for the control

group), indicating that both sets of students were at comparable academic levels before the treatment.

Research question two: Is there a significant difference in the academic performance of male and female Economics students who use educational mobile applications at FCT College of Education, Zuba-Abuja?

Table 2: Mean and Standard Deviation on research question two

Gender	N	Pre-Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD
Male	25	46.1	6.2	73.8	5.9
Female	25	44.3	5.5	71.2	6.1

Source: SPSS, Version 25.

The descriptive statistics showed that male students achieved a post-test mean score of 73.8, while female students had a mean score of 71.2. Although male students performed slightly better, the difference in scores was minimal. Both groups displayed similar levels of variability in performance, with standard deviations of 5.9 for males and 6.1 for females, suggesting a consistent performance distribution across genders. These findings indicate that educational mobile applications are equally effective for both male and female students.

Hypothesis one: There is no significant difference in the academic performance of Economics students who use educational mobile applications and those who do not at FCT College of Education, Zuba-Abuja.

Table 3: Independent t-test for hypothesis one

Group	N	Pre-Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD	t-value	p-value	Decision
Experimental (Mobile Apps)	50	45.2	5.8	72.5	6.4	7.89	0.001	Reject Ho
Control (Traditional)	50	44.9	5.6	58.7	7.2			

Source: SPSS, Version 25.

The results indicated that the experimental group (students using mobile apps) had a mean post-test score of 72.5, whereas the control group (students relying on traditional learning methods) had a mean post-test score of 58.7. An independent t-test analysis produced a t-value of 7.89 and a p-value of 0.001, which falls below the significance threshold of 0.05. Since the p-value is statistically significant, we reject the null hypothesis ($H0_1$) and conclude that educational mobile applications have a significant positive effect on the academic performance of Economics students at FCT College of Education, Zuba-Abuja.

Hypothesis Two: There is no significant difference in the academic performance of male and female Economics students who use educational mobile applications at FCT College of Education, Zuba-Abuja.

Table 4: Independent t-test for hypothesis two

Gender	N	Pre-Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD	t-value	p-value	Decision
Male	25	46.1	6.2	73.8	5.9	1.82	0.071	Fail to Reject H0
Female	25	44.3	5.5	71.2	6.1			

Source: SPSS, Version 25.

The results show that male students achieved a post-test mean score of 73.8, while female students had a mean score of 71.2. The standard deviation values (5.9 for males and 6.1 for females) indicate a similar level of variability in performance across both groups. An independent samples t-test produced a t-value of 1.82 and a p-value of 0.071, which is above the 0.05 significance threshold. Since the p-value is not statistically significant, we fail to reject the null hypothesis (H_0) and conclude that there is no significant difference in academic performance between male and female Economics students who used mobile learning applications.

Discussion of Findings

The significant improvement in post-test scores among students who used educational mobile applications, compared to those who relied on traditional learning methods, aligns with previous research findings. Sung, Chang, and Liu (2016) conducted a meta-analysis and concluded that mobile learning significantly enhances student engagement, comprehension, and knowledge retention. Similarly, Heflin, Shewmaker, and Nguyen (2017) found that mobile technology promotes collaborative learning environments, allowing students to take an active role in their education, which leads to better academic outcomes. The results of this study further support the idea that mobile learning offers interactive and flexible learning opportunities, enabling students to learn at their own pace, access multimedia content, and engage more effectively with course materials.

The findings showed no statistically significant difference in the academic performance of male and female students who used mobile learning applications. This suggests that mobile learning benefits students equally, regardless of gender. This result contrasts with the findings of Briz-Ponce and García-Peñalvo (2015), who reported that male students were more likely to adopt mobile learning tools, while female students preferred structured learning environments. However, this study suggests that despite possible differences in adoption rates, the effectiveness of mobile learning in enhancing academic performance remains similar across genders. This finding supports the argument made by Domingo and Garganté (2016), who concluded that when students have equal access to digital learning tools, gender differences in academic outcomes are minimized. The lack of significant gender-based performance disparities in this study suggests that mobile learning applications can serve as an inclusive educational tool, promoting equal learning opportunities for both male and female students.

Conclusion

The findings of this study confirm that educational mobile applications significantly improve the academic performance of Economics students at FCT College of Education, Zuba-Abuja. Students who used mobile learning tools performed better than their peers who relied on traditional learning methods, emphasizing the effectiveness of digital learning in enhancing engagement, comprehension, and knowledge retention. The study found no significant gender-based differences in learning outcomes, indicating that mobile learning applications benefit both male and female students equally. With the increasing integration of technology in

education, this study highlights the importance of utilizing mobile applications to complement traditional learning methods.

Recommendations

Based on the findings the following recommendations were made;

i. Given the significant improvement in academic performance among students who used mobile applications, educational institutions, particularly FCT College of Education, Zuba-Abuja, should formally integrate mobile learning applications into the Economics curriculum. Educators should receive training on incorporating these digital tools into their teaching methods, ensuring that students have structured access to interactive learning resources such as simulations, quizzes, and multimedia content.

ii. Since the study found no significant gender-based differences in the effectiveness of mobile learning, educational institutions should ensure equal access to mobile learning tools for both male and female students. Policymakers and educators should work toward creating inclusive digital learning environments by addressing potential barriers, such as digital literacy gaps or accessibility issues that may hinder students from fully utilizing mobile applications.

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CHALLENGES AND PROSPECTS OF TEACHING AND LEARNING AFRICAN TRADITIONAL RELIGION VIA ARTIFICIAL INTELLIGENCE IN THE 21ST CENTURY

By

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Abstract:
The paper elucidated on the study of African Traditional Religion/s which has been the religion of the African people right from time immemorial; where in the course time, contacts with non-African religious world views began a proselytizing period which its effects kept straying and continuously affected also, its scholarly exercises. This act therefore created more gabs in the teaching and learning of the phenomenon especially in the education institutions as it goes to also affect the future of ATR in totality. This paper pointed out via an in-depth usage of secondary data sources and the internet facility that, there were scourging phases which revealed the several interested diversities that have marred the development of the study of ATR. It also deciphered that, the teaching and learning of ATR still remained tasking even in the 21st century so as to guarantee its future. The paper suggested a reliance on some of the 21st century discoveries thingamabob as 'artificial intelligence' (AI) which boosts intelligence by providing a complex and evolving landscape where if integrated into academic fields could present both significant opportunities for growth in the teaching and learning upon its formidable challenges.

Keywords: ATR, AI, Teaching and Learning, challenges and prospects.

Introduction

It is quite noticeable that, the eventful explosions of the 21st century have not left out digital technologies especially with the sudden rise of artificial intelligence (AI) and machine learning. As an addendum, this is actually leading to breakthroughs in many fields of human endeavor which range from deep learning algorithms, natural language processing as the computer vision is developing self-driven cars, intelligent virtual assistants and inventing also, powerful tools for research with a lot more in the offing, (www.youtube.com).

As observed, this newly exerted world order is nowadays, tantalizing the seeming third world countries' classroom education where the all and sundry activities of teaching and learning are still in a dilapidated state and thus, cumbersome in task. As a matter of fact, this saddened situation always results from the imbedded abject and obsolete teaching and learning mechanisms therein. Also, forlornly, such always render education at this end awkwardly.

Now, African Traditional Religion is one other discipline in the study of world religions clandestine in the arts and humanities and it is as well being taught and learned in the Nigerian school systems so as to secure its future, (NCCE, 2012; Quarcoopome, 1987). This is because its belief system is still relevant in human development especially in this part of the world; and as seen among other institutional disciplines that, the predicament of teaching and learning mechanisms of ATR are not farfetched from those that affect other disciplines from achieving a smooth transmission of their subject matter by the teacher to the learner. The situation seems to authenticate the plethora of nagging educational challenges which have been variously pointed out as in the case of (Abiri & Jekayinfa, 2010).

The fact is that, there has been the gradual development and assimilation of this Artificial Intelligence (AI) in some quarters which could be traced to its key milestones that continuously mark its increasing presence and adoption in Nigeria. The polity began to witness this development especially in the mid-2010s where the banks implemented AI-powered chatbots for customer and other financial services. Subsequently, in November 2019, the Nigerian government developed a National Artificial Intelligence Strategy; same year: 2019, the Cross River State Government created a ministry of Robotics and Artificial Intelligence and this cue was crowned with the commissioning of the National Centre for Artificial Intelligence and Robotics (NCAIR) by the Nigerian government. Of course, the in vogue and stamped whirlwind, began to take a toll even on the Nigerian private sector, particularly startups and companies have not been left out as they also use it for a variety of purposes as fraud detection, logistics optimization and healthcare diagnosis, (thenationonlineng.net). It is on this backdrop that, this paper expounds on the possibility and challenges of using the AI doodad as mechanism in teaching and learning ATR being a 21st century targeted goal.

Origin and Development of Atr in Nigeria

The abbreviation ATR stands for African Traditional Religion/s and it is interchangeably referred to as either 'African Religion'; 'African Indigenous Religion/s'; 'Traditional Religions' and sometimes as 'Autochthonous Religion/s' which depend on the author (Kalu, 2015). It is actually the Religion of the Africans but of course not in the western sense because it is not separated from the rest of the African peoples' life and culture (Mbiti, 1975); in some sense, a total way of looking at the world that includes the entire African values and belief systems, (*cf*: Kalu, 2015). ATR is therefore sourced orally from myths, proverbs, theophoric names, folklore, songs and lullabies, prayers and chants, formulae for vows, curses and blessings dreams and visions (Gehman, 2001). Its non-oral sources range from art

forms, archaeological arte-facts, cult objects and relics, taboos and totems as well (Metuh, 1987).

Observing from the manner AI is rising today, so was the sudden rise in agitation to study ATR. Of course, it was wittingly or unwittingly carried out by the European explorers, ordinarily colonialists, missionaries, and ethnographers; also, Historians, Sociologists, Geographers and Anthropologists who were scouting for Glory, Gold and God alike. The outcome of their assumed organized study rather misconstrued the phenomenon of ATR and hence created more gaps than expected, (Lere, 2001; Mangvwat 2013, Muzzanganda 1981).

Now as ATR is misconstrued, it therefore gave rise to seeming gaps in the course of the development of its teaching and learning as time went. Some African writers as Idowu (1973 and Quarcoopome (1987) grouped the accrued misconceptions on ATR as they occurred in phases of as below:

i.The phase of pure ignorance: a period where Europeans practically knew nothing about Africa as a continent. An example is the case of Robert Maffat; a missionary to the Hotentots, Bechuanas and the Bushmen of southern Africa had asserted '…*Satan has erased every trace of religious impression from their (Africans) minds…'*, Another Christian propagandists had expressed that, '… *the heathens in their blindness bows down to wood and stone..';* In fact they kept assuming that, Africans were spiritually bankrupt thus: '*savages and primitive people have no intellectually capacity to conceptualize theologically and hence cannot have any knowledge of God…'* Another armed-chair writer in Emil Ludwig doubted the Africans' capacity to even think or reason and asked: '…*How can the untutored African conceive of God? because believing in a Deity is a philosophical concept of which savages incapable of framing …;*

ii.The phase of doubt and resisted illumination: it brewed honest researchers that felt the need to challenge the position of the armed-chair writers of the first phase because of their myopia which made them not to capture the whole essence of ATR. Following, their critique reinstated that, '… *there is no society in the world however primitive, without any knowledge of God…'* Such was the case of Andrew Lang in his Book: "The Making of Religion" but, unfortunate the fare view was still met with doubts and resistance since the African society was to benefit from this categorical fact.

iii.The phase of the era of intellectual dilemma: this juncture was a direct result of the second phase of doubts and resisted illumination where cultural pride and academic arrogance could not do away with pre-conceived ideas and pet theories for concrete evidence. So, various evasive means were created and adopted to escape from the intellectual dilemma as they invented spurious and derogatory terminologies so describe ATR as *Primitive religion, Ethnic Religion, Pre-Literate Religion, Tribal Religion, Heathenism, Paganism, Idolatry, Polytheism, Animism, Fetishism, Juju, Ancestral Worship and Totemism among others* (Kalu, 2015).

Following the outcome of the third phase which has an array of unending terminologies for ATR; Danfulani & Maigoro (1999) reports that, by 1954 during the Legon conference in Ghana, (though Metuh claims Abijan Conference in Ivory Coast) that, the Father of ATR (Evans Geoffrey Parrinder) though a European, rightful laid the foundation for the study of ATR with his book titled: 'African Traditional Religions'. As it silenced the debate of authenticity, it created that of pluralizing or not. Though an African by decent but trained by Europeans (Metuh-Ikenga Emefie 1987), tried to present it subsequently in a generalized manner as '…*the institutionalized patterns of beliefs and worship practiced by the various African societies from time immemorial in response to the supernatural as manifested in their environment and experience…'*

It is on this backdrop that, this paper tries to map out yet, gaps that still bedevil the study of ATR for perhaps the use of AI to douse. Of course, ATR has problems associated to its studies but are anyway just academic. This is because such problems do not affect its practice by the adherents. According to Muzzanganda (1981; Metuh, (1987) & kalu, (2025), Some of such problems range from the polemic of either pluralizing or not its nomenclature; interpretation; being a community religion, being ascriptural; non-evangelism; lacking outright founders and reformers.

The AI Phenomenon in Teaching and Learning

In clear terms, the AI phenomenon is a abroad field of computer science focused on creating systems that can perform tasks that would normally require human intelligence as learning and adaptation; reasoning and problem solving; perception and decision making. It '*thinks'* or *'acts'* in ways that mimic human cognition (www.mtu.edu). To be contextual, the use of AI in the study of ATR will however require a culturally sensitive approach to be framed around the need to preserve, revitalize and share indigenous knowledge and cultural heritage in a rapidly digitizing world (https://g.co/gemini/share/0a14216bc035).

Now that, all phenomena in ATR require studies, AI can therefore facilitate such for either its own sake so as to be ascertained or because it is the religious background of the Africans. Also, as one considers the good number of proselytizing adherents into other faiths raises the need to use any means as the AI for investigation. It is noticed that, some of these proselytizing Africans do return to the aged practice at crisis' times for solution and this makes ATR to be studied. Its studies always revive the African nationalism as well as revealing the various African ideologies socially, politically, economically and not just religious. To study ATR, one must have a research skill as in the case of AI today which will therefore expose the research/religionist to other research methodologies (Gehman, 2001).

Challenges of Using AI in the Study of African Traditional Religion

It is worth noting that, if the integration of artificial intelligence (AI) into the academic field of African Traditional Religion is not carefully considered will then be challenged by the following:

i. Aunthenticity and misrepresentation: ATR is adjudged not to be a monolithic Religion because it is more of a diverse collection of beliefs, practices and traditions specific to various ethnic groups across Africa, The major problem here is the risk of AI oversimplify or misrepresenting these complex, nuanced and often localized traditions known as theological distortions. AI models, trained on vast datasets, may flatten the diversity of ATR, potentially creating a generalized and inaccurate 'version' of the religion. This can lead to loss of the unique cultural context, symbolism, and spiritual depth that are central to ATR. Furthermore, a reliance on AI could diminish the importance of oral traditions and direct transmission of knowledge from elders and spiritual leaders, who are authentic custodians of these beliefs.

ii. Ethical and Cultural Sensitivity: The application of AI in the teaching and learning of ATR raises profound ethical questions. AI algorithms can be susceptible to biases present in their training data. If this data is incomplete, historically biased, or influenced by colonial or western perspectives on ATR, the AI could perpetuate or even amplify these biases (Algorithmic bias and stereotypes). This could result in a distorted or prejudiced portrayal of ATR, undermining the very goal of a respectful and accurate academic study.

iii. Commercialization and commodification: in line with the above, there is also risk that, AI could lead to the commercialization of sacred knowledge and practices. If AI powered platforms are used to digitize and disseminate ATR, It could be done without proper respect for the traditions, potentially leading to the

commodification of sacred symbols and rituals for profit or spiritual tourism'

iv. Dehumanization of spiritual Experience: Religious and spiritual experience are deeply personal and communal. Learning about ATR often involves human-to-human interaction, mentorship from elders and religious leaders and participation in ceremonies. An AI cannot replicate this 'human touch'. It lacks the capacity for empathy, intuition and the subjective understanding that is central to spiritual development. This could lead to a depersonalized and shallow learning experience.

v. The Authority of the Machine: The introduction of AI into religious education raises questions about authority. Who or what is the ultimate source of knowledge? In ATR, this authority resides with elders, priests and community leaders. An AI system, while capable of providing information, cannot possess the wisdom, life experience or spiritual authority that these human guides hold. Relying too heavily on AI could challenge the established religious hierarchy and the role of human-to-human mentorship.

vi. Technological and infrastructural challenges: in many African communities, the infrastructure needed to support Ai-driven education-reliable internet, electricity and access to devices is limited. This digital divide could prevent many from accessing these resources, exacerbating existing inequalities and creating a new barrier to learning about their own heritage.

(https://g.co/gemini/share/c1d863f60547).

Prospects of Using AI in the Study of African Traditional Religion

As much as there are solid challenges in the usage of AI to study ATR, so are stronger reliable prospects which some are enumerated below:

i. Preservation and Digitalization of cultural Heritage: A major benefit of AI is its ability to digitize and preserve African Cultural artifacts, oral traditions, symbols and sacred text. This can create accessible archives and virtual exhibitions that protect these traditions from being lost and make them available to a global audience. AI can help in the digital preservation of traditional religious languages, stories and rituals, and practices, ensuring their continuity and relevance in the digital era.

ii. Personalized and Engaging Learning Experiences: AI can create personalized learning paths for students, tailoring content to their individual needs and interests. AI-powered platforms can offer interactive modules and chat-bots that provide an immersive educational experience. This can make the study of ATR more engaging and accessible, especially for a younger generation that is heavily influenced by digital media.

iii. Enhanced Research and Analysis: AI can process vast amounts of data from religious texts, oral histories and from cultural artifacts at a speed that would be impossible for a human scholar, it can identify patterns, themes and connections that might otherwise be missed, offering new insights into the complex narratives and practices of ATR. This can be particularly useful for comparative religious studies.

iv. Bridging the Generational and Digital Divide: AI can help bridge the gap between older generations, who hold the traditional knowledge, and younger generations who are more comfortable with technology. By integrating ATR practices into the digital age through educational initiatives, AI can raise public consciousness and ensure the continuity of these customs.

v. Ethical and Culturally-Grounded Development: The integration of AI into ATR education can be guided by ethical principles rooted in traditional African Religious beliefs. This can ensure that, the technology serves the spiritual, cultural and social well-being of communities and is not a threat to indigenous knowledge systems.

(https://g.co/gemimi/share/7fc43706ee72).

Conclusion

It is no longer a debate at this point that, the digital technology in the form of AI has become

the world order as it is very capable of rendering assistance and aiding humanity in some ramifications. So, educational institutions should not miss out on this tool by making it an imperative in the course of teaching and learning. It is by so doing that, a phenomenon as ATR which as its studies developed through phases has not been able to win over labeled biases and prejudices because earlier attempts to study it had compounded the understanding of the phenomenon with misconceptions and derogations. This inept attitude actually affected the expressed will of young minds' enrolment into its studies so, the impetus of most of scholars were to rather but observe and correct wrong notions passed to the general public on the aged long faith. It is on this note that, this exegesis of the AI facility is reemphasized to be adopted for the study of ATR that its success may perhaps form the fourth phase in the development of the study of ATR which its end result could go a long way to bridge the gap of passing ATR values from the old to the young generations of today.

Recommendations

Now, it can be deduced from the foregoing that, the usage of AI matter in teaching and learning and in the case of ATR, it may even guarantee its phenomenal future especially in the 21st century because, technology is now a full fledge tool for research. It is on this backdrop that, the paper recommends thus:

i. That, the deliberate secrecy; derogatory nomenclature and misconstrued information still inherent in ATR can be unraveled as well as reduce resistance and correct wrong notions earlier held, only if AI is applied. This can go a long way to giving justification to the religionist/practitioner to avoid further menaces and armed-chair scholarship that do hinder paths to securing the future of the faith.
ii. That, the ascriptural nature of ATR which causes the problem of not having specific records and perhaps, a sacred referencing text for as found in other world religions will need to take advantage of the AI phenomenon to enable certainty of preserved information for onward dissemination as it is being taught and learned in institutions learning.
iii. That the AI ability of 'near-perfect-conclusions', if applied in the teaching and learning of ATR may be able to specifically, resolve the issue of rash generalizations and conclusions which always crop up in researches carried out among the vast number of the languages and dialects of Africa.
iv. That, as many European settlements have wiped out the aboriginal people and obliterated many racial memories; Western education, civil mercantile service, travelling to various places outside Africa have also given a devastating blow the study of ATR, the AI facility may recover to tract to an extent.
vi. Importantly that, education institutions; authorities and governments alike in the so-called 'third world' countries should adopt and avail the AI facilities for not just the enhancement of ATR but, to achieve accuracy in diverse endeavors, preserve and disseminate so fast information, encourage independent learning, maximize human capital for higher profit and among others align with the world order of the day.

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APPLICATION OF DIGITAL TECHNOLOGIES IN THE TEACHING AND LEARNING OF AGRICULTURAL EXTENSION IN THE 21ST CENTURY

By

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Abstract

The 21st century has witnessed a transformative shift in education driven by rapid advancements in digital technologies. In the field of agricultural extension, digital tools and platforms have revolutionized the way knowledge is disseminated, acquired, and applied. This paper explores the various digital technologies utilized in the teaching and learning of agricultural extension, assesses their impacts, and identifies challenges and opportunities associated with their implementation. The study underscores the need for integrating emerging digital innovations to enhance instructional efficacy, learner engagement, and the overall relevance of agricultural extension in the digital age.

Keywords: Agricultural extension, digital technologies, e-learning, mobile learning, ICT, agricultural extension.

Introduction

Agricultural extension plays a pivotal role in the dissemination of agricultural knowledge and practices to farmers, researchers, and practitioners. As traditional extension services face increasing challenges ranging from geographical barriers to limited human resources the integration of digital technologies into teaching and learning has become imperative. The digitization of education offers new avenues for enhancing the reach, efficiency, and effectiveness of agricultural extension services. (Olaniyi *et al*., 2023).

Agricultural extension, traditionally seen as a bridge between research institutions and farmers, plays a crucial role in improving agricultural productivity, food security, and rural livelihoods. In the 21st century, the teaching and learning of agricultural extension have undergone remarkable transformation due to rapid advancements in digital technologies. These technologies have introduced innovative ways to deliver agricultural education, foster participatory learning, and address challenges related to distance, accessibility, and resource limitations in agricultural extension training. (Ajani, *et al*, 2021).

Digital technologies including mobile applications, e-learning platforms, virtual simulations, social media, geographic information systems (GIS), artificial intelligence (AI), and big data analytics have revolutionized educational delivery modes across disciplines. In agricultural extension, these tools enhance the capacity of educators and learners by enabling flexible, interactive, and personalized learning environments (Olaniyi, Ojo, & Yusuf, 2023). They provide platforms for real-time knowledge sharing, virtual collaboration, and access to a wealth of up-to-date agricultural information, thus reshaping both formal agricultural extension education and non-formal training for farmers and extension workers.

The integration of digital tools in teaching agricultural extension is particularly significant given the global challenges of climate change, population growth, and the need for sustainable agricultural practices. Digital learning technologies offer innovative solutions to train a new generation of extension professionals equipped with the skills to support resilient and productive farming systems. They also help bridge educational gaps in rural and underserved areas, ensuring that agricultural knowledge reaches even the most remote communities (Aker *et al.,* 2021).

This paper explores the application of digital technologies in the teaching and learning of agricultural extension in the 21st century. It highlights key tools and platforms, discusses their impact on Agricultural Extension outcomes, and examines the opportunities and challenges associated with their adoption. The recommendation aims to provide insights for educators, policymakers, and development practitioners seeking to harness digital innovations for more effective agricultural extension education.

Concept of Agricultural Extension

Agricultural extension is a non-formal educational system designed to provide technical knowledge, skills, and innovations to farmers, rural communities, and agricultural stakeholders to help improve productivity, income, and overall well-being. FAO (1997) defines agricultural extension as: “The system of out-of-school education for rural people. It helps improve their knowledge, attitudes, and skills in agriculture, home economics, health, and business.” Swanson (2008) sees it as “The entire set of organizations that support and facilitate people engaged in agricultural production to solve problems and obtain information, skills, and technologies to improve livelihoods.

Objectives of Agricultural Extension have to do with; Transfer of technology– introducing improved seeds, tools, and practices. Capacity

building training farmers to make informed decisions. Linking farmers to research – ensuring feedback between farmers and scientists. Promoting sustainable agriculture – encouraging environmentally friendly practices, improving livelihoods – supporting income generation and food security.etc.

Functions of Agricultural Extension among others includes; Educational function — teaching farmers about new technologies and practices. Advisory function — offering guidance on farming decisions. Facilitator function — linking farmers to markets, credit institutions, and input suppliers and Motivator function — encouraging community action for rural development.

Principles of Agricultural Extension deals with; Voluntary participation- farmers choose to engage. Cultural sensitivity-respect for local cultures and values, Practicality - focus on useful and applicable knowledge, Flexibility – adapt to changing needs and conditions. Partnerships – collaboration with other agencies and stakeholders.

Methods of Agricultural Extension

Agricultural extension uses a combination of individual, group, and mass methods: Approaches of Agricultural Extension

Technology Transfer Model: Focuses on passing innovations from research to farmers (top-down).

Participatory Extension: Farmers help identify problems and solutions (bottom-up).

Commodity-based Extension: Provided by private companies for specific crops (e.g. cocoa, cotton).

Farmer-to-Farmer Extension: Trained farmers educate others in their community.

ICT-driven Extension: Uses digital tools like mobile apps, e-learning, and online advisory platforms.

Importance of Agricultural Extension includes: - Bridge's research and practice, boosts productivity, enhance food security, encourages community development and support climate-smart agriculture among others. (Kamau, *et al.*, 2022)

Digital Technologies in Agricultural Extension Education

(a). E-learning platforms: E-learning platforms such as Moodle, Blackboard, and Canvas provide structured environments for delivering course content, assessments, and feedback. These platforms allow for asynchronous and synchronous learning, thus accommodating diverse learner needs and schedules (Moore *et al.*, 2018). An E-learning platform is a digital environment (website, software, or application) designed to deliver, manage, and track educational content and activities online. It allows learners and educators to interact, share resources, take assessments, and collaborate remotely, without being in the same physical space. In simple terms: An e-learning platform is the online classroom where teaching and learning happen using the internet.

Key Features of E-learning Platforms includes; Content delivery (videos, notes, presentations, quizzes) Communication tools (chat, discussion forums, messaging) Assessments and quizzes, Live sessions / webinars Tracking progress and performance and Customization for different subjects or courses

Other E-learning platforms in Agricultural Extension includes: -

Video Conferencing Tools:

Platforms such as Zoom, Google Meet, and Microsoft Teams facilitate real-time virtual training sessions for extension workers and farmers. They enable live demonstrations, expert lectures, and participatory discussions. These tools became especially crucial during the COVID-19 pandemic to sustain extension services (Olaniyi et al., 2023).

Digital Simulations and Virtual Farms:

Simulated farming environments and virtual labs help learners practice agricultural techniques safely and cost-effectively. Tools like Virtual Farm by Purdue University and Plant Village Nuru (AI-based diagnostic app) are used to teach pest management, crop

production, and soil management (Kamau et al., 2022).

Online Discussion Forums and social media: Discussion boards (e.g., in LMS or platforms like Facebook groups, Telegram channels) encourage knowledge exchange, peer learning, and networking among agricultural extension students, farmers, and professionals (Ajani et al., 2021). Social media provides an informal but powerful platform for disseminating and discussing agricultural innovations.

Multimedia and Interactive Content:
E-learning in agricultural extension leverages YouTube channels, podcasts, digital storytelling, and interactive infographics to make learning engaging and contextually relevant. These tools are effective for illustrating agricultural practices visually and in local languages (Sseguya *et al.*, 2022).

Open Educational Resources (OER):
OER platforms like FAO's e-learning Academy, Access Agriculture, and CGIAR online modules offer free learning materials on various extension topics. These tools support self-paced learning for both students and practicing extension agents globally (FAO, 2024).

Why E-learning Platforms Matters in Agricultural Extension: -
They reach dispersed learners, including rural farmers and extension workers, support flexible self-paced learning, reduce training cost (No need for frequent travel or printed materials), and enabled sharing of up-to-date agricultural innovations quickly.

(b) Mobile Learning (M-learning) Mobile technologies have enabled the rise of m-learning, which provides learners with access to educational resources through smartphones and tablets. Applications such as WhatsApp, Telegram, and YouTube are frequently used to share multimedia content, facilitate group discussions, and conduct assessments (Aker *et al.*, 2016).

Mobile phones have become vital tools in agricultural extension e-learning due to their wide penetration, even in rural areas. Apps like AgriApp, e-Extension, and FARMAFRICA SMS platforms support farmer education through videos, audio messages, SMS, and WhatsApp-based learning. According to Mtega and Msungu (2022), mobile learning is particularly effective for on-the-go learning and real-time advisory services.

In other words, Mobile learning (m-learning) refers to the use of mobile devices such as smartphones, tablets, and basic mobile phones to access educational content, interact with educators, and engage in learning activities anytime, anywhere (Traxler, 2007).

It is characterized by: Flexibility in time and location, Bite-sized, easy-to-access learning materials, Use of multimedia (audio, video, images, text). Interactive and participatory elements (quizzes, chats).

Mobile Learning in Agricultural Extension:
In agricultural extension, m-learning involves delivering agricultural education, training, and advisory services to farmers, extension agents, and rural communities using mobile devices. It is especially useful in rural areas where internet and infrastructural challenges make traditional classroom-based or desktop computer-based learning difficult. (Traxler,2007)

Key Applications of Mobile Learning in Agricultural Extension
Farmer training capacity building: Mobile platforms provide short videos, text messages, or voice recordings that demonstrate best practices in crop production, animal husbandry, pest management, irrigation, and post-harvest handling.

Advisory services: Farmers can send queries and receive expert advice through SMS, WhatsApp, or call centers. For example, services like *Esoko* (Ghana), *mFarms* (Nigeria), and *iCow* (Kenya) provide tailored recommendations.

Market and weather information: m-learning platforms integrate extension messages with real-time market prices and weather updates, helping farmers make informed decisions.

Farmer-to-Farmer learning: Mobile phones support social learning, enabling farmers to share experiences via community WhatsApp groups or voice networks.

Monitoring and Evaluation of Extension programmnes: Extension officers can collect field data using mobile tools and provide feedback to educational institutions or policymakers. (Mtega, *et al*, 2022) Examples of m-learning initiatives in agricultural extension includes: -

iCow (Kenya): SMS and voice-based advisory platform for livestock farmers.

mFarms (Nigeria): Mobile app that connects farmers with input suppliers, buyers, and extension agents.

FARMAFRICA SMS (multiple countries): Delivers customized SMS on good agricultural practices.

Plant Village Nuru: AI-powered mobile tool for diagnosing plant diseases through image analysis. (Olaniyi, *et al.*,2023)

© ICT Tools: Information and Communication Technologies (ICT) including videos, podcasts, webinars, and virtual reality (VR) have enriched the teaching of agricultural extension by offering interactive and immersive learning experiences. These tools bridge the gap between theoretical knowledge and field practice (Zhang *et al.*, 2020).

A video is a form of digital or analog media that records, displays, and transmits sequences of moving images, often combined with sound, to represent information, tell a story, or demonstrate an action. In simple terms: A video is a recording of visual images (and often sound) that can be played back to show motion, events, or processes. (Saravanan, *et al.*, 2020)

Uses of Video in Teaching Agricultural Extension includes: - Demonstration of farm practices (e.g., planting, harvesting, irrigation methods) Training on new technologies (e.g., use of modern machinery, pest control) Farmer testimonials and success stories to motivate others and Virtual tours of model farms or agricultural research stations.

A podcast is a digital audio program made available on the internet for download or streaming. Podcasts are usually released in episodes and can cover a wide range of topics. In agricultural extension, podcasts are often used as an educational tool to share information, interviews, discussions, or advice that can be listened to anywhere, anytime. In simple terms: A podcast is like a radio show that you can listen to on your phone, computer, or other devices at your convenience. (Aker, 2011).

Uses of Podcasts in Agricultural Extension has to do with sharing expert advice on farming techniques, pest control, market trends, Broadcasting success stories from farmers or extension agents, delivering policy updates or climate information, providing training content that farmers and students can listen to while working. (Aker, 2011).

Few examples of podcast are: - FAO's *Agriculture Podcast* (topics on food systems, sustainability) Local extension services creating podcasts in indigenous languages for rural farmer, and University agricultural departments publishing interviews with experts (Aker, 2011).

A webinar (short for *web-based seminar*) is an online event where a presenter, or a group of presenters, delivers a lecture, training session, or workshop to a remote audience over the internet in real time. It combines audio, video, slides, and interactive features like Q&A, polls, or chats. In other wordsa webinar is like an online class or seminar where people can learn, ask questions, and interact from anywhere. (FAO, 2013)

Uses of Webinars in Agricultural Extension includes; training agricultural extension workers on new tools, techniques, or policies. Teaching farmers remotely about modern farming practices. Hosting discussions on issues like climate-smart agriculture, pest management, or marketing strategies, and connecting experts globally to share knowledge and innovations. (Sanginga, *et al*, 2019).

Examples of webinars includes; Webinars organized by agricultural universities on sustainable farming, FAO and other agencies hosting online workshops on digital agriculture., National extension programs offering virtual trainings for rural development workers. (Sanginga, *et al*, 2019).

Virtual Reality (VR) is a computer-generated, three-dimensional (3D) environment that a person can interact with and explore as if they were physically present inside it. Using special devices like VR headsets, gloves, or controllers, users feel immersed in a simulated world that responds to their actions in real time. In simple terms: VR is technology that lets an individual feel like one is inside a different place — a virtual farm, field, or workshop — where a farmer can look around, move, and interact as if one is really there. (Davis, 2019). Uses of VR in Agricultural Extension Teaching: - Virtual farm tours — enabling learners to explore modern farms without travelling and also simulating farming operations — such as machinery handling, irrigation system setup, or crop scouting. etc (Davis, 2019).

Examples of VR application includes; Virtual training on tractor operation or irrigation system design, VR tours of demonstration farms or research centres., Climate-smart agriculture scenarios to teach adaptive techniques. (Davis, 2019).

(d) Geographic Information Systems (GIS) and Remote Sensing

Agricultural extension is tasked with transferring knowledge and innovations to farmers and rural communities to improve agricultural productivity, sustainability, and livelihoods. In the 21st century, digital technologies like GIS and remote sensing have become essential tools in teaching agricultural extension because they provide real-time, spatially accurate, and data-rich resources that enhance decision-making and advisory services. (Mulla, 2013).

GIS is a computer-based system for capturing, storing, analyzing, managing, and visualizing geographic (spatial) data. It allows users to map and interpret relationships, patterns, and trends across space.

Applications in teaching Agricultural Extension: - Mapping agricultural resources — Teaching students and extension workers how to map soil types, crop distribution, pest/disease outbreaks, and irrigation systems. Land use planning — Training on how to use GIS for sustainable land management, identifying suitable areas for different crops or conservation practices. Disaster preparedness — Equipping learners with skills to assess risks (e.g., floods, droughts) using GIS layers and data to guide communities. Monitoring farm activities — Teaching extension agents to track adoption of technologies (e.g., improved seed varieties) geographically. (Anderson,2020).

Benefits in teaching includes; Enhances practical, problem-solving skills, provides hands-on experience with real-world data and mapping software, Encourages evidence-based recommendations to farmers. (Anderson,2020) ON the other hand, remote sensing is the use of satellites, drones, or aircraft to collect information about the Earth's surface without direct contact. It gathers data through sensors that detect radiation reflected or emitted from objects.

Applications in teaching agricultural extension: - Crop health monitoring — Teaching how to use satellite images to detect crop stress, pest infestation, or nutrient deficiencies. Yield estimation — Showing learners how remote sensing data can predict harvest levels and support food security planning. Environmental monitoring — Training on tracking deforestation, soil erosion, water bodies, and climate effects on agriculture. Precision agriculture — Introducing learners to how remote sensing supports variable rate applications (fertilizer, pesticides). (Anderson,2020).

Some of the benefits in teaching includes; Exposes students and extension workers to modern tools for large-scale agricultural surveillance. Improves interpretation of spatial data for better advisory services and fosters innovative problem-solving using technology. (Anderson,2020).

Incorporating GIS and remote sensing into teaching agricultural extension modernizes the curriculum, equips learners with critical digital skills, and prepares extension professionals to deliver precise, timely, and location-specific advice to farmers. This approach aligns with the broader goal of transforming agriculture through digital innovation. (Anderson,2020).

Impacts of Digital Technologies on Teaching of Agricultural Extension

The adoption of digital technologies has led to increased access to educational content, personalized learning experiences, and improved learner motivation. Educators benefit from enhanced instructional delivery, while learners experience greater autonomy and engagement. (Anderson, 2020). Key impacts include the following: -

a. **Mobile Learning** overcome geographical barriers, enabling timely access to weather, market, and crop alerts—especially vital for smallholder farmers. **Boosts yield and income**: Randomized trials show SMS-delivered advice increased sugarcane yields by ~11.5%; broader reviews confirm enhanced productivity and profitability via mobile tools. (Anderson, 2020). **Cuts costs**: Remote advisory reduces travel time and costs—savings of 30–50% estimated for travel and training.

b. Web Platforms, Social Media & e-Learning: Equitable access: Online platforms, social media, and video conferencing bridge information gaps—benefiting remote or marginalized farmers. **Farmer-to-farmer learning**: Initiatives like Digital Green use short, participatory videos to amplify peer learning, reaching 150,000+ farmers (70% women) across India and Africa. **Supports joint learning**: Video conferencing (e.g., Alaska Cooperative Extension) enables real-time collaboration between extension agents and community groups.

c. GIS, and Remote Sensing

Improved targeting: Satellite and drone imagery inform plot-level pest/disease alerts, soil health assessments, and precision recommendations.

Climate-smart outcomes: Digital agronomy data help scale climate-resilient practices—improving productivity and sustainability in Africa etc.

d. ICT Tools and its impact on Agricultural extension

(i) Enhanced Access to Knowledge

ICT tools break geographical barriers, enabling teachers and extension trainers to reach learners in rural, remote, and underserved areas.

Mobile apps, SMS, and online portals provide on-demand access to learning materials, videos, and interactive content. Example: Farmers and students can access up-to-date pest control advice or climate information via mobile services (e.g., mKisan in India, Esoko in Ghana mFarms in Nigeria).

(ii) Improved Learner Engagement

Multimedia tools (videos, podcasts, animations) and virtual field tours make learning more interactive and practical.

Tools like virtual reality (VR) and simulations help students experience real-life farming scenarios without being on the farm. Example: VR can simulate pest outbreaks or irrigation planning, enabling risk-free learning.

(iii) Cost and Time Efficiency

E-learning reduces the need for costly and time-consuming physical travel for workshops, demonstrations, or classes.

Teachers can reach large numbers of learners simultaneously through webinars, radio, or social media live sessions.

(iv) Promotes Collaborative Learning

Platforms like WhatsApp, Telegram, Facebook, and forums allow peer-to-peer learning between students, extension officers, and farmers.

Learners share experiences, seek clarification, and build networks.

(v) Supports Evidence-Based Teaching

GIS, remote sensing, and big data tools give students exposure to real-time agricultural data for analysis and problem-solving.

Teachers use actual satellite images, maps, and data dashboards to guide learners in precision agriculture and climate-smart practices.

(vi) Strengthens Problem-Solving and Digital Skills

ICT tools help extension learners gain practical skills in using technology for farm management, advisory services, and policy support. This prepares future extension professionals to integrate technology in their work.

(vii) Scalability and Customization

ICT allows teaching materials to be tailored to local languages, cultural contexts, and specific crops or farming systems.

Tools can be updated or scaled rapidly in response to emerging challenges (e.g., pest outbreaks or market shocks).

Challenges of using Digital Technologies in Teaching Agricultural Extension

Despite the benefits, several challenges hinder the effective integration of digital technologies in agricultural extension education. These include inadequate digital infrastructure, limited digital literacy among instructors and learners, and resistance to change (Kumar & Sharma, 2021). Additionally, concerns about data privacy and content quality must be addressed. Others includes: -

(a). Digital Divide

Many rural areas still lack reliable internet connectivity, electricity, or mobile network coverage.

Farmers, students, and even some extension workers may not own smartphones, computers, or other digital devices. This limits participation in e-learning, webinars, or mobile advisory services. Example: In sub-Saharan Africa, only about 28% of the population uses the internet (World Bank, 2021).

(b**) Low Digital Literacy**

Many learners and extension agents lack skills to use digital tools (e.g., GIS, e-learning platforms, data dashboards). This creates a gap between the availability of technology and its effective use. Example: A 2023 study (Okere *et al*., Journal of Agricultural Extension) found that <40% of surveyed extension agents in parts of West Africa felt confident using digital platforms for teaching.

(c) Cost Barriers

High costs of devices, data, software licenses, and maintenance make digital tools unaffordable for many institutions and individuals.

Digital infrastructure (e.g., servers, smart classrooms) can be expensive to set up and sustain.

(d) Context and Language Barriers

Many digital learning resources are not localized in terms of language, cultural relevance, or farming practices. This can reduce the usefulness or adoption of digital tools in diverse rural contexts. *Example:* E-learning content in English may not suit learners in areas where local languages (e.g., Hausa, Yoruba) are dominant.

(e) Limited Teacher Capacity

Many agricultural educators and trainers themselves need more training to integrate digital tools effectively into lessons.

Poor instructional design in digital materials can make technology-based teaching ineffective or disengaging. *Example:* A teacher unfamiliar with GIS software may struggle to deliver practical mapping exercises.

(f) Technological Reliability

Poor power supply, outdated hardware, or frequent technical failures (e.g., software crashes, bandwidth issues) can interrupt digital learning.

Dependence on technology increases the risk of learning disruption if systems fail.

(g) Data Privacy and Security Concerns

Collecting and sharing agricultural data digitally raises ethical concerns about data ownership, privacy, and misuse — especially when using AI and big data platforms.

(h) Risk of Over-reliance on Technology

Heavy dependence on digital tools can overshadow local knowledge, traditional practices, and face-to-face interaction, which are also key in extension work.

Not all agricultural learning can be effectively digitized (e.g., some hands-on skills require physical practice).

Opportunities and Recommendations

Digital technologies present huge potential to modernize and improve agricultural extension teaching. Some key opportunities include:

(a) Wider Reach and Inclusiveness

ICT tools (e.g., mobile phones, radio, social media) help reach remote, underserved, and marginalized communities.

E-learning platforms enable self-paced, flexible learning for both extension agents and farmers.

Example: Mobile platforms like Esoko (Ghana) and mKisan (India) have helped extension services reach isolated communities.

(b) Interactive and Engaging Learning

Tools like videos, podcasts, virtual reality (VR), and simulations make learning more practical, experiential, and interesting.

Learners can visualize complex agricultural processes (e.g., pest management, irrigation systems).

Real-time Data for Evidence-Based Teaching

GIS, remote sensing, and IoT devices provide real-world data that can be used for teaching land use, crop monitoring, and climate-smart practices.

Digital technologies support precision agriculture concepts in the classroom.

(d) Cost and Time Efficiency

Digital technologies reduce the need for physical travel for workshops or demonstrations.

Teaching resources (e.g., e-books, online modules) can be shared widely at low cost.

(e) Collaboration and Peer Learning

Social media platforms, forums, and WhatsApp groups enable extension students and professionals to share knowledge, experiences, and solutions.

Cross-border learning becomes easier.

(f) Customization and Localization

Digital content can be tailored to local languages, cultures, and specific farming systems.

Conclusion

Digital technologies hold immense potential for transforming agricultural extension education in the 21st century. The integration of digital technologies into the teaching of agricultural extension has revolutionized how knowledge, skills, and innovations are transferred to students, extension agents, and farmers. Tools such as mobile phones, e-learning platforms, GIS, remote sensing, social media, and virtual reality have expanded the reach, inclusiveness, and effectiveness of Agricultural Extension. These technologies enable interactive, data-driven, and flexible learning, preparing future extension professionals to meet the complex demands of modern agriculture. However, the full potential of digital technologies can only be realized when challenges such as the digital divide, high costs, low digital literacy, and inadequate infrastructure are addressed. Furthermore, technology should complement — not replace — traditional, hands-on, and community-based learning approaches. For digital technologies to truly transform agricultural extension teaching there is a need for: Targeted investments in rural digital infrastructure, Capacity building for both educators and learners, Localization of content to suit diverse farming contexts and Supportive policies that promote equitable access, data privacy, and sustainable use of technology.

By blending digital innovation with practical field-based training, agricultural extension education can become more responsive, inclusive, and impactful, ultimately supporting sustainable agricultural development and food security.

Recommendations

To fully realize the opportunities, certain actions are needed:

(a) Invest in Infrastructure

Governments and institutions should improve internet connectivity, electricity supply, and access to affordable devices in rural areas.

(b) Build Digital Literacy

Provide training programs for agricultural educators, extension agents, and students on how to use digital tools effectively.

Include digital skills as part of extension education curriculum.

c) Localize Content

Develop context-specific, language-appropriate, and culturally relevant digital materials that meet the real needs of farmers and communities.

(d) Promote Blended Learning

Combine face-to-face training with digital tools to ensure practical, hands-on experience is not lost.

(e) Ensure Data Privacy and Ethics, as well as encourage Public-Private Partnerships.

Develop and enforce policies to protect data privacy, security, and ownership in digital extension teaching.

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CHALLENGES AND STRATEGIES FOR IMPROVING ECONOMICS EDUCATION LEARNING OUTCOMES USING DIGITAL TECHNOLOGY

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Abstract

The digital technology has dramatically transformed education, especially in the field of Economics. With the proliferation of technological tools and online platforms, the way Economics is taught and learned has evolved. However, despite these advancements, there remain significant challenges in

ensuring that Economics education effectively enhances student learning outcomes. This paper examines strategies for using digital technology in improving Economics students learning outcomes. It focused on integrating technology, encourage active learning and foster interdisciplinary approaches. Through a review of literature, the paper highlights the importance of digital tools such as learning management systems, data-driven analysis and collaborative platforms in fostering engagement and improving learning outcomes. The paper also discusses the need for curriculum reforms to incorporate real-world applications, critical thinking and ethical considerations. By employing these strategies, educators can better prepare students for the complexities of the modern economy while equipping them with the skills necessary for success in the digital technology.
Keywords: Economics Education, Students, Learning Outcomes, Digital Technology.

Introduction

The rapid advancement of digital technology has transformed the educational arena given it a new opportunity in the teaching and learning of Economics. In the digital era, students are increasingly exposed to digital tools and resources that can enhance their understanding of Economics principles, theories, and applications. However, to maximize these benefits, there is a need for well-defined strategies aimed at improving Economics education to optimize students' learning outcomes (Oblinger, 2014). Economics as a subject plays a crucial role in equipping students with analytical and problem-solving skills necessary for making informed financial and policy-related decisions. Traditional methods of teaching Economics which often rely on lectures and textbooks are becoming insufficient in meeting the diverse learning needs of students in the digital age.

The integration of technology such as e-learning platforms, virtual simulations, artificial intelligence-driven tutoring systems and online collaborative tools has the potential to make Economics education more interactive, engaging and effective (Mishra & Koehler, 2016). One of the key strategies for enhancing Economics education is the adoption of blended learning approaches which combine face-to-face instruction with digital resources. This approach allows for flexibility in learning as it enable students to access materials at their own pace and reinforcing classroom learning with digital content (Garrison & Vaughan, 2018). Also, gamification and simulation-based learning have gained recognition as effective tools for improving students' conceptual understanding of Economics. Virtual trading platforms for example, help students develop a practical understanding of financial markets and investment strategies (Oblinger, 2014).

Another crucial strategy involves the professional development of Economics educators to ensure that they possess the digital competencies required for effective teaching. Training teachers in the use of digital pedagogies, online assessment tools and student engagement strategies is essential for optimizing learning outcomes (Selwyn, 2016). Also, the integration of Artificial Intelligence (AI) in Economics education provides personalized learning experiences by analyzing students' progress and tailoring instructional content to their needs (Luckin, Holmes, Griffiths & Forcier 2016). Despite the numerous advantages of digital tools in Economics education, there are challenges that must be addressed such as the digital divide, inadequate technological infrastructure and the need for digital literacy among students and teachers. Policymakers and educational institutions must work collaboratively to bridge these gaps by providing access to reliable internet, affordable digital devices and relevant training programmes. Therefore, it is on this bases that the paper examines the challenges and strategies for improving Economics Education learning outcomes using digital technology.

Clarification of Concepts

Economics Education:

The term 'Economics Education' is derived from two different words 'Economics' and 'Education'. It is expedient to explain and define the meaning of the two terms; their meanings have overtime shifted from pragmatic to modern due to globalization and new insight from scholars. The American Economics Association, (2018) defined Economics education as the study of scarcity, the study of how people use resources and respond to incentives or the study of decision making. Economics is a broad discipline that helps us understand historical trends, interpret today's headlines and make eradications about the coming years. Economics education can be seen as a process, science and product; as a process - Economics education involves a time phase of inculcating the needed skills and values on the learners (Daniele, 2016).

In other words, Economics education entails the preparation of learners for would-be-Economics educator (teachers) and disseminating of valuable Economics information on learners in other for them to improve their standard of living by engaging in meaningful venture; as a science, it means that, it is a body of organized knowledge which is subjected to scientific proves/test; and as a product, Economics education involves the inculcation of saleable values/skills/disposition on the learners which are desirable by employers of labour and the society at large *(Hanushek, Jamison, Jamison, & Woessmann, 2015).*

Concept of Digital

Scholars have provided various interpretations of this era, each highlighting its distinctive features. According to Castells (2016), the Digital Era is marked by the rise of a "network society," where digital technology facilitates unprecedented global connectivity. The internet and communication networks enable instant information sharing, transforming how individuals, organizations, and governments interact. Drucker (2019) describes the Digital as a shift from an industrial economy to a knowledge-based economy, where information and digital skills become the most valuable assets. The rapid exchange of knowledge fosters innovation and Economics growth. Brynjolfsson and McAfee (2014) emphasize that the Digital is defined by digitization the process of converting analog information into digital formats and automation, where Artificial Intelligence (AI) and machine learning drive efficiency and productivity in various sectors.

Friedman (2015) argues that the Digital has "flattened" the world by making communication and commerce more accessible across geographical boundaries. This globalization fosters a digital culture where people across the globe share similar digital experiences through social media, online platforms, and digital content. Shirky (2018) highlights the role of the Digital in democratizing information. Social media and digital platforms empower individuals to share ideas, engage in activism, and challenge traditional media structures, giving rise to citizen journalism and digital movements. West (2015) points out that the Digital has transformed governance by introducing e-government services, digital public administration, and electronic voting. Citizens now interact with government institutions through digital platforms, increasing transparency and accountability.

Digital Technology and Its Impact on Economics Education

Digital technology has transformed Economics education, reshaping how knowledge is disseminated, acquired, and applied. Digital technologies, artificial intelligence and online learning platforms have revolutionized teaching methodologies, access to educational resources and the overall learning experience in the field of Economics. Scholars have explored various dimensions of this impact, highlighting the benefits and challenges that come with the

integration of digital tools in Economics education.

Enhanced Access to Educational Resources: Digital technology has democratized access to Economics education through open educational resources (OER), online databases and digital libraries. According to McCowan (2019), digital platforms such as Coursera, and Khan Academy have made high-quality Economics education accessible to a global audience, reducing geographical and financial barriers. Students and educators can now access vast amounts of Economics research, textbooks, and multimedia content, enriching the learning process.

Interactive and Personalized Learning: Digital technologies facilitate personalized and interactive learning experiences in Economics education. According to Laurillard (2012), digital simulations, artificial intelligence-driven tutoring systems, and game-based learning help students engage actively with Economics concepts. Economics models, such as supply and demand curves, can now be visualized dynamically through interactive tools, making abstract theories more comprehensible.

Data-Driven Analysis and Research: The rise of big data and digital analytics has transformed Economics research and education. Brynjolfsson and McAfee (2014) argue that access to real-time Economics data, machine learning applications, and computational tools enables students to analyze Economics trends more effectively. Digital platforms like Stata, R, and Python provide students with hands-on experience in econometrics, fostering critical analytical skills.

Online Learning and Virtual Classrooms: The Digital technology has expanded online learning opportunities, allowing students to engage in Economics education remotely. According to Means et al. (2013), the effectiveness of online learning is comparable to traditional classroom instruction, with benefits such as flexible learning schedules and access to diverse instructors. Virtual classrooms, webinars, and discussion forums facilitate interaction among students and educators across different geographical locations.

Current Challenges in Economics Education

In the contemporary world, various challenges hinder the effective teaching and learning of Economics. These challenges range from curriculum relevance and technological integration to accessibility issues and pedagogical limitations. Scholars have extensively explored these concerns, offering insights into how they impact the quality of Economics education.

Curriculum Rigidity and Relevance: One of the major challenges in Economics education is the rigidity of curricula, which often fail to keep pace with real-world Economics developments. According to Colander (2015), many Economics programs remain heavily theoretical, with limited incorporation of contemporary issues such as climate change Economics, behavioral Economics, and digital financial systems. This lack of adaptability makes it difficult for students to relate Economics theories to practical problems in society.

Overemphasis on Mathematical and Theoretical Models: While mathematics is an essential tool in Economics, an overemphasis on complex mathematical modeling can alienate students from the subject. Krugman (2018), argues that Economics education often prioritizes mathematical abstraction over practical Economics reasoning, making it less accessible to students who lack strong quantitative skills. This approach may discourage critical thinking and the application of Economics principles to real-world problems.

Inequality in Access to Economics Education: Disparities in access to quality Economics education remain a significant challenge, particularly in low-income regions. According

to Goldin and Katz (2018), students from underprivileged backgrounds often lack access to experienced instructors, up-to-date textbooks, and digital learning resources. The gap between well-funded and poorly funded institutions leads to unequal opportunities in acquiring Economics knowledge and skills.

Technological Disruptions and Digital Divide*:* The increasing reliance on digital tools in Economics education has created both opportunities and challenges. While digital platforms facilitate access to vast Economics resources, Selwyn (2016) highlights that many students and institutions face difficulties in adapting to online learning due to inadequate technological infrastructure and digital literacy. In developing countries, limited internet connectivity and lack of access to computers further widen the digital divide.

Insufficient Focus on Interdisciplinary Learning: Economics education traditionally operates in isolation from other disciplines such as psychology, sociology, and political science. However, Akerlof and Shiller (2019), argue that Economics decisions are influenced by human behavior and social factors, necessitating an interdisciplinary approach. The failure to integrate insights from other fields can lead to an incomplete understanding of Economics phenomena.

Student Engagement and Motivation: Many students perceive Economics as abstract and difficult, leading to low engagement and motivation. According to Becker (2014), traditional lecture-based teaching methods often fail to stimulate critical thinking and problem-solving skills. Active learning approaches, such as case studies, simulations, and real-world problem-solving exercises, are necessary to enhance student interest and comprehension.

Strategies for Improving Economics Education in the Digital Technology

The Digital Era has transformed how Economics is taught and learned, providing new opportunities while also presenting challenges. To enhance the quality of Economics education in this rapidly evolving technological landscape, educators must adopt innovative strategies that improve accessibility, engagement, and practical application. Scholars have proposed various approaches to modernizing Economics education, ensuring that students develop relevant skills for the digital economy.

Integrating Digital Learning Tools and Technologies: One of the most effective ways to enhance Economics education in the Digital Era is by incorporating digital learning tools such as artificial intelligence (AI), simulation models, and online resources. According to Laurillard (2012), digital platforms like Coursera, Khan Academy, and provide interactive content that enhances student understanding of complex Economics concepts. Additionally, AI-powered tutors and chatbots can offer personalized learning experiences, catering to individual student needs.

Encouraging Data-Driven and Computational Approaches: The rise of big data and computational methods in Economics necessitates a shift in educational strategies. Brynjolfsson and McAfee (2014), argue that teaching students how to use programming languages such as Python and R for Economics analysis equips them with skills relevant to the modern job market. Digital tools such as Stata and Tableau enable students to analyze real-time Economics data, fostering analytical thinking and problem-solving abilities.

Promoting Active and Experiential Learning*:* Traditional lecture-based teaching methods often fail to engage students effectively. Becker (2014), suggests that active learning techniques, such as case studies, role-playing, and simulations, enhance students' ability to apply Economics theories to real-world situations. Digital simulations, such as the MIT Macro and MicroEconomics Experiments, allow students to engage in virtual Economics decision-making, improving their understanding of Economics principles in action.

Incorporating Interdisciplinary and Real-World Applications: Modern Economics challenges require interdisciplinary perspectives that go beyond traditional Economics models. Akerlof and Shiller (2019), advocate for integrating insights from psychology, political science, and sociology to create a more holistic approach to Economics education. Real-world case studies on Economics crises, climate change, and technological disruptions can help students connect Economics theories with contemporary global issues.

Enhancing Teacher Training and Digital Literacy: For digital transformation in Economics education to be successful, educators must be equipped with the necessary technological skills. Selwyn (2016), emphasizes the importance of professional development programs that train educators in digital pedagogy, AI-driven learning, and virtual classroom management. Universities and policymakers must invest in continuous teacher training to ensure educators can effectively use modern educational technologies.

Enhancing Student Engagement through Social Media and Collaboration Tools

Social media platforms and collaboration tools have emerged as powerful mechanisms for enhancing student engagement, both inside and outside the classroom. These technologies facilitate communication, knowledge sharing, and peer collaboration, ultimately fostering a more interactive and dynamic learning environment. This research discusses how social media and collaboration tools can be leveraged to increase student engagement, improve learning outcomes, and foster a sense of community.

Facilitating Communication and Feedback: Social media platforms such as Facebook, Twitter, and Instagram provide students with easy and informal channels to communicate with their instructors and peers. According to Junco (2012), these platforms can break down barriers of distance and time, allowing students to ask questions, share ideas, and engage in academic discussions outside traditional classroom settings. Also, instructors can use these platforms to provide timely feedback, reinforce class materials, and facilitate discussions on current Economics issues or other relevant topics. This continuous interaction between students and instructors promotes deeper engagement and a more personalized learning experience.

Fostering Peer Collaboration and Group Work: Collaboration tools like Google Drive, Microsoft Teams, and Slack enable students to work together on projects and assignments in real time. By using shared documents, spreadsheets, and presentations, students can collaborate efficiently, regardless of their location. These tools promote active participation and collective problem-solving, allowing students to take ownership of their learning. According to Dabbagh and Kitsantas (2012), group work through digital platforms can increase students' motivation, as they can directly contribute to the development of knowledge and ideas while receiving immediate feedback from peers. Collaboration tools also support the development of critical skills such as communication, teamwork, and leadership.

Creating a Collaborative Learning Environment: Social media and collaboration tools can create an inclusive and interactive learning environment. Platforms like Edmodo and Google Classroom facilitate the sharing of course materials, announcements, and assignments in one central location, fostering a sense of community among students. According to Anderson (2018), collaborative learning platforms allow students to discuss course content, share resources, and participate in group activities, encouraging interaction with a diverse range of ideas and perspectives. This collaborative space enhances students' sense of belonging and motivates them to take an active role in their learning.

Promoting Informal Learning and Knowledge Sharing: Social media allows for informal

learning, where students can explore subjects outside the formal curriculum and engage in knowledge-sharing activities. Platforms like LinkedIn provide opportunities for students to connect with professionals in their field, while forums and discussion groups on Reddit or Quora allow students to ask questions and engage in conversations related to their studies. According to Veletsianos and Kimmons (2012), informal learning through social media enables students to apply classroom knowledge in real-world contexts, enhancing their understanding of the material and increasing engagement.

Encouraging Active Participation through Gamification: Many social media platforms and collaboration tools incorporate elements of gamification, which can further enhance student engagement. Features like badges, leaderboards, and challenges encourage students to participate actively in online discussions and activities. For example, tools such as Kahoot! and Quizlet allow students to engage in interactive quizzes and games that reinforce learning content while making the experience more enjoyable. According to Anderson and Rainie (2014), gamification can motivate students by making learning more dynamic and enjoyable, leading to improved academic performance and greater participation.

Providing Access to a Broader Learning Community: The use of social media and collaboration tools can extend students' learning networks beyond the classroom. Platforms such as Twitter and LinkedIn provide opportunities for students to connect with experts, thought leaders, and professionals from around the world. These platforms allow students to stay updated on the latest trends and discussions in their field, such as Economics or technology, fostering a broader understanding of the subject matter. According to Heo (2015), these extended learning communities help students develop critical thinking skills and engage with diverse viewpoints, which enrich their learning experiences.

Conclusion

In conclusion, the digital technology presents both opportunities and challenges for improving Economics education. The integration of digital tools, such as online learning platforms, collaborative tools, and data analytics, can significantly enhance student engagement and learning outcomes. However, achieving these improvements requires a concerted effort from educational institutions, policymakers, and educators to adapt teaching strategies and curricula to the evolving needs of the digital world. By embracing technology and fostering an interactive, interdisciplinary, and ethical approach to teaching Economics, educators can equip students with the critical skills necessary to navigate the complexities of the modern global economy. The shift towards digital learning provides an opportunity to address the limitations of traditional teaching methods, while simultaneously preparing students for a rapidly changing job market.

Recommendations

The paper recommended the following:

i. Educational institutions should invest in digital learning platforms and tools that enhance the teaching and learning experience. These platforms can facilitate access to resources, encourage collaboration, and enable real-time feedback. Incorporating data analytics tools such as R or Python into the curriculum will also equip students with the necessary skills for analyzing complex Economics data, preparing them for the demands of the modern economy.
ii. Economics curricula should be updated to reflect current Economics challenges, including topics such as digital economies, behavioral Economics, and sustainability. Integrating case studies, simulations, and real-world examples will make the subject matter more relevant and engaging for students, enhancing their understanding and ability to apply Economics principles in real-world scenarios.

iii. Traditional lecture-based teaching methods should be complemented with active learning strategies, such as project-based learning, simulations, and group discussions. These approaches encourage students to engage with the material actively, fostering critical thinking and problem-solving skills that are essential in the digital era.

iv. Instructors should be provided with ongoing professional development opportunities to enhance their digital literacy and pedagogical skills. This training should focus on the effective use of technology in teaching, as well as new methods of delivering content in a digitally-driven educational landscape.

v. Economics education should include discussions on the ethical implications of Economics policies and practices, including topics like Economics inequality, sustainability, and corporate social responsibility. This will ensure that students are not only equipped with technical knowledge but also with a sense of social responsibility in their Economics decision-making.

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INFLUENCE OF SOCIAL ENVIRONMENT ON ACADEMIC PERFORMANCE IN SOCIAL STUDIES AMONG UPPER BASIC 2 STUDENTS IN ZONE C BENUE STATE

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Abstract
The study investigated the Influence of social environment on academic performance in social studies among upper basic 2 students in zone c Benue state. Two research hypotheses were formulated and tested and expo-facto research design was adopted for the study. 418 students were selected through multi stage sampling technique and used from the total Population of 2,287. A self-constructed questionnaire titled Social Studies Attitude Inventory and Social Studies Performance Test (SSPT) was employed as instrument for data collection. The reliability coefficients were 0.89 and 0.92 for SSAI and SSPT were established respectively. Inferential statistics of independent sample t-test was used to analyze the data and all the null hypotheses were tested at 0.05 level of significance. Findings of the study revealed that: students' involvement in club activities has significant influence on the academic performance in social studies (t-value is 12.95, p-value 0.00). That students' home background has significant influence on the academic performance in Social Studies (t-value is 10.85, p-value 0.00). The study concluded that students' involvement in club activities and their home background have significant influence on their academic performance in social studies. Therefore, it is recommended among others that Parent and guardians, government and all stakeholders in educational sectors should create a conducive learning environment for their children to learn especially in the home.
Keywords: Social Environment, Academic Performance

Introduction

Environment plays a major role in the life of every individual whether a teacher, student, employer or employee. The influence of social environment has been considered as one of the factors that influence students' academic

performance and attitudes in secondary schools especially at the Upper Basic level. Obasi (2010) opines that social environment exposes students to a set of social interaction with their classmates and teachers. Social environment is an important factor that could contribute to students' learning and assimilation. The environment can help the child to realize or hinder his goals in life. In other words, the school setting determines how well the child can realize his or her goals or destroy them. Environment can be loving or frightening, stimulating or boring, conducive or inhibiting to the development of the purpose and goals for which it was established (Berger, 2015).

Social environment refers to the interaction students have with one another in school. For example, it includes the series of interactions between teachers and students, students and students, students and the home. All these tend to shape learning and academic performance (Ojo, 2013). Social environment could be a significant factor in children's academic performance and attitudes. Rousseau (2010) contends that human beings are victims of corruptive influence of society. This is because children are not inherently liars, thieves or murderers. They learn these vices from the society. There is a common dictum that "man's character is made for him and not by him". This underscores the power of social environment in character formation. It is believed that whoever controls the environment would be able to produce the kinds of human beings he wants. Human behavior can be placed on a continuum with bad behaviour or vices resulting from bad influences on one end, and superior character (virtue) on the other end. A superior character can be developed in a conducive environment populated by people with the right kind of educational academic performance and attitudes. This suggests that knowledge can be best advanced through interaction with others in a conducive environment (Rousseau, 2010).

There is an increasing interest and concern regarding the role of learning environment in Nigeria educational system. Learning environment is seen as the place and setting where teaching and learning occur. A learning environment could be the home, the church, the school or a social club. Learning environment could be the social, psychological and the physical settings (Unachukwu, 2010). School as social environment has both human and material resources that could play an important function for the academic performance of the target aims and objectives (Goddard, & Jeyness, 2013). Thus, the higher academic performance of students depends mostly on their attitudes. Examples of such attitudes include: open mindedness, concern for others, honesty, civic responsibility, tolerance, cooperation, respect for individuals and property (Shamija, 2011). Attitudes have further been categorized as attitudes for desirable intellectual behavior and attitude for desirable social behaviors. All these could exert significant influences on students' academic performance.

Academic performance is the measure of students' learning and acquisition of certain skills at the end of teaching and learning activities. Gagne (2016) defines academic performance as the performance of the students in the subjects they study in the school. It is directly related to students' growth and development of knowledge in educational situation where teaching and learning take place. According to Benedict and Thomas (2013), academic performance is something one does or attains at school, in class, in a laboratory, library or fieldwork. An academic performance such as graduating 1st in one's class is sometimes a purely quantitative matter, while having the findings of lengthy, comprehensive research published by a recognized journal is also a notable academic performance. Being named a head of a particular department at a university is both a professional attainment and academic performance. Academic performance has become an index of child's future in this highly competitive world. It has been one of the most

important goals of the educational processes. Academic performance is a key mechanism through which adolescents learn about their talents, abilities and competencies which are important part of developing career aspirations (Gagne, 2016). Academic performance includes both curricular and co-curricular performance of the students. It indicates the learning outcomes of the students. In classrooms, students perform their potentials efficiently. As a result, learning takes place and the learning outcomes changes the behavior pattern of the students through different subjects (Mehta, 2014). Academic performance is the knowledge obtained or skills developed in the school subjects. It is usually derived through test scores or marks assigned by the teacher.

Social Studies is a compulsory subject which all students at Upper Basic level of education offer. In line with the National Policy on Education (Federal Republic of Nigeria, 2014), Social Studies provides learners with opportunities to reflect critically upon events and connection with the past and be able to consider the future (Shamija, 2011). The subject also helps learners to understand their roots, comprehend context, recognize the community of people, appreciate the delicate balance of rights and responsibilities in an open society and at the same time develop the habit of thoughtful analysis and reflective thinking. Abdullahi (2012) describes Social Studies as creating compartmentalized knowledge and artificial subject area restriction that inhibit learners from understanding their environment better. Social Studies can be referred to as a problem approach school subject through which man studies and learns about problems of survival in his environment.

Social Studies as a value laden subject needs conducive environment in order to improve the academic performance and attitudes of students (Lawal, 2010). Students' participation in teaching and learning of Social Studies is imperative. Students do not learn much by just sitting in classes and listening to teachers. Sometimes, students memorize pre-packaged assignment by giving out answers, rather than having ability to talk about what they learn write reflectively on it, relate it to the past experience and apply it to their daily living as they interact with both human and materials components of the environment. All these make learning to become part of them (Akinlaye, 2014). The studies of Lawal (2010) and Ojo (2013) established the fact that social environmental factors coupled with negative teaching-learning behavior could be inhibitors to effective and adequate academic performance and attitudes. A club can be defined as any activity outside the classroom that could enhance and contribute to students' learning. It involves extra- curricular activities. A club is a group of people that belongs to one group with a target aim of achieving a goal in a school environment (Santor, 2013). Club activities can be sponsored by the schools and community organizations for children and adolescents. These clubs provide opportunities for them to participate in activities, interact with peers in a supervised setting, and form relationships with adults. Some clubs focus on a specific area, thus allowing members to develop their skills and interests in that area. A club could be a very strong force that binds friends from different family backgrounds together in school. This could influence their learning and attitudes.

In clubs, some students normally put on an indecent dress because it is in vogue among their peer and some lack the strong will to say no to evil for fear of being isolated. But a child with good home training and fear of God is always in a good position to distill between right and wrong. No matter how he/she is lured by the club members to join the wagon of immoral acts that are colourful to them, they will always try to maintain their integrity and the good name of the family (Alachi, et al, 2013).

Sporting activities are activities that involve physical efforts that can be carried out with the

application of mental and physical activities. They are the physical activities done for exercise and pleasure usually in a special area and according to fixed rules. These include football, volleyball, tennis and hockey (Adewale, 2015). According to Odipe (2014), students that love sports have little or no positive attitude towards their academic work. They are always absent minded in the class. All they think is how to organize sports. Such students will not pay attention to what is being taught and learned. They are always more committed to sports and always fail examinations. Odipe (2014) also avers that participation in excessive sporting leads many students become school drop- out due to poor academic performance and negative attitudes towards learning since less commitment to academic work is observed. The author reported that more than 50% cases of students drop out as a result of excessive sporting activities which shift their concentration from their academic work to sports. Sporting activities sometimes cause the death of many secondary school students. According to Odipe (2014), sporting result in unexpected injuries such as dislocation, spinal cord, and damage to sensory organs like the nose, eye and mouth, which sometimes caused the death of many students. Many parents have been compared without plan to withdraw their children from schools due to serious injuries cause to them (Adewale, 2015). Students who are always participate in excessive sport activities always absent themselves from classes. Such students use their study hours to sneak to their sports partners' houses). They cheat to pass examination and always disobey school rules and regulations. They play truant and, in most cases, tell lies.

Home background is a first education of child's experiences. His ideas, attitude and general pattern of behavior are as a result of his childhood rearing. The home background has the potential to influence a child's academic performance. This is because it is the first environment of the child. The initial experience that would mold the child's values, aspirations, emotions, interest and attitudes are offered by the parents/family (Okeke, 2014). What the child learns at home and how his family motivates him towards education contributes to the child's success in school. It is opined that home background is a primary socialization agent and influences a child's interest in school and aspirations for future. The author further states that if the home fails to give the right socialization and the school fail to correct the anomalies in the socialization process, the child may become unruly, delinquent or become a hardened criminal. Home background is the circumstance, fact or event that influences, causes or explains the social, economic and political level of a group consisting of the father, mother and children in a society.

In the traditional African society, the behavior of the youth was the concern of everybody. As a result, anyone could discipline a child who was found misbehaving outside the home most especially by the elders in such a community (Eze, 2012). Today, Nigeria's value system is materialistic oriented: such, there is tendency for students to presume this value and use it as a basis for unruly behaviors, especially by students from wealthy families. The students in this category may look down on teachers as having low economic status that is below average. Such students may demonstrate unruly behavior in school and thus affect their academic achievement and attitudes. Oni (2014) opines that children from low social economic status earn lower test scores and are likely to drop out of school, since they are unable to access vital resources in addition to the stress at home. The focus of this study, therefore, was to investigate the influence of social environment on academic performance in social studies among Upper Basic 2 students in Zone C of Benue State.

Statement of the problem

Social environment of students influences them in diverse ways. However, the issue of poor academic performance Upper Basic 2 students

in the study area seems to generate persistent negative feelings among individuals, groups and institutions and its negative influence on students' attitude towards learning of Social Studies and problem-solving abilities. This ultimately results in poor academic performance in school. The problem of poor academic performance and negative attitude of students toward Social Studies in Upper Basic 2 has become a sensitive issue that needs urgent attention. There are indications that students' involvement in excessive club activities, sport activities and poor home background contribute to their academic performance and attitude in Social Studies subject.

Social environmental factors such as home background, excessive club activities, and sport activities seem to have some influences on Upper Basic students in Education Zone C Benue State. The manifestations of negative attitudes such as disrespect to parents, elders and constituted authorities, truant behaviors, taking hard drugs, stealing and other social vices are products of environmental influence like home background and social activities. How this contributes to academic performance of students in unknown. Available literature has shown that such research data in zone c of Benue state is lacking. It is on this background that the present study intends to fill the gap by investigating the influence of social environmental on academic performance in social studies among Upper Basic 2 students in Zone C Benue State.

Objectives of the study

1. Find out the influence of club activities on students' academic performance in Social Studies.
2. Determine the influence of home background on students' academic performance in Social Studies.

Research Questions

1. What is the influence of club activities on students' academic performance in social studies?
2. What is the influence of home background on students' academic performance in social studies?

Research Hypotheses

1. There is no significant influence of club activities on students' academic performance in social studies.
2. There is no significant difference in the mean academic performance scores in Social Studies between students from a supportive home background and those from an unsupportive home background.

Methodology

The study adopted ex-post facto research design. The design is quite useful in a research in which independent variables among the respondents already exist and cannot be directly manipulated or controlled (Ali, 2006). In an ex-post facto research design, the investigation starts after the fact has occurred without interference from the researcher. It does not include any form of manipulation before the fact occurs, as it is the case in experimental designs. In this study, social environment, which is the independent variable, had already occurred hence the design is appropriate for this study. This study was carried out in Education Zone C of Benue State. This zone comprises nine local government areas. These are Ado, Apa, Agatu, Oju, Obi, Otukpo, Okpokwu, Ohimini and Ogbadibo.

The target population of this study comprised 2,287 Upper Basic 2 students from 149 schools from the nine local government areas in Education Zone C of Benue State (Benue State Universal Basic Education Board, 2018). A sample of 418 Upper Basic 2 students was selected. This represents 18.8% of the population. According to Emaikwu (2013), a sample of 418 is adequate for a population of 2,287. The sample of the study was selected using multistage sampling procedure which is an extension of cluster sampling procedure that involves selecting samples from samples in stages. In the first stage, all the nine local government areas in the zone were selected. At

the second stage, 27 schools which represent 18% were selected from a total of 149 Upper Basic schools. That is, three schools each from the nine selected local government areas. The 27 selected schools comprised 418 students proportionally selected.

The instruments for data collection in this study were self-constructed questionnaire Titled Social Studies Attitude Inventory and Social Studies Performance Test (SSPT). All the items were presented on a 4-point Likert scale of Strongly Agreed (SA) = 4 points Agree (A) = 3 points; Disagree (D) = 2 points and Strongly Disagree (SD) = 1 point for positively framed statements. The negatively framed statements were scored on a reverse order. Altogether, there were 20 items on the instrument. The two instruments were validated by two experts in Social Studies education and one expert in measurement and evaluation from Department of Arts and Social Science Education, Benue State University, Makurdi. The instruments were pilot tested and the data obtained were subjected to reliability test using Cronbach alpha coefficient for SSAI and Kuder Richardson formula K_{20} for SSPT. The reliability coefficients were 0.89 and 0.92 for SSAI and SSPT respectively. These coefficients were considered reliable for the study. Independent sample t-test was used for testing the hypotheses at 0.05 level of significance. This was appropriate because it enabled the researcher to compare the means of the two groups (that is, students from a conducive social environment and students from an unconducive social environment).

Results

Hypothesis one: There is no significant influence of club activities on students' academic performance in social studies.

Table 1: Independent sampled t-test on students' academic performance in Social Studies based on their involvement in club activities

Factor	N	Mean	t	df	Sig. (2-tailed)
Students' Performance in SSPT	246 172	11.37 7.59	12.95	416	0.00

Table 1 shows that $t_{(416)} = 12.95$ with $p = 0.00$.

This is indicative that the p-value was less than 0.05. Therefore, the result was considered significant and the hypothesis was rejected. This implies that students' involvement in club activities enhanced their academic performance in Social Studies.

Hypothesis two: There is no significant difference in the mean academic performance scores in Social Studies between students from a supportive home background and those from an unsupportive home background.

Table 2: Independent sample t-test on students' academic performance in Social Studies based on the influence of home background

Factor	N	Mean	t	df	Sig. (2-tailed)
Students' Performance in SSPT	277 141	10.98 7.54	10.85	416	0.00

Table 2 shows that $t_{(416)} = 10.85$ with $p = 0.00$.

This indicates that the p-value was less than 0.05. Thus, the result was considered significant and the hypothesis was rejected. This implies that students' home background enhanced their academic performance in Social Studies.

Discussion of Findings

The findings revealed that club activities in school have significant influence on students' academic performance and attitude in Social Studies. This finding is in line with Philip (2014) who found that students' engagement in clubs significantly affects their academic performance and attitudes. Robert (2013) also reported that students' engagements in clubs significantly influenced on their academic performance and attitude. This finding is in contrast with Robert (2013) who asserts that membership of clubs can most times promote unhealthy behavior against other group members. It has been observed that shared values among club members deliberately play a guiding role in their behavior as well influence their academic performance. Participating in club activities is a primary stage of development and identities often closely associated with that of their members where club members are a key of the developmental process, they can have an influence on young people due to members' pressure and conformity.

The result also showed that home background has significant influence on students' academic performance and attitude towards Social Studies. This finding is agreement with Majoribanks (2015) who found that home background influences students' academic performance. Adams and Bruno (2013) also found that the home, economic, social, educational and cultural backgrounds significantly affect students' attitudes. Adams and Bruno (2013) reported that the home, economic, social, educational and cultural backgrounds significantly affect students' academic performance and attitudes. The low socio-economic status in the home could negatively influence academic performance because low socio-economic status parents would have low access to vital resources and creates additional stress at home. The environment at home is a primary socialization agent and influences a child attitude towards learning in school and aspirations for future. If the home fails to give the right socialization and the school fails to correct the anomalies or socialization process, the child may become unruly, delinquent or become a hardened criminal.

Conclusion

It is concluded in this study that social environment variables such as club activities and home back ground have significant influence on the academic performance of students in social studies. This implies that club activities enhance academic performance of students in social studies. Also, supportive home background enhances academic performance of students in social studies.

Recommendations

On the basis of the findings and conclusion of this study, it is recommended that Parent and guardians should create a conducive environment for their children to learn especially in the home. This could encourage them to put in their best for enhancing academic performance in Social Studies. Regular sensitization workshops should be organized by the Universal Basic Education Commission to train and retrain Social Studies teachers on how to manage social environment which would influence on students' academic performance. Both parents and teachers should encourage participation of students in club activities so as to help them focus on their different ideas, talents and values. By so doing, these will enable the students to do better in their academic work. Federal, state and local governments should provide sporting equipment in all the schools in education Zone C area of Benue State. This could facilitates and encourage school sporting activities which will enhance the skill and well-being of the students both in academic and attitude.

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EFFECTS OF ARTIFICIAL INTELLIGENCE TUTORS ON SELF-DIRECTED LEARNING AMONG ISLAMIC STUDENTS IN FCT COLLEGE OF EDUCATION ZUBA, ABUJA

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Abstract
The application of artificial intelligence (AI) in education is reshaping learners' interaction with knowledge. Islamic Studies like any other subject taught in Nigeria school should not be left out of the new innovation in teaching; this study investigates the effectiveness of AI tutors in promoting independent learning of Islamic Studies students and compares AI-assisted instruction with traditional teaching method on self directed learning among Islamic Studies Students. A quasy experimental research design was adopted for this study. The population for the study comprised 100 NCE 2 Islamic studies students. Simple random sampling technique was adopted to select 100 Islamic Studies Students for the study. The students were divided into two groups A and B: experimental group which engaged with AI-powered tutoring tools ChatGPT and Islamic Q&A bots for self-directed study, while the control group received traditional lecture method of instruction. Pre-tests and post-tests were administered to both groups to determine which of the instructional method is more effective than the other in teaching and learning Islamic studies. Learning Evaluation and AI Perception Scale (ISLEAPS). The study revealed that AI tutors enhances accessibility and comprehension of foundation concepts, supporting and effective for independent learning to a significant extent. However, while students in the AI-assisted group demonstrated notable gains in knowledge acquisition, certain limitations emerged regarding the handling of nuance of Islamic Studies that typically require expert scholarly guidance. The study recommends that there should be adoption of a blended learning model combining Ai and tradition method of instruction.
Keywords: Artificial Intelligence, Islamic Studies, Self-Directed Learning, Islamic Studied, Pedagogy.

Introduction

Artificial Intelligence (AI) has caused paradigm shift and transformations in education and almost all aspects of human life, it is one of such domain that has been very profoundly useful in impacting knowledge. This change in paradigm of learning seems to be most promising in the case of Islamic studies

where traditional forms of teaching have been increasingly adopted and implemented by Islamic Studies teachers. AI tutors surface as one of the most meaningful tools that encourages self-learning (Karim &Sugianto, 2023). The AI platforms are effectively facilitate individual learning and help students to navigate all difficult areas and to associate ideas at their own pace, and according to their own learning needs. This development enables greater participation in Islamic Studies, thus expanding the scope of wider audience (Aliyu & Yusuf, 2025).

The current development pedagogically focus on learners centre which is the expected target central pole of every Muslim leaner in the conduct their educational surgeon using self-directed learning principles (Yildirim, 2023). The traditional methods have been for long a flourishing approach between the teachers, instructors and the learners in instructional delivery. The advent of AI has brought about paradigm shift to the conventional learning system focusing learner center. AI technology has made educational resources accessible to Students with ease. Natural language processing drives through AI application has provided real-time text interpretation, explanatory services and question responses for Islamic Studies Students. The new innovation in education software allows students to learn and develop critical thinking abilities as it encourages students' autonomy in learning (McLaren &Nguyen, 2023).

Comparing AI-assisted learning with traditional educational methods is essential for evaluating the effectiveness of AI in the context of Islamic Studies. Traditional approaches depend heavily on direct one-person engagement by means of which the process of teaching and learning depend on the bookish authority of the teacher. In contrast, AI-supported learning brings about greater flexibility and availability learning materials. Previous study like Harrell, (2023) revealed that AI-driven systems have potentials of tailoring the learning experience to suit learner's needs, offering customized feedback and resources aligned with each learner's pace and comprehension. Application of AI devices in teaching and learning process, when compare with the standardized structure of traditional models, this level of personalization and autonomy in learning may contribute to more successful learning outcomes via AI (Kaplan, 2021).

According to McLaren & Nguyen (2023), AI in education enhances students' engagement, increases motivation, and improves academic performance by offering personalized learning content. Likewise, Lampropoulos (2022) postulated that AI platforms facilitate language learning by tailoring study materials according to each student's proficiency level, thereby promoting effectiveness in enhancing good learning environments. Further-still, AI tools make potential changes by improving educational strategies and learning outcomes in Islamic Studies especially in the area of difficulty topics of Islamic Studies like: *Tajweed*, Arabic language, Inheritance law among others.

The application of AI to Islamic Studies faces specific hurdles despite its potential advantages. AI systems users need understanding of specific complex aspects of Islamic Studies through sophisticated training can be done (Yildirim, 2023). The application of AI in religious education demands cautious examination in terms of ethical matters, Islamic Jurisprudence, Islamic Legal theory to mention but few. AI tutors need to demonstrate Islamic values and principles for students to embrace their effectiveness in learning processes (Mijwil, 2022). The study holds major value because it paves new ways which unite Islamic Studies traditions with present-day technological development. The effectiveness of AI tutors in Islamic Studies on self-directed learning requires research evaluation as the researchers assess the extent to which it measures up traditional approach.

Problem Statement

The integration of Artificial Intelligence (AI) into educational system presents a unique opportunity; It enhance self-directed learning (SDL), particularly in Islamic Studies, meanwhile traditional methods of learning have emphasized face-to-face instruction and in-depth analysis of classical texts in Islamic Studies, as it witnesses a lot of rigors. Mean while AI-driven platforms offer a flexible alternative that assists the learner to overcome the limitations of traditional methods, such as accessibility and availability of materials. However, despite the promise of AI in education, the actual effectiveness of AI tutors in supporting independent learning ability within the domain of Islamic Studies. Islamic Studies by nature, is a discipline that requires not only memorization of Qur'an and legal rulings but also a critical understanding of the texts, ethical considerations, and contextual interpretations. Traditional learning methods are built around interaction with experienced scholars, allowing for nuanced discussion and interpretation.

The question remains whether AI systems, with their personalized feedback and adaptive learning capabilities, can adequately replicate this depth of learning. Existing studies on AI in education show its potential for enhancing student engagement and motivation, particularly in subjects like language acquisition and mathematics, but there is limited research on its application in religious education, particularly in the complex field of Islamic Studies. More so, the use of IA for Islamic Studies required to be versed in Islamic Studies and in computer literacy which are insufficient among Students of Islamic Studies, these coupled with Islamic Studies Teachers attitudes to digitalization created barrier to the improvement in the use of IA among Islamic Studies Students. Given these challenges, this study seeks to investigate the effectiveness of AI tutors in supporting self-directed learning in Islamic Studies comparing in contrast to traditional learning methods. The study will explore whether AI can enhance knowledge acquisition and whether it offers a viable alternative to traditional methods of teaching. Therefore, the study aims to investigate the effectiveness of AI tutors in promoting independent learning, particularly in Islamic Studies, the study finally intends find out the potentiality of AI tools are aligned to both educational effectiveness and cultural appropriateness.

Objectives of the Study

The general objective of this study is to assess the effects of artificial intelligence tutors on self-directed learning in Islamic Studies, specifically the study sets:

1. To examine the effectiveness of AI tutors in supporting independent learning in Islamic Studies.
2. To investigate the significant difference in the performance of the students exposed to AI assisted in self learning and students exposed to traditional learning models in Islamic Studies?

In the light of the above objectives two hypotheses were postulated to be tested thus:

Hypotheses

H_1: there is no significant effect of AI tutoring on independent learning in Islamic Studies.

H_2: There is no significant difference in performance of the students exposed to AI-assisted learning and students exposed to traditional learning models in Islamic studies.

Theoretical Framework

Constructivist Learning Theory (CLT) was adopted for this study because of its relevance for the use of learner center method of instructional delivery which is the focus of contemporary society when it comes to teaching and learning process. This theory was primarily propounded by Jean Piaget in the 1930s, and later expanded by Lev Vygotsky and other educationist theorists across 20th century. The theory postulates that learners construct their own understanding and knowledge of the world through experiences,

reflection, and active engagement. Rather than receiving information passively, learners build meaning from interactions with their environment, resources, and peers (Piaget, 1952 and Vygotsky, 1978). Constructivist Learning Theory (CLT) emphasizes that learning is a constructive, contextual, and personal process. Knowledge is not simply transferred from teacher to student rather; it is actively constructed by the learner. Every individual integrates new information with prior knowledge thereby reshaping and reorganizing their cognitive structures in the process. This implies that learning environments are expected to promote inquiry, exploration, and self-directed activity that would facilitate active and autonomous learning. In educational settings, this theory supports methods that encourage learners centered by asking questions, manipulating ideas, and deriving answering or meaning through dialogue and problem-solving (Bada & Olusegun, 2015 and Chiu et al., 2022).

Constructivist learning theory distinguishes between cognitive constructivism, emphasized by Piaget, and social constructivism, emphasized by Vygotsky. Piaget focused on how individuals independently construct knowledge through mental processes, while Vygotsky paid attention to the significance of social interaction, language, and culture in the learning process. The concept of the Zone of Proximal Development (ZPD) set in by examines what learners can achieve with guidance versus what they can do independently as foundational in understanding how learners progress with support from tools, peers, or mentors (Vygotsky, 1978 and Hammond., Mullen., & Bryan, 2020).

In the digitalized learning age, Constructivist Learning Theory (CLT) has been revitalized through its application in technology to enhance harmonious learning environments. It has been observed that AI-based systems, when designed as supportive tools, aligned with constructivist principles by offering personalized feedback, inquiry-based exploration, and self-paced learning than direct instructors. For example, AI tutors responds to students' queries, scaffold difficult concepts, and adapt to learner preferences reflecting the kind of cognitive scaffolding that constructivist theory champion (Holstein et al., 2021 and Jebeile&Abeysekera, 2023). Digital platforms using AI allow learners to engage actively with contents, make meaning from responses, and control their learning journeys hallmarks of the constructivist paradigm.

In relation to the current study, constructivist learning theory provides an appropriate theoretical lens to focuses on how Islamic Studies Students use AI tutors independently to acquire and construct knowledge in the areas that require reasoning, contextual interpretation, and understanding of Islamic creed and principles. AI tutors, functioning as scaffolding tools that allow Islamic Studies Students to interact with some principles, pose inquiries, and explore Islamic ideology at their own pace. This fosters self-directed and constructivist learning, especially in environments where teacher-led instruction is limited. By anchoring this study in Constructivist Learning Theory (CLT), it is affirmed that learning is most effective when students actively engage with and personalize their educational experience; the process is now facilitated by AI in the digitalized Islamic classroom.

Research Methodology

This study employed quasi experimental design to examine the effectiveness of AI-assisted learning compared to traditional methods in Islamic Studies. The study targeted a population of 100 students who are sampled randomly using simple random sampling techniques to select 100 NCE Islamic Studies Students who participated in the Study. The participants were divided into two groups: an experimental group using AI-assisted learning tools (ChatGPT and Islamic Q&A bots) and a control group engaging in traditional method. Islamic Studies Learning Evaluation and AI

Perception Scale (ISLE & APS) were used as instrument for testing the hypotheses postulated, a pilot study was conducted with 20 students who were not participating in the study but shared similar characteristics with the sample selected. Test-retest method was used to ensure the reliability of the instrument while the ISLEAPS instrument was subjected to face and contents validity. Cronbach's alpha coefficient was used to test the reliability of the scale, at a reliability coefficient of 0.8. Data were collected through pre- and post-tests, and mean and standard deviation were calculated to evaluate the learning outcomes and AI perception of the students. T-tests were applied to test the hypotheses at 0.05 significance level.

Results

Hypothesis One: H_1: there is no significant effect of AI tutoring on independent learning in Islamic Studies.

Table 1: T-test analysis on significanteffects of AI tutors and supporting independent learning in Islamic Studies.

	N	Mean	Std.	Df	T	Sig. (2-tailed)	Decision
Pre-Test	50	10.23	2.31	29	8.29	< .001	Reject H_{01}
Post-Test	50	14.37	2.04				

The t-test analysis compared the pre-test and post-test scores of students who engaged with AI tutors for learning Islamic Studies. The results show that the mean score increased significantly from 10.23 (pre-test) to 14.37 (post-test). The t-value of 8.29 with 29 degrees of freedom and a p-value less than 0.001 indicates a statistically significant difference in scores before and after the use of AI tutors. Since the p-value is less than the 0.05 significance level, the null hypothesis (H1) is rejected. This implies that the AI tutors had a significant effect on supporting independent learning in Islamic Studies.

Hypothesis Two: H_2: There is no significant difference in performance of the students exposed to AI-assisted learning and students exposed to traditional learning models in Islamic studies Table 2: T-test Analysis on significant difference in performance of the students exposed to AI-assisted learning and students exposed to traditional learning models in Islamic studies udies.

Group	N	Mean	Std.	Df	T	Sig. (2-tailed)	Decision
AI-assisted	50	14.37	2.04	29	3.29	0.002	Reject H_{02}
Traditional	50	12.45	2.5				

This independent samples t-test compared the knowledge acquisition levels between students taught using AI-assisted learning and those exposed to traditional learning models. The mean score of the AI-assisted group (14.37) was higher than that of the traditional group (12.45). The computed t-value is 3.29 with 29 degrees of freedom, and the p-value is 0.002, which is also less than the 0.05 level of significance. Therefore, the null hypothesis (H_o2) is rejected, confirming that a statistically significant difference exists in the Islamic Studies Students' performance in knowledge acquisition between the two groups. This result implies that AI-assisted learning significantly enhances students' performance in acquisition of Islamic Studies knowledge compared to traditional teaching methods.

Discussion of Findings

The findings of this study revealed that AI tutors significantly facilitates independent learning among Islamic Studies students. It

showed that there is improvement in post-test scores compared to pre-test scores in the AI-assisted group which suggests that students were able to grasp Islamic Studies concepts more effectively with the support of AI tools. This outcome aligns with previous studies that emphasize the benefits of AI in fostering learner autonomy and self-paced instruction (Zawacki-Richter et al., 2019 and Chen et al., 2020). AI tutors severally incorporate adaptive learning features and instant feedback mechanisms, which can guide students to revisit concepts and learn at their own convenience, thus reinforcing independent learning. This supports the assertion by Holmes et al. (2021) affirmed that AI-driven platforms gives room for personalize learning pathways that promote self-directed education in either pluralistic environment or religious contexts.

In furtherance, the comparison between the AI-assisted and traditional learning groups indicated that significant difference exists in the knowledge acquisition of the students exposed to AI-assisted than those exposed to traditional instruction. This revealed the potentiality of AI to facilitate deeper understanding and retention of subject matter, consistent with recent empirical studies in educational technology (Luckin et al., 2016; Alzahrani& Seth, 2022). The structured and interactive nature of AI tutors promotes not only cognitive scaffolding but also enrich with strategies that traditional methods may lack. These findings affirmed the assertion of Ouyang and Jiao (2021), which stated that students' learning with intelligent tutoring systems often recorded academic improvement across various disciplines. In the same way, the integration of AI in Islamic Studies could mark a transformative shift in how foundational religious knowledge can be disseminated and internalized.

Conclusion

This study examined the performance of Islamic Studies Students via the use of AI tutors in the 100 NCE II were randomly selected for this study. Quasi experimental design was adopted for the study, two research objectives were raised and two hypotheses were postulated. The findings of the study revealed that AI assisted tools, significantly enhances students' performance in independent learning and improves their knowledge acquisition compared to traditional learning models. The statistical analyses provided, also showed that learners who engaged with AI-assisted instruction performed better than those exposed to traditional mode of instruction, this also affirmed the transformative role in which artificial intelligence played cotemporary educational system. These findings however support many other literatures that position AI as a critical tool that encourages personalized and student-centered learning experiences. Islamic Studies like any other subjects needs critical thinking, independent reasoning which AI tutors have the potential of creating interactive and adaptive learning environments that accommodate diverse learners need, promote autonomy and deeper comprehensive learning. In view of the above it can be concluded that the use of AI in contemporary dispensation should be encouraged.

Recommendations

Educational institutions offering Islamic Studies should incorporated integrating AI-based tutoring systems into their curricula. Ministries of education and curriculum developers should take in to consideration when planning and designing curriculum for Islamic Studies the trend in the era of digitalization particularly its value and role of AI in the development of critical thinking and independent learning that would support self-paced and personalized learning among Islamic Studies Students.

There should be regular training retraining on capacity building and professional development workshops for Islamic Studies Teachers on the effective use of AI technologies as this would enhance proper implementation of the curriculum, as it is necessary to expose them to digital skills and pedagogical strategies by incorporating AI in

their instructional practices, this would ensure a seamless integration that complements human teaching and fosters better student engagement and outcomes in learning Islamic studies.

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UTILIZATION OF DIGITAL TOOLS IN TEACHING AND LEARNING OF ECONOMICS IN FCT SECONDARY SCHOOLS, ABUJA

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Abstract
The paper investigated the utilization of digital tools in teaching and learning of Economics in FCT secondary schools. Three research objectives, three research questions and three hypotheses were formulated for the study. The study adopted descriptive survey research design. The population was 117 Economics teachers in all the 88 public senior secondary schools in the Federal Capital Territory. The entire population constituted the sample size for the study, adopting census sampling technique. Sixteen (16) items researcher's designed questionnaire tiled: "Utilization of Digital Tools in Teaching and Learning of Economics Questionnaire (UDTTLEQ)" was used to generate data for the study. Content validity was used. Test-retest method of reliability was used to obtain the internal consistency. The reliability index was obtained through Cornbrash's alpha (.98). Out of the 117 questionnaires administered, 83 were returned valid, representing 71% success rate. Data analysis was done using descriptive and inferential statistics. Frequency tables were used to anlyse the research questions while independent t-test was used to test the null hypotheses at an Alpha of 0.05 levels of significance. The findings revealed among others that Economics teachers in FCT secondary schools utilize digital tools that include Google search engine and Wiki but not Google classroom, Socrative, Interactive whiteboards, Notability and YouTube. Digital tools utilization makes learning permanent and makes difficult concepts easy for Economics teachers to explain. High cost of internet subscriptionand inadequate digital technological tools are major challenges to the utilization of digital technological tools in teaching and learning of Economics in FCT secondary schools. The study recommended among others that FCT administration should provide free internet connection (WIFI) across the public secondary schools within the FCT to ensure free access to internet service by teachers and students, FCT administration and donor agencies should supply FCT secondary schools with adequate digital technological tools needed to facilitate teaching and learning, particularly in Economics.
Keywords: Utilization, Digital Tools, Teaching, Learning, Economics

Introduction

The effectiveness of teaching and learning of Economics in contemporary educational system is determined by the appropriate use of technological devices by teachers. Hayes (2024) sees Economics as a social science that focuses on the production, distribution, and consumption of goods and services. The teaching and learning of Economics is therefore very important because it focuses on understanding and improving the crucial human capacity to learn about production and distribution of goods and services for human consumption as well as for national economic prosperity. Teachers' approach to teaching Economics should not only be theoretical and memorizing, but more practical in order to make knowledge acquisition permanent for students.

Azhar and Iqbal (2018) argue that the age in which teachers gointo class with a lesson plan designed by them and policy makers is gradually fadingaway, as a new era of education hasstarted where teaching and

learning is blended digitally. Dancsa *et al*, (2023) and Alordiah *et al*, (2023) agree that digital tools are software, applications, technologies, plug-ins, add-ons or websites that are accessible via an internet connection and enhance learners' ability to conduct a thorough literature review and to master the knowledge they need to learn. They are online resources and offline tools that streamline the teaching process, thus enabling practicality in learning and faster instructional delivery.

Economics teachers can take advantage of these digital tools in various ways and to address different educational challenges which can include classroom overcrowding (Abah, 2019). Some categories of digital tools include interactive whiteboards, Socrative and YouTube (Dancsa *et al*, 2023). Others are computers, smartphones, smart TVs, online teaching software, wiki-grade blogs, Google classroom anddigital projectors. These technologies facilitate students' engagement with learning contentwhich is vital for desiredlearning objectives to be obtained. Digital technological tools such as blogs, wikis, the Google classroom, Google search engine, YouTube audio and video files and WhatsApp instant messaging have been the subject of numerous studies that have sought to identify the potential of these digital tools when used by teachers (AbdelSalam & Madji, 2021; Owolarafe *et al*, 2024).

According to Bunza (2018), these tools provide hands-on experiences that are often not possible in traditional classroom settings due to limited resources. For example, students can conduct virtual experiments, observe real-time outcomes, and engage in social inquiry in a controlled digital environment. This interactivity fosters a deeper comprehension of Economics theories. According to Oludeyi and Olawole (2020), digital tools facilitate collaborative learning. This is crucial for Economics education. Digital tools allow access to a wealth of educational resources that include online databases, journals and multimedia contents. These resources can enrich the Economics curriculum and provide students with up-to-date information and diverse perspectives on arrays of Economics topics. For instance, multimedia resources such as videos and animations can simplify complex concepts and make them more relatable to students (Bunza, 2018). Digital platforms allow teachers to create interactive lessons, track students' progress, and provide timely feedback.

The impact of digital tools in teaching and learning are also emphasized by scholars like Atanda *et al*, (2023); Patrick and Nnamani (2024). However, teachers' utilization of digital tools in teaching and learning of Economics may be influenced by factors that include: availability of digital devices in secondary schools, professional experience and experience in the use of technologies for educational purposes by Economics teachers and students, as well as their attitudes regarding technologies. Olakulehin (2018) argues that integrating digital technologies in classrooms faces multifaceted challenges that hinder its effective integration. These challenges are infrastructure limitations that include unreliable electricity supply and limited internet connectivity. Without consistent power and internet access, schools struggle to maintain uninterrupted use of digital devices and online educational resources.

Also, Adeoye and Ogunleye (2020) argue that many teachers lack adequate training and support in using digital tools effectively in their classrooms. This deficiency in teachers' readiness inhibits the adoption of technology driven instructional methods that could enhance student engagement and learning outcomes. Ogunode *et al* (2021) reveal that the high cost of digital technologies in Nigeria is a major reason many public-school teachers and students are not using them to support teaching and learning programs. However, while the impact of digital tools in teaching and learning are emphasized by scholars like Adeoye and

Ogunleye (2020); Atanda *et al*, (2023); Patrick and Nnamani (2024), none of these studies consider the digital tools that teachers utilize in teaching and learning of Economics, particularly in FCT secondary schools. This gap created in literature is what this study filled by investigating the utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja.

Statement of the Problem

Utilization of technological devices in educational system is said to facilitate effective teaching and transfer of information, knowledge, skills, attitudes and other useful capabilities. But in recent times, many students and teachers in public secondary schools are faced with difficulties in the utilization of modern technologies to facilitate teaching and learning process in classroom situation. In the preliminary assessments of some public secondary schools in the FCT by the researcher, there were observed problems of availability of digital tools in these schools, Internet connectivity, electricity and digital literacy by teachers and students. Also, the researcher observed insufficient understanding by teachers on how digital tools can be utilized to facilitate teaching and learning process. These problems necessitated this study on utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja.

Objectives of the Study

The major objectives of the study were to:

1. Find out which digital tools teachers utilize in teaching and learning of Economics in FCT secondary schools.
2. Ascertain the impact of utilization of digital tools in teaching and learning of Economics in FCT secondary schools.

Determine the challenges affecting the utilization of digital tools in teaching and learning of Economics in FCT secondary schools.

Research Questions

1. Which digital tools teachers utilize in teaching and learning of Economics in FCT secondary schools, Abuja?
2. What is the impact of utilization of digital tools in teaching and learning of Economics in FCT secondary schools?
3. What are the challenges affecting the utilization of digital tools in teaching and learning of Economics in FCT secondary schools?

Hypotheses

HO_1: There is no significant difference between the mean ratings of male and female Economics teachers on digital tools teachers utilize in teaching and learning of Economics in FCT secondary schools

HO_2: There is no significant difference between the mean ratings of male and female Economics teachers on the impact of utilization of digital tools in teaching and learning of Economics in FCT secondary schools

HO_3: There is no significant difference between the mean ratings of male and female Economics teachers on the challenges affecting the utilization of digital tools inteaching and learning of Economics in FCT secondary schools.

Research Methods

The study adopted descriptive survey research design. The population of the study was 117 Economics teachers, including 69 males and 48 females in all the 88 public senior secondary schools in the FCT. Since the population was relatively small, the entire population constituted the sample size for the study, using census sampling. This was in line with Surbhi (2017) who asserted that census samplingis a quantitative research method, in which all the members of the population are enumerated. Sixteen (16) items researcher's designed questionnaire tiled: "Utilization of Digital Tools in Teaching and Learning of Economics Questionnaire (UDTTLEQ)" was used to generate data for the study. Content validity was used. Test-retest method of reliability was used to obtain the internal consistency. The reliability index was obtained through Cornbrash's alpha (.98). Out of the 117

questionnaires administered, 83 were returned valid, representing 71% success rate. Data collected was imputed into the SPSS (25) software package where descriptive statistics, in the form of frequency tables were generated. The test of null hypotheses was done using independent t-test. To uphold or reject the hypotheses advanced for the study, an Alpha of 0.05 levels of significance was used.

Results

Research Question One: Which digital tools teachers utilize in teaching and learning of Economics in FCT secondary schools, Abuja?

Table 1: Digital tools that teachers utilize in teaching and learning of Economics in FCT secondary schools, Abuja.

	Variables	Frequency	Percent
Valid	Google search engine	31	37.3
	Google classroom	9	10.8
	Notability	3	3.6
	Socrative	6	7.2
	Interactive whiteboards	5	6.0
	YouTube	3	3.6
	Wikipedia	26	31.3
	Total	**83**	**100.0**

Source: SPSS version, 25

Table 1 revealed that large percentage of the Economics teachers, 31 (37.3%) use Google search engine to facilitate the teaching and learning of Economics, 26 (31.3%) use Wikipedia and 9 (10.8%) use Google classroom. 6 (7.2%) use Socrative and 5 (6.0%) use interactive whiteboards, 3 (3.6%) use Notability and another 3 (3.6%) use YouTube. The findings implied that Economics teachers utilize Google search engine and Wikipedia as digital tools to facilitate the teaching and learning of Economics.

Research Question Two: What is the impact of utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja?

Table 2: Impact of utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja.

	Variables	Frequency	Percent
Valid	Make students learn better	15	18.1
	Make abstract concepts real to students	10	12.0
	Make learning permanent	30	36.1
	Make difficult concepts easy to explain	28	33.7
	Total	83	100.0

Source: SPSS version, 25.

Table 2 revealed that large percentage of the Economics teachers, 30 (36.1%) were of the view that using digital tools to teach Economics make learning permanent, followed by 28 (33.7%) who were of the view that using digital tools make difficult concepts easy for teachers to explain. 15 (18.1%) of the Economics teachers were of the view that using digital tools make students learn better and 10 (12.0%) of the Economics teachers believed that

utilizing digital tools make abstract concepts real to students. Conclusion drawn is that utilizing digital tools make learning permanent for students (36.1%) and also make difficult concepts easy for teachers to explain (33.7%).

Research Question Three: What are the challenges affecting the utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja?

Table 3: Challenges affecting the utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja.

Variables		Frequency	Percent
Valid	High cost of internet subscription	33	39.8
	Electricity problem	7	8.4
	Internet network failure	11	13.3
	Lack of digital competency	10	12.0
	Inadequate digital tools	22	26.5
	Total	**83**	**100.0**

Source: SPSS version, 25.

Table 3 revealed that large percentage of the Economics teachers, 33 (39.8%) were of the view that high cost of internet subscription is a challenge to the utilization of digital tools in teaching Economics, followed by 22 (26.5%) who were of the view that inadequate digital tools are major challenges. 11 (13.3%) portrayed the challenge to be internet network failure, 10 (12.0%) considered the challenge to be lack of digital competency while 7 (8.4%) attributed the challenge to electricity problem.

Conclusion drawn is that, utilizing digital tools in teaching and learning of Economics in FCT secondary schools is faced with the challenges of high cost of internet subscription (39.8%) and inadequate digital technological tools (26.5%).

Test of Hypotheses

Ho_1 There is no significant difference between the mean ratings of male and female Economics teachers on digital tools teachers utilize in teaching and learning of Economics in FCT secondary schools, Abuja

Table 4: t-test on significant difference between the mean ratings of male and female Economics teachers on digital tools teachers utilize in teaching and learning of Economics in FCT secondary schools, Abuja.

Status	N	Mean	Std. D	T	df	Sig. (2-tailed)	Decision
Male Teachers	44	2.2045	1.45601	-6.932	81	.001	rejected
Female Teachers	39	5.3846	2.62193				

Source: SPSS version, 25 **p = .001 < 0.05.**

Table 4 presents t-test which determines significant difference between the mean ratings of male and female Economics teachers on digital tools teachers utilize in teaching and learning of Economics in FCT secondary schools, Abuja. The table reveals that df = 81 and t =-6.932 at p = .001. The mean rating of both male and female Economics teachers on digital tools teachers utilized in teaching and learning of Economics in FCT secondary schools, Abuja is considered significant since p = .001 < 0.05. The hypothesis which states that

there is no significant difference between the mean ratings of male and female Economics teachers on digital tools teachers utilize in teaching and learning of Economics in FCT secondary schools, Abuja is hereby rejected.

Ho_2 There is no significant difference between the mean ratings of male and female Economics teachers on the impact of utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja.

Table 5: t-test on significant difference between the mean ratings of male and female Economics teachers on the impact of utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja.

Table 5: t-test on significant difference between the mean ratings of male and female Economics teachers on the impact of utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja.

Status	N	Mean	Std. D	T	df	Sig. (2-tailed)	Decision
Male Teachers	44	2.6136	1.14559	-2.210	81	.03	Rejected
Female Teachers	39	3.1282	.95089				

Source: SPSS version, 25 **p = .03 < 0.05.**

Table 5 presents t-test which determines significant difference between the mean ratings of male and female Economics teachers on the impact of utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja. The table reveals that df = 81 and t =-2.210 at p = .03. The mean rating of both male and female Economics teachers on the impact of utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja is considered significant since p = .03 < 0.05. The hypothesis which states that there is no significant difference between the mean ratings of male and female Economics teachers on the impact of utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja is hereby rejected.

Ho_3 There is no significant difference between the mean ratings of male and female Economics teachers on the challenges affecting the utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja.

Table 6: t-test on significant difference between the mean ratings of male and female Economics teachers on the challenges affecting the utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja.

Status	N	Mean	Std. D	T	df	Sig. (2-tailed)	Decision
Male Teachers	44	1.6591	.93866	-8.959	81	.001	Rejected
Female Teachers	39	4.0256	1.44162				

Source: SPSS version, 25 **p = .001 < 0.05.**

Table 6 presents t-test which determines significant difference between the mean ratings of male and female Economics teachers on the challenges affecting the utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja. The table reveals that df = 81 and t =-8.959 at p = .001. The mean rating of both male and female Economics teachers on the challenges affecting the utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja is considered significant since p = .001 < 0.05. The hypothesis which states that there is no significant difference between the mean ratings of male and female Economics teachers on the challenges affecting the utilization of digital tools in teaching and

learning of Economics in FCT secondary schools, Abuja is hereby rejected.

Discussion of Findings

Table 1 presented responses on digital tools that teachers utilize in teaching and learning of Economics in FCT secondary schools, Abuja. Key findings from the table revealed that, majorly, Economics teachers in secondary schools in the FCT utilize Google search engine (37.3%) and Wikipedia (31.3%) as digital tools to facilitate the teaching and learning of Economics. These teachers hardly use Google classroom (10.8%), Socrative (7.2%), Interactive whiteboards (6.0%), Notability (3.6%) and YouTube (3.6%). The findings contradicted some of the existing literature on digital tools that are commonly used by teachers especially in Nigeria. The major findings of the study were consisted with the position of AbdelSalam and Madji (2021); Owolarafe, Abdulraheem, and Bolaji (2024) who listed Google search engine, wikis and Google classroom among digital technological tools used by teachers in educational setting.

Table 2 presented responses on the impact of utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja. Key findings from the table showed that, majorly, using digital technological tools to teach Economics make learning permanent (36.1%) and also make difficult concepts easy for Economics teachers to explain (33.7%). The impact of digital tools in teaching and learning of Economics is average on making students to learn better (18.1%) but minimal on making abstract concepts real to students (12.0%). These findings corroborated the earlier study by Bunza (2018) that digital technological tools allow access to a wealth of educational resources that include online databases, journals and multimedia contents. These resources can enrich the Economics curriculum and provide students with up-to-date information and diverse perspectives on arrays of Economics topics. For instance, multimedia resources such as videos and animations can simplify complex concepts and make them more relatable to students.

Table 3 presented responses on the challenges affecting the utilization of digital tools in teaching and learning of Economics in FCT secondary schools, Abuja. Key findings from the table showed that high cost of internet subscription (39.8%) and inadequate digital technological tools (26.5%) were major challenges to the utilization of digital technological tools in teaching and learning of Economics in FCT secondary schools. Internet network failure (13.3%), teachers' lack of digital competency (12.0%) and electricity problem (8.4%) has minimal challenges. These findings opposed the views of Olakulehin (2018) who argued that integrating digital technologies in classrooms faces multifaceted challenges that include unreliable electricity supply and limited internet connectivity. Without consistent power and internet access, schools struggle to maintain uninterrupted use of digital devices and online educational resources. It also disagreed with Adeoye and Ogunleye (2020) who argued that many teachers lack adequate training and support in using digital technological tools effectively in their classrooms.

Conclusion

The integration of digital tools in teaching and learning of Economics offers numerous benefits that can enhance student engagement, understanding, and academic performance. But there are numbers of challenges affecting the utilization of digital technological tools in schools. However, based on the findings of the study, conclusion can be drawn that: Economics teachers in FCT secondary schools make use of digital tools that include Google search engine and Wiki to enhance the teaching and learning of Economics. Teachers do not use Google classroom, Socrative, Interactive whiteboards, Notability and YouTube for teaching and learning of Economics. Digital tools have positive impact on teaching and learning of Economics in FCT secondary

schools. Its utilization makes learning permanent and also makes difficult concepts easy for Economics teachers to explain. High cost of internet subscriptionand inadequate digital technological tools are major challenges to the utilization of digital technological tools in teaching and learning of Economics in FCT secondary schools.

Recommendations

Based on the findings and conclusion of the study, the following recommendations were put forward.

1. FCT administration should provide free internet connection (WIFI) across the public secondary schools within the FCT to ensure free access to internet service by teachers and students. This will also reduce the cost of internet subscription to source of education materials by teachers and students.
2. FCT administration and donor agencies should supply FCT secondary schools with adequate digital technological tools needed to facilitate teaching and learning, particularly in Economics.
3. Economics teachers should go for in-service training, workshops and seminars on the application of digital tools in facilitating teaching and learning in classrooms. They will improve their digital competencies, especially in handling digital technological tools.
4. Economics teachers should deploy available digital technological tools for classroom instruction to facilitate concrete learning.

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INFLUENCE OF SOCIO-ECONOMIC STATUS ON STUDENTS' ACADEMIC PERFORMANCE IN APA LOCAL GOVERNMENT AREA OF BENUE STATE

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Abstract

The study investigated the Influence of socio-economic status of parents on the academic performance of secondary school students in Apa Local Government Area of Benue State. Four research hypotheses were formulated and tested and survey research design was adopted for the study. 150 students were randomly selected and used from the total Population of 1, 578 which represents 10% of the population. A self-constructed questionnaire on the socio-economic status of parents was employed as instrument for data collection and the students' grade point average (GPA) was used as a measure of their academic performance. The reliability coefficient of the two instruments is 0.78 and 0.69 respectively. Inferential statistics of independent sample t-test was used to analyze the data and all the null hypotheses were tested at 0.05 level of significance. Findings of the study revealed that: parent level of education has significant influence on the academic performance of students (t-value 5.09, t-critical 1.66), parent occupation has significant influence on the academic performance of students (t-value 4.58, t-critical 1.655), Family size has significant influence on the academic performance of students (t-value 3.59 t-critical 1.655) and income of the parent has significant influence on the academic performance of students (t-value 6.16 t-critical 1.66). The study concluded that parent level of education, nature of occupation, family size and level of income are some of the factors that influence academic performance of students. Therefore, it is recommended among others that Parents of low socio-economic status should be empowered to enable them provide the basic needs for their children in order to enhances their academic performance.

Keywords: Socio-economic status, academic performance.

Introduction

Assessing academic performance is vital for evaluating students' progress, improving educational practices and making data-driven decisions in education. Giving the report of mass failure in the senior school certificate examination results, it is importance to investigate academic performance of secondary school students. Owusu and Larson (2015) pointed out that "It is sad to note that for five consecutive years, candidates writing the National Examination Council (NECO) examination have recorded mass failures. Apparently, this scenario is worrisome to education stakeholders as nobody knows who should be responsible or blame for low performance. In 2002 at NECO's maiden edition, most candidates passed their registered subjects including Mathematics and English Language however, performances of students in this national examination continue to deteriorate every year, down to 11.3% in recent years (West, 2012).

In a similar way, Gulbahar et al, (2018) reported that the result of WAEC in recent years witnessed a mass failure in Mathematics and English Language. They reported that only 31.28% obtained credits in Mathematics and other four subjects. In comparing this result to the past performance, there is a marginal decline in the performances of students. The researcher observed that this mass failure in national examination has been a source of worry to parents and guardians in Apa local government majority of whom are of low socio economic status and therefore finding it difficult to register their children on two sittings. There are indications that most parents in Apa local government will be unable to give their children a second chance in sitting for these national examinations due to their socio economic background.

The nature of the relationship between socio-economic status and students' academic performance has been debated for decades with the most influential arguments appearing in equality of educational opportunities (Rothman, 2013). Socio -economic status is any measure which attempt to classify individuals, house-hold or families in terms of indications such as occupation, family size, income, education, among other in relation to their interaction in the society. Socio economic status includes factors such as two-parent versus single-parent households, divorce, parenting practices and aspirations, maternal characteristics, family size, and neighborhood (Majoribanks, 2016).

According to Nwachuku (2011), in the quest of finding survival feet, the nation has evolved series of socio-economic and educational measures and policies such as structural adjustment program (SAP), austerity measure, universal primary education, (UPE), Universal Basic Education (UBE) and devaluation of the naira. These measures have not improved the socio-economic and educational status of families in the country. They have rather increase their suffering and widened the socio-economic gaps between families. Many rural and sub-urban dwellers can no longer pay the school fees of their children. Children are made to engage in subsistence farming and become housemaids or engage in other menial jobs to support their academic pursuit. It is on this background that this study investigated the influence of socio economic status on the academic performance of secondary school students in Apa local government area of Benue state.

The environment at home is a primary socialization agent and influences a child's interest in school and aspirations for the future. For these reasons, socio-economic status is closely tied to home environment and one could argue that socio-economic status dictates the quality of home life for children. Isanghedighi (2016) noted that children whose parents are of low socio-economic are made to engage in petty trading in order to earn income with which to pay fees and buy books while the high socio-economic parents encourage their children to have extra coaching after school

period. In order words, when children are poorly catered for and deprived of the basis learning resources such as pens, pencils, books, such children are very likely to achieve poorly in school work. Socio-economic status (SES) is often measured as a combination of education, income, family size and occupation. It is commonly conceptualized as the social status or class of an individual or group. Low socio-economic status and its correlates, such as lower education, poverty and poor health, ultimately affect our societies as a whole.

Research indicates that children from low social economic status (SES) households and communities develop academic skills more slowly compare to children from higher socio-economic status group. Aiken and Barbarin (2018) noted that, the school system in low social economic status communities are often under resource and have negatively affected student's academic progress. Families from low social economic status communities are less likely to have the financial resource or time available to provide children with academic support. The health status of the children which could also be traceable to parental socio-economic background can be another factor that can affect the academic performance of the student. It has been reported that in a rural community where nutritional status is relatively low and heath problem are prevalent, children academic performance is greatly hindered.

Home background influence academic and educational success of students. Socio economic status reinforces the activities and functioning of the teachers and students. The quality of parents and home background of student goes a long way to predict the academic performances of student. Children from poor home may suffer because there may be no money to pay school fees, purchase book, uniforms, and other schools' materials, such child may play truant, thus his performance in school may be adversely affected. On the other hand, good parenting supported by strong economic home background could enhance strong academic performance of the child. Some empirical findings on socio economic status and academic performance of students are reviewed to guide this study.

Easmin et al (2015) investigated the impact of different socioeconomic indicators on the academic performance of the undergraduate students of Bangladesh. The relationship between different components of parental socio economic status with the academic performance of students of selected Private universities of Dhaka city in Bangladesh is investigated. Using semi structured questionnaire information from a sample of one hundred and seventy-five (175) randomly selected students of seven private universities is used for the study. Diverse statistical tests were performed on the various data collected to establish statistical significance of the effects on student's academic performance. Mother's education has significance effect on the academic performance of the students. However, the parental educational qualification was identified to have statistically significant effect on the academic performance of the students. The two variables that indicated significant influence do reflect nature of the student's home environment and played notable role in the academic achievement of the respondents.

Ovansa (2017) investigated the effects of socio-economic background of senior secondary school students on their academic performance in Adavi LGA of Kogi state. Survey and ex-post facto research design work was used to collect data on student socio-economic background and their academic performance respectively. The population of the study comprises of out-going senior secondary school students of the selected school and their parent's socio-economic status. Stratified random technique was used to select the secondary schools and the students for the study. Simple percentage was used to analyze the research hypothesis. Conclusion drawn

from the analyses indicates that parent socio-economic status influenced the academic performance of the students. Recommendation was made based on the findings. Such as: parents with high socio economic status to assist schools in area of educational developments. Government should introduce scholarship scheme to assist less privilege students, basic and social amenities to be provided in all public schools by the government to ensure that standard are maintained.

Gobena (2018) investigated the effect of family socio-economic status on students' academic Achievement. Descriptive survey research design was employed. The target population was students from the College of Education and Behavioural Sciences. 172 students were taken from the target population through stratified random sampling. The results showed us that first, family income did not bring anything new to students' academic Achievement; second, there was statistically significant negative relationship between sex and students' academic achievement; finally, family education level contributed 40.96% (R2*100%) to students' academic achievement whereas 59.04% (1-R2) *100%) were unex-plained variables that contributed to students' academic achievement. It was recommended that families should access education to encourage their children in schools. Moreover, socio-economic policies should be formulated to enable children from low economic status to have equal opportunity as children from high economic parents to maintain the harmony among children in the nation.

Statement of the Problem

In Nigeria today, the standard of education has fallen thus leading to a lot of arguments among scholars, teachers, stakeholders, educationalists, civil servants etc as to immediate and the remote cause of the fallen standard and factors hindering high standard of education . While we blame government, teachers and pupils, the family which pupils come from have much to be desired. It is of great importance to note that we cannot exonerate the family which the child comes from when we are talking about pupils' performance in school. This is based on either the family background which is either polygamous or monogamous in nature, socio economic status of the parents or level of education of the parents or if the family health facilities may be involved.

Objectives of the Study

The general objective of this study is to investigate the influence of socio economic status of parents on students' academic performance in Apa local government area of Benue state. Specifically, the objectives of the study are:

1. To find out the influence of parents' level of education on the students' academic performance in Apa local government of Benue state.
2. To find out the influence of parents' occupation on the students' academic performance in Apa local government of Benue state.
3. To find out the influence of parents' family size on the students' academic performance in Apa local government of Benue state.
4. To find out the influence of parents' income on the students' academic performance in Apa local government of Benue state.

Research Questions

The following questions are raised to guide the study.

1. What is the influence of parents' level of education on the academic performance of students in Apa local government, Benue state?
2. What is the influence of parents' occupation on the academic performance of students in Apa local government, Benue state?
3. What is the influence of parents' family size on the academic performance of students in Apa local government, Benue state?
4. What is the influence of parents' income on the academic performance of students in Apa local government, Benue state?

Research Hypotheses

The following null hypotheses are formulated to guide the study.

1. There is no significant influence of parents' level of education on the academic performance of students in Apa local government Benue state.
2. There is no significant influence of parents' occupation on the academic performance of students in Apa local government Benue state.
3. There is no significant influence of parents' family size on the academic performance of students in Apa local government Benue state.
4. There is no significant influence of parents' income on the academic performance of students in Apa local government Benue state.

Methodology

The population of this study comprises of five senior secondary school students randomly selected from Apa local Government Area of Benue State. The total population of the study is (1578) and the sample size is 150 representing 10 % of the population. According to Guilford and Fruchter (2013), the sample of 10% of the population is adequate for a descriptive research. The design of this study is descriptive survey. Socio economic status questionnaire and students' grade point average (GPA) were used as instruments for data collection. Socio economic status questionnaire has four subscales comprising parental level of Education, Occupation, Family size and Income. The scores of the instrument was correlated with students' grade point average (GPA) obtained as measure of their academic performance. The two instruments were validated to ascertain their relevance and appropriateness in the study. The internal consistency and reliability measures of the instruments are 0.78 and 0.69 respectively. The Inferential statistics of independent sample t-test was used to analyze the data and all the null hypotheses were tested at 0.05 level of significance.

Results

Table 1. Independent sample t-test statistics on parents' level of education and academic performance of students.

Variables	N	Score	SD	t-value
Literate	89	14.82	6.71	5.09*
Illiterate	61	10.12	4.60	

Significant at 0.5, critical t = 1.66 df = 148

The result of the analysis as presented in Table 1 showed that, the calculated t-value of (5.09) is higher than the critical t-value of 1.66 at .05 levels of significance with 148 degrees of freedom. Therefore, the null hypothesis which stated that there is no significant influence of parental education on the students' academic performance is hereby rejected. This result implies that, there is a significant influence of parental education on the students' academic performance.

Table 2. Independent sample t-test statistics on parents' occupation and academic performance of students.

Variables	**N**	**Score**	**SD**	**t-value**
High	89	15.93	6.21	4.82*
Low	61	11.33	5.40	

Significant at 0.5, critical t = 1.655 df = 148.

In Table 2 presented above, it is revealed that, the calculated t-value of (4.82) is higher than the critical t-value of 1.655 at .05 levels of significance with 148 degrees of freedom. This

result implies that, there is a significant influence of parental occupation on the students' academic performance, therefore the null hypothesis which stated that there is no significant influence of parental occupation on the students' academic performance is hereby rejected.

Table 3. Independent sample t-test statistics on parents' family size and academic performance of students.

Variables	N	Score	SD	t-value
Large	90	13.83	5.63	
				3.59*
Small	60	10.71	4.92	

Significant at 0.5, critical t = 1.655 df = 148.

According to Table 3 presented above, it is revealed that the calculated t-value of (3.59) is higher than the critical t-value of 1.655 at .05 levels of significance with 148 degrees of freedom. This means that, there is a significant influence of parental family size on the students' academic performance. Therefore, the null hypothesis which stated that there is no significant influence of parental family size on the students' academic performance is hereby rejected.

Table 4. Independent sample t-test statistics on parents' income and academic performance of students.

Variables	N	Score	SD	t-value
High	98	14.92	6.91	
				6.16*
Low	52	9.15	4.50	

Significant at 0.5, critical t = 1.66, df = 148.

Table 4 result analysis showed that, the calculated t-value of (6.16) is higher than the critical t-value of 1.66 at .05 levels of significance with 148 degrees of freedom. It implies that there is a significant influence of parental income on the students' academic performance therefore, the null hypothesis which stated that there is no significant influence of parental income on the students' academic performance is hereby rejected.

Discussion of Findings

The domains of socio-economic status investigated in this study are parents' level of education, occupation, family size and income. This study found that all these domains of socio-economic status have significant influence on the academic performance of students. The finding of this study is in line with the previous finding of Easmin et al (2015). According to Easmin et al, Mother's education has significance effect on the academic performance of the students. The parental educational qualification was identified to have statistical significant effect on the academic performance of the students. The two variables that indicated significant influence do reflect nature of the student's home environment and played notable role in the academic achievement of the students. This finding also agreed with the previous study of Ovansa (2017). Ovansa study indicates that parent socio-economic status influenced the academic performance of the students.

Furthermore, Gobena (2018) study partly agreed and disagreed with the finding of this study. According to his finding, family income did not bring anything new to students' academic achievement. This finding does

support the finding of this study which stated that family income has significant influence on the academic performance of students. However, it was found in his second finding that family education level contributed 40.96% (R2*100%) to students' academic achievement whereas 59.04% (1-R2) *100%) were unexplained variables that contributed to students' academic achievement. This second finding of Gobena agreed with the finding of this study which stated that parents' level of education has significant influence of the academic performance of students. The agreement and disagreement that exists between this study and the previous studies could be attributed to many other factors such as the population, location, and the nature of measurement.

Conclusion

It was found that all the domains of socio-economic status investigated in this study which include: parents' level of education, occupation, family size and income have significant influence on the academic performance of students in Apa local government Benue state. It is therefore, concluded in this study that socio economic status of parents' such as education, occupation, family size and income have significant influence on the academic performance of students.

Recommendations

The study recommended that parents of low socio-economic status should be empowered to enable them provide basic needs for their children in order to enhances their academic performance. Counselling psychologists should be employed in schools to identify students with low socio-economic background and provide counselling support to them. Seminars and workshops should be regularly organized for parents on the effect of large family size. This will enable them build a manageable home that guarantee basic educational needs for their children. Government and educational stakeholders should endeavor to provide students facilities like Libraries, laboratories, etc. so as to improve students' academic performance.

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APPLICATION OF DIGITAL TECHNOLOGY RESOURCES AND SERVICES USE BY LIBRARIANS IN THE 21ST CENTURY ACADEMIC LIBRARIES IN GOMBE STATE, NIGERIA

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Abstract

The study investigated application of digital technology resources and services use by Librarians in the 21st Century Academic Libraries in Gombe State, Nigeria. The objectives of the study include: to Identify digital technology resources and services use by Librarians in the 21st Century academic libraries in Nigeria and to establish challenges of digital technology use by Librarians in the 21st Century academic libraries in Nigeria. The study was guided by descriptive research design. The study population consisted of 45 librarians from academic libraries in Gombe State, Nigeria. Census sampling techniques was used for this study. The study found that the use of digital technology resources and services use by librarians is that digital technology contributes largely to library services for the benefits of the users and community service. The study established that despites challenges associated despites gaps identified in the literature, the study indicated that digital technology resources and services use continued to shaped the digital information service delivery towards improving their research output and learning capabilities. The study concluded that librarians in academic libraries have a greater role to play in bridging the prevailing information gaps through virtual/digital technology services, Internet, social media services and digital references services as strategies to widen information service delivery. The study study recommends thatthere is a need for librarians to use digital technology resources and services to demonstrate new knowledge to deliver

information service delivery and improve information service provision. Also, there is a need for librarians to be more proactive in tackling various challenges that confront the use of digital technology resources and services use in handling the ever-changing digital technology.
Keywords: Digital Technology, Internet Services, Electronic Resources, Social Media Services, Academic Libraries.

Introduction

The 21st century is characterized by digital technology revolutions and innovations. Today, the advents of digital technologies have transformed the way services are delivered for communication, information generation, access and dissemination (Emiri, 2023). Digital technologies have opened opportunities for individuals, organizations, corporate bodies and nations for effective information service delivery (Anyim, 2018). Library and information Science Professionals require skills and competencies of the digital technologies to facilitate teaching, learning and research to provide effective library services with the view to remain relevant in the digital era (Singh, 2019).

The concept of digital technology is terms commonly used interchangeably across disciplines such as the sciences, engineering, education, medicine, social science, management, and humanities. Apparently, there is no single universal definition of the term "digital technology" because it covers a wide range of perspectives and approaches. Definitions from academic literature provide convergent and divergent views and opinions of digital technology. For example, Singh (2019) defines digital technologies as those information resources that can only be accessed by the use of computers and other digital/ICT devices. These materials may require the use of a peripheral device directly connected to a computer or computer network. Hussain (2019) conceptualize digital technology to mean the application of technological services resources such as, Digital video Disc (DVD), the Internet, Online Public Access Catalogues (OPAC), electronic books, electronic journals and electronic index for delivery of information services. In the context of this paper, digital technology is the application of the Internet, electronic resources and social media platforms in the delivery of information services in academic libraries to improve teaching, learning and research output. In other words, the use of digital technology resources and services has given rise to new modes of organizing, processing and accessing information resources in academic libraries. Globally, the advent of ICTs and the evolution of World Wide Web (WWW), smartphones, tablets, robots, e-books and game machines have enabled academic libraries to develop skills and knowledge for effective use of digital technologies to improve communication, collaboration, education, research and learning (IFLA, 2023a).

Despite the critical role of digital technology, literature shows disparities between the developed and the developing countries. Many academic libraries in the United States of America, the United Kingdom, Canada and France have demonstrated skills in digital technologies to ensure efficient and effective information service provision in an environment driven by technology (Hussaini, 2023). However, developing countries like Morocco, Tunisia and Malawi still find it difficult to progress into a technology-driven environment, global economy and knowledge-based society (UNESCO, 2017). For example, Ansari (2013), observed that LIS Professionals in Pakistan find it difficult to keep pace with new challenges of digital technology. In Africa, a review of literature reveals that academic libraries are still facing challenges of providing library services using Internet. For example, Atram (2017) states that many academic libraries in developing countries were still finding it difficult to use the Internet, social

media and electronic resources in the provision of library services.

In spite of these challenges, digital technologies have assisted academic libraries to assume new thinking and innovation towards timeliness in research as well as increase discovery and creation of new fields of inquiry in many countries in Africa (Hussaini, 2019). This study was motivated by the desire to explore and investigate application of digital technology in the 21st century academic libraries in Nigeria. With the advancement in digital technology, academic libraries have demonstrated interaction and communication, exchange ideas and knowledge via email, teleconferencing and chatting to advance information service delivery. However, evidence from literature indicated that not all academic libraries have digital technology resources and services to provide effective information service delivery. This justified that digital technology resources played an important role in assisting academic libraries to develop new thinking and creativity toward digital technologies to support academic activities to achieve functional research, interactions and learning process (Ali, Naeem & Bhatti 2020). However, many academic libraries in developing countries especially in Nigeria still find it difficult to transform digital technologies to advance the library services to meet the dynamic and fast changing information needs of the users (Kaushal & Yadav 2022).

Statement of the Problem

Despite that 21st century is characterized by digital technology transformation and innovations to advance research output in academic libraries worldwide (Reynolds, 2016), the inability of some academic libraries in developing countries to provide quality information service delivery with digital technology to deliver effective information services is still a challenge (Lamptey, 2016). The central argument in various studies indicated that many academic libraries find it difficult to keep pace with new challenges of digital technology to demonstrate quality innovations in the provision of library services (Raju, 2017; Hussain, 2019). The argument also noted that some academic libraries were still lagging behind to effectively use digital technologies such as computer application, Internet, Electronic resources, Mobile technology services, cloud computing and web content management to engage in information service delivery (Atram, 2017; Anyim, 2018). Therefore, this study became necessary to close the gaps for academic libraries to use various digital technologies in the provision of effective and efficient information service delivery in the 21st century.

Objectives of the Study

The objectives of this study are to:

1. Identify digital technology resources and services use by Librarians in the 21st Century academic libraries in Nigeria
2. Establish challenges of digital technology use by Librarians in the 21st Century academic libraries in Nigeria.

Literature Review

Digital Technology Resources and Services use by Librarians in the 21st Century Academic Libraries.

Digital technology resources and services and specifically the paradigm shift in library services with the advent of Information and Communication Technologies (ICTs), Internet services, electronic resources, digital collections and other digital technology quality information service delivery in academic libraries in Nigeria. Academic libraries are pivotal contributors to the academic success of higher education, fostering intellectual growth, facilitating research endeavors, creativity, life-long learning and enhancing overall excellence by providing a diverse range of digital technology services in fostering information literacy (Hotsonyame 2023). Academic libraries serve as indispensable technological hubs that cater for the students, lecturers, researchers and other members' academic community for advancement in scholarship and

educational excellence (Rodrigues & Mandrekar 2020).

The global evolution of digital technological advancements has significantly reshaped and revolutionized various service provisions in the library. The integration of digital technology into the academic library landscape has elicited both commendation for its streamlining of traditional processes and criticism for its limitations (Gillespie et al. 2023). Over the years, librarians in academic libraries, mirroring other sectors, have undergone substantial transformations, transitioning from manual operations to embracing cutting-edge technologies to enhance library utilization and streamline service access. Notable advancements include the transition from traditional card catalogues to Online Public Access Catalogues (OPAC), simplifying information retrieval and eliminating the need for exhaustive manual searches (Eserada & Okolo 2019). Additionally, the accessibility of library services has significantly improved, enabling remote subject assistance without physical presence (Adetayo 2023). These technological strides have been instrumental in fostering improved library utilization, particularly pertinent in the context of the fourth and fifth industrial revolutions (Oke & Fernandes 2020). Literatures identify digital technology resources and services in the 21st Century academic libraries as follows:

The Internet Services: The Internet is the high –speed fiber-optic network of networks that use TCP/TP protocols to interconnect computer networks around the world. The Internet according to Howe (2016) enables users to communicate via e-mail, transfer data and programme file via file transfer protocol (FTP), find information on the world wide web, and access remote computer system such as online catalogue and electronic databases easily. Over the last decade, a significant transformation has been noticed in the academic libraries and the roles of librarians have changed as well. Internet services in academic libraries are meant to assist libraries in bridging the prevailing information provision gaps in the teaching, learning and research needs of the users (Elizabeth & Ronke, 2015). The emergence of the Internet service has opened opportunities for quickly reaching out to many users at the same time (Adeyinka, Akanbi-Ademolake & Olufemi, 2017). Librarians from developed countries have demonstrate ability in the Internet services to facilitate teaching, learning and research which are the core mandate of academic institutions. For example, the American Library Association (ALA) (2012) provides a standard for Internet service in academic libraries in the United State of America. The International Federation of Library Association (IFLA) (2016) recommends that academic libraries in Asia and Europe demonstrate knowledge in metadata, digital contents, content creation, support in online search, and cybersecurity in enhancing effective library services. Despite effort of the Internet services in bridging the information provision gaps, challenges of learning new technologies on Internet services still persist in some part of Africa (Echedom & Okuonghae, 2021). Many academic libraries in many parts of African countries are still lagging behind to demonstrate capabilities and capacities to be familiarized with the Internet in the provision of library services.

Social Media Services: Social media platforms are platforms use by librarians in academic libraries have become an indispensable phenomenon in global information provision and dissemination. This is because in a world driven by digital technological advancement, there is need for academic libraries to equip themselves with the information needs of 21st century library users especially in the area of marketing and promotion of information products and services (Alhassan, 2022). Social Media has become a platform that everybody, organizations and institutions cannot do without (Hussain, 2019). Before the advent of social media platforms, library holdings were predominantly in print, but, the evolution in

ICTs, digital technologies, digital resources in electronic formats where library collections have changed from local contents to global networks. Atram (2017) clarifies that the emergence of social media platforms has affected virtually every sphere of human endeavor as it revolutionized information communication.

Social media have become an increasing familiar tool employed by academic libraries in sharing information and marketing services and resources to current and prospective patrons. Social media applications offer boundless opportunities for academic libraries to learn while also contributing to the knowledge of others. Social media service is an evolutionary development of online participation where people of common interest communicate, share and contribute content on the social cyberspace. It is a viable tool for cooperation and sharing of knowledge in an open access platform. In the Social Network, people with common interests are able to share information with each other via a huge variety of social network sites (sites created specifically to make sharing, communicating, and creating information as simple and efficient as possible). Academic libraries in developed countries like Britain, France, Germany, Japan and China takes advantages of social media to provides opportunity to reach out to academic community, target specific audiences, and give chance to interact with library and library services. On the other hand, academic libraries in developing countries are still lagging behind to communicate and exchange ideas, share information and learning capabilities because of poor skills in using social media for engagement, exchange and sharing of ideas. It is evidence that studies have indicated that many academic libraries are finding it difficult to use social media platforms for collaboration and exchange of information in the delivery of information service which are integral part of library services (Anunobi, 2019; Alhassan, 2022).

Electronic Information Resources: Electronic information resources are one of the basic digital technology services that contribute to the growth of academic libraries. Electronic information resources especially in e-journals, e- newspapers and e-magazines, e-books, digital images, online databases and other digital networks have assisted academic libraries in the delivery of information services. In addition, academic libraries make use of electronic information resources especially with the use of e-discussion, e-news, data archives, e-mails, online chatting and social media to enhance library service. Electronic information resources and technologies have a great potential in improving the provision of library service to users at a lesser cost. According to Raju (2014), electronic information resources involve the ability of academic libraries to demonstrate knowledge in e-journals, e-newspapers and e-magazines and e-books. Similarly, Hussaini (2023) highlights the importance of electronic information resources creation and maintenance as one of the digital technology abilities that assists librarians to demonstrate knowledge and communication in information searching, retrieval and sharing. Raju (2017) emphasized that electronic resources and the accompanying digital platforms provide several benefits to libraries and its users. Adamou (2017) stated that academic libraries in the United State of America demonstrate knowledge in electronic information resources to enhanced information searching, retrieval and sharing, better access to information and speedy delivery of information to users. Hussaini (2023) opined that electronic information resources assist the academic libraries to assist users to responds to questions and receive responses and deliver digital content through hyperlinks embedded in the resources. The ability for the academic library to engage the use of electronic information resources in acquiring, organizing, preserving, storing and disseminating information resources in different formats for quality

information service delivery. On the other hand, Singh (2019) stressed that the inability of academic libraries to keep pace with reality of digital technology to demonstrate abilities in technological developments which dramatically change the way service is delivered.

Challenges of Digital Technology Resources and Services Use by Librarians in the 21st **Century Academic Libraries**

Literature review reveals numerous challenges of digital technology in academic libraries in the 21st century which have led to a wide gap in the way information is delivered with digital technologies (Odu and Omosigho, 2017). However, in the context of this study, the major challenges identified are as follows:

Poor Digital Technology Competence: Digital technology competence enables academic libraries to make use of digital resources to participate in new social and intellectual order (Vijayakumar & Gopalakrishnan, 2016). Poor digital technology to access computers and databases led to serious resentment of academic libraries in the delivery of information services. Acquiring Digital technology in academic libraries has become a requirement for deriving maximum benefit from digital technology development without which academic libraries would be confronted with a wide gap in meeting with the changes of modern society in information delivery (Vijayalakshmi, Thirumagal & Mani, 2018).). The benefit of digital technology to enable academic libraries to demonstrate ability to evaluate and use information critically from relevant and authoritative sources online (Coldwell-Nelson, 2013). However, failure of some academic libraries to develop digital technology competence poses a big challenge in achieving the goals of digital transformation and innovations in academic libraries.

Inadequate Digital Technology Training: Inadequate digital technology training and re-training have become a huge problem affecting academic libraries in developing countries to carryout library functions in a digital environment. Poor digital technology of in academic libraries as a result of inadequate training has hindered the effective use of digital technology in academic libraries. Many academic libraries in developing countries still find it difficult to integrate digital technology to transform skills with the traditional method of information service delivery due to poor training.

Lack of Digital Technology Awareness: Lack of awareness and understanding of new digital technologies such as mobile Internet access, cloud-based computing, the 'Internet of Things', digital data, artificial intelligence and an increase in computer-driven decision-making and other forms of automation have become a big challenge for academic libraries in recent times (Eiriemiokhale & Sulyman, 2023).

Methodology

This study was guided by descriptive research design. The study population consisted 45 of librarians in academic libraries in Gombe State, Nigeria. In this study, since the total number of librarians was not large, census method was used to gather the data. The population units of the study consisted of 45 librarians across academic libraries in Gombe State. This study integrated quantitative methods approaches which allow richer and better result for every unit of the population that was studied. Therefore, forty-five copies of structured questionnaires were distributed to the study population. Of the 45 copies of the questionnaire administered, 38 copies were returned. Data analysis was done using frequency count and simple percentages. Statistical package for social sciences (SPSS) software was used as tool for data analysis in the study.

Findings and Results

This section is concerned with data presentation, analysis, interpretation and discussion of findings. The results are presented and analyzed based on the research questions by the researcher's.

Research Objective 1: Identify digital technology resources and services use by Librarians in the 21st Century academic libraries in Gombe State, Nigeria. To address this objective the researcher identified rolesplayedbylibrarians on the use of digital technology resources and servicesinacademiclibrariesin Gombe State. The respondents were given statements and they were to answer by stating their level of agreement with them using a scale: Strongly Agree (SA) = 4, Agree (A) =3, Disagree (D)=2 and, Strongly Disagree (SD)= 1 respectively. Table 2 shows the statements that the respondents were presented with and how they responded

Table 1: The digital technology resources and services use by Librarians.

S/N	The Digital Technology Resources and Services Use by Librarians	SA	A	D	SD
1	Digital technology resources and services use promotes speedy information search for efficient research productivity.	11 28.9%	25 65.7%	2 5.2%	0 0%
2	Digital technology resources and services enhance performance in the retrieval of current information service provision.	13 24.2%	20 52,5%	3 7.8	2 5.2%
3	Digital technology resources and services use assist librarians to develop new knowledge in my field of study.	10 26.3%	28 73.6%	0 0%	0 0%
4	Digital technology resources and services use decrease my productivity in the provision of information service delivery.	22 57.8%	13 24.2%	2 5.2%	1 2.6%
5	Digital technology resources and services use build networks among librarians in sharing of information across the globe.	11 28.9%	11 28.9%	15 22.0 %	1 2.6%

Source: Field (2025).

The findings revealed that 36 (94.7%) of the respondent indicated that digital technology resources and services use promotes speedy information search for efficient research productivity, while 2(5.2%) had divergent view. Similarly, the finding also showed that 33 (86.8%) of the respondents revealed that digital technology resources and services enhance performance in the retrieval of current information service provision, while 5 (13.1%) had contrary opinion. in the aspect of the digital technology resources and services use assist librarians to develop new knowledge in my field of study, 38 (100%) of the respondents strongly agreed or agreed with the statement while none of the respondent disagreed or strongly disagreed. On the contrary view, the finding also showed that over 36 (94.7%) of the respondents disagreed or strongly disagreed that Digital technology resources and services use decrease my productivity in the provision of information service delivery, while 3 (7.8%) agreed or strongly agreed with the assertion. The result also found that 22 (57.8%) strongly agreed or agreed that digital technology resources and services use build networks among librarians in sharing of information across the globe while 16 (24.6%) had contrary view. The implication of this findings is that the use of digital technology resources and services use by librarians is that digital technology contributes largely to library services for the benefits of the users and community service.

Table 2: Establish challenges of digital technology resources and services use by Librarians.

S/N	Establish challenges of digital technology resources and services use by Librarians	SA	A	D	SD
1.	Lack of knowledge of digital technology resources and services use lowered my acquisition of knowledge towards usage of digital information resources.	28 73.6 %	10 26.3 %	0 0%	0 0%
2	Inadequate digital technology resources and services use training and re-training affect my skills to deliver quality to acquire digital technology.	8 21.0 %	25 65.7 %	4 10.5 %	1 2.6%
3	Lack of skills on creating awareness and understanding of digital technology resources and services use affect my research and information needs to improve my knowledge.	30 78.9 %	8 21.0 %	0 0%	0 0%
4	Poor knowledge of digital technology resources and services usage have render slow rate and change of behaviours toward digital information resources.	15 22.0 %	16 42.1 %	5 13.1 %	2 5.2%
5	Poor skills in digital technology resources and services use posed a great danger in the future of information service delivery in the library.	17 44.7 %	20 52,5 %	1 2.6%	0 0%

Source: Field Survey (2025).

The finding revealed that majority of the respondents strongly agreed or agreed that they were facing challenges that ranges from inconsistency in system breakdown and inadequate maintenance, lack of standard well –equipped e-library, inadequate time for self-development programme due to work pressure in the library, lack of personal office computer affects work speed, inability to provide required technology tools and up-to-date knowledge in digital resource handling, unreliable power supply in the library affects internet connectivity which in turn affects online service delivery to patrons, inadequate funding sponsorship for national and international professional training and inadequate facilities and ICT tools in the library to foster service delivery to users.

Discussion of Findings

Objective one of the study was to identify digital technology resources and services use by Librarians in the 21st Century academic libraries in Nigeria. The study found that digital technology resources and services use promotes speedy information search for efficient research productivity. The study also found that digital technology resources and services enhance performance in the retrieval of current information service provision. Similarly, the study found that digital technology resources and services use assist librarians to develop new knowledge in my field of study. The study also revealed that digital technology resources and services use build networks among librarians in sharing of information across the globe. The finding is in line with a study by Chirra and Madhusudhan (2016) in a survey on the use of electronic journals by doctoral research scholars of Goa University, India, revealed that all (100%) of respondents used the e-journals of the consortium and accessed them effectively. The findings of this study also corroborate with findings by Rahmah, (2015) in their study on uses of digital resources by faculty and research scholars of Manonmaniam Sundaranar University found out that about 67.14% of the faculty members were familiar with the use of digital resources. Though, majority of the

respondents appreciate digital information resources as key to their academic success because digital information resources played and still playing a fundamental role in learning, research and information needs thereby changing their information seeking behaviours.

The second objective is to establish challenges of digital technology resources and services use by Librarians in the 21st Century academic libraries in Nigeria. The study established that despites challenges associated despites gaps identified in the literature, the study indicated that digital technology resources and services use continued to shaped the digital information service delivery towards improving their research output and learning capabilities. This is in line with study conducted of Singh, (2019) who justified that digital information resources is spreading to all nooks and crannies around the world, thereby fostering new thinking among students and researchers to acquire knowledge that would foster new research skills and learning capabilities. The findings of this study disagreed with the finding of Echedom and Okuonghae (2021) who revealed that the many students and researchers in higher institutions in Nigeria are lagging behind because of poor skills in digital information resources which have been major set- back in many higher institutions in Nigeria.

Conclusions

Application of digital technologies have continued to assist academic libraries to develop and refresh new thinking in order to keep abreast with the constant innovations and new developments in the digital world. The findings of the study revealed that digital technology resources and services use by librarians is that digital technology contributes largely to library services for the benefits of the users and community service. The study also revealed that application of digital technologies in Internet service, social media service, electronic resources and computer application have assisted librarians in academic libraries to deliver quality library services in an environment that is constantly changing with technology. Therefore, the study established that despites challenges associated despites gaps identified in the literature, the study indicated that digital technology resources and services use continued to shaped the digital information service delivery towards improving their research output and learning capabilities. The paper also concludes that gaps still exist as not all librarians in academic libraries in Gombe State are equipped with the right resources and services to deliver quality information services with the digital technologies. Therefore, academic libraries have a greater role to play in bridging the prevailing information gaps through virtual/digital technology services, Internet, social media services and digital references services as strategies to widen information service delivery.

Recommendations

Based on the findings of the study, the study recommends that:

1. There is a need for librarians to use digital technology resources and services to demonstrate new knowledge to deliver information service delivery and improve information service provision.
2. There is a need for librarians to be more proactive in tackling various challenges that confront the use of digital technology resources and services use in handling the ever-changing digital technology.

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THE ROLE OF TECHNOLOGY-ENHANCED LANGUAGE LEARNING (TELL) IN ADVANCING SOCIAL STUDIES EDUCATION IN 21ST CENTURY NIGERIA

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Abstract
The role of Technology -Enhanced Language Learning (TELL) in advancing Social Studies education in 21st century Nigeria is gaining increasingly attention due to the growing influence of technology in educational settings. TELL has the potential to revolutionize the teaching and learning of Social Studies by providing interactive, engaging and learner-centered experiences that are crucial for students' understanding of historical, geographical, political and cultural concepts. This paper uncovers the role of TELL in Social Studies education in Nigeria. It examines the benefits of technology integration such as engagement, access to a wide range of effective implementation such as limited infrastructure, lack of teacher training and socio-economic factors and suggests strategies to overcome these challenges. The paper suggests that TELL can transform Social Studies education in Nigeria by making it more dynamic and effective in preparing students for the challenges of the 21st century.
Keywords: Technology, Social Studies Education, 21st Century Learning, Nigeria.

Introduction

In the 21st century, the integration of technology into Social Studies education has become pivotal in enhancing instructional effectiveness, student engagement and overall learning outcomes. This is particularly significant in Nigeria, where the adoption of Information and Communication Technology (ICT) across various sectors, including education is steadily gaining momentum (Nomass, 2021). The application of digital tools such as multimedia resources, interactive whiteboards, learning applications, virtual classrooms and online collaboration platforms has introduced dynamic and flexible approaches to the teaching and learning of Social Studies. These tools allow teachers to present complex historical, geographical,

political and cultural concepts in more engaging, practical, and relatable ways.

Recent studies further highlight the realities and potential of technology integration in Nigerian Social Studies classrooms. For instance, a study by Ayinde and Ajibola (2023) on the impact of Technology-Enhanced Learning in Zaria Local Government Area, Kaduna State found that only 4.7% of Social Studies teachers had adequate exposure to educational innovations and the same percentage possessed relevant ICT skills for instructional use. This limited exposure reveals a significant gap in teacher preparedness and access to technological resources factors critical to successful integration. Similarly, research by Ibikunle, Ogunsanmi, and Paramole (2024) in Ibadan South, Oyo State assessed the influence of technology on Social Studies teaching and found moderate levels of integration. Notably, 90% of teachers reported using online resources, and 74% employed interactive whiteboards. While these figures are encouraging the study also identified barriers such as poor infrastructure and teacher resistance to change, indicating the need for a robust support system to foster wider and more effective use of technology.

Social Studies teachers' preparedness to implement Artificial Intelligence (AI) tools and e-learning platforms was conducted by Ododo, Anwan, Clement, Epoke & Mfon, (2024) in In Akwa Ibom State. The findings showed a high level of readiness among teachers, who recognized the transformative potential of these technologies in improving instructional delivery and learner participation. However, despite this enthusiasm, challenges such as the digital divide characterized by unequal access to devices and internet connectivity persist. Also, many teachers lack the necessary training to incorporate technology effectively and some students struggle to adapt to new digital learning environments (Atubi, 2021). Therefore, this paper seeks to examine the role of technology in advancing Social Studies education in 21st century Nigeria.

Clarifications of the Concepts

Social Studies Education:

Social Studies education most commonly refers to the training of professional educators to teach social studies. It includes the training of social studies educators who emphasize the need for social education through the teaching of various social science disciplines (e.g., history, psychology, political science). The field of social studies education is unique and is occasionally referred to as social science education and/or history education. However, it should be noted that social science education. The National Council for the Social Studies (NCSS, 2017) further defines Social Studies Education as a methodology drawing upon many disciplines including anthropology, archaeology, economics, geography, history, law, philosophy, political science, psychology, religion and sociology as well as appropriate content from the humanities, mathematics and natural sciences.According to Ogundare (2016), Social Studies is a study of survival in an organized curriculum as well as the process of finding solutions to such problems.

In this assertion, Social Studies as a subject in Nigeria educational system needs to be implemented in senior secondary schools because of its objectives to cater for social problems, especially in a situation whereby Nigeria as a country is facing social problems such as religious intolerance, suicide bombing and acts of terrorism that pervaded the relationship of citizens especially in the north east region where many lives were lost, properties worth billions of Naira were destroyed. In his study, Ajiboye (2019) ascribed social studies as a school subject that is out to direct and give learners a free hand and opportunity to make enquiries, investigate, discover, discuss, experiment and acquire experiences in order to make decisions on social issues and problems and find solutions to them. Social Studies should help students acquire knowledge, master the processes of learning and become active citizens.

Technology-Enhanced Learning (TELL):
TELL can be defined as the use of technology in enhancing the teaching and learning of language. It allows for the integration of digital resources such as language software, online platforms and multimedia tools to facilitate interactive and effective language learning experiences. This tool creates immersive environments that foster both learning and communication (Hubbard, 2019). TELL according to Chik (2017) is describes as the employment of digital technologies to provide learners with opportunities for language interaction, exposure and practice. Godwin-Jones (2018) frameworks TELL as educational tool that incorporates multimedia tools such as videos, podcasts and virtual classrooms which provide learners with diverse ways to interact with the target audience. He highlights that TELL is not only about the use of these technologies but also how they are integrated into pedagogical frameworks to enhance education. Stockwell (2017) defines TELL as the integration of various technologies such as computers, smartphones, and internet-based resources to support and improve language learning. Stockwell (2017) further focuses on how these technologies cater to diverse learning styles and provide learners with customized, flexible, and accessible learning experiences.

The Role of TELL in Advancing Social Studies Education in 21st Century Nigeria

In the context of Social Studies education, TELL supports the integration of technology to enhance students' understanding of historical, geographical, social and political topics. By incorporating digital tools, multimedia resources and interactive platforms, TELL not only improves language proficiency but also broadens the scope of Social Studies education by making it more engaging and effective.

Facilitating Active Learning and Engagement: One of the primary advantages of TELL in Social Studies education is its ability to engage students actively. Traditional teaching methods often focus on passive learning, where students are recipients of information. However, TELL encourages student participation through digital tools such as virtual simulations, multimedia presentations, gamified quizzes, and interactive maps empower learners to actively explore and analyze social, historical and geographical issues. For example, virtual field trips enable students to explore the Niger River or colonial landmarks without leaving their classrooms. These approaches support active learning and critical thinking to core goals of Social Studies education (Akinwumi & Kolawole, 2020).

Access to Rich and Diverse Educational Resources: One of the most transformative aspects of TELL in Social Studies is its ability to provide access to a wealth of diverse and culturally relevant content. Online archives, podcasts, video documentaries, digital museums and scholarly databases broaden the sources of information beyond conventional textbooks. Resources such as Google Earth, YouTube EDU, or Historypin allow students to explore real-world scenarios, compare global perspectives and investigate complex political or cultural issues (Kanu, 2018). This enhances content richness and supports inclusive, multicultural Social Studies instruction.

Personalised and Inclusive Learning: TELL enables the personalization of Social Studies instruction to meet the unique needs of each learner. Platforms that offer differentiated tasks, track progress, and provide real-time feedback enable learners to work at their own pace and revisit difficult concepts. For example, struggling learners can watch simplified videos on topics like democratic governance, while advanced students explore primary sources or create multimedia presentations. This inclusive approach ensures that every student has an equitable opportunity to master Social Studies content (Okoye, 2021).

Promoting Collaborative and Civic Engagement: TELL promotes collaboration which is a cornerstone of Social Studies. By

connecting students through online discussion boards, group projects via Google Docs and civic engagement platforms. These tools encourage learners to work together on research projects, simulate policy-making debates or organize community service initiatives. Through such digital collaboration, students develop empathy, respect for diversity, and critical citizenship skills. Technology thus fosters not only academic learning but also real-world social responsibility (Udu & Nwankwo, 2020).

Challenges of Implementing Technology-Enhanced Language Learning in Advancing Social Studies Education in 21st Century Nigeria

While Technology-Enhanced Language Learning (TELL) offers numerous benefit to enhancing Social Studies education in 21st century Nigeria, several challenges hinder its effective implementation. These challenges reduce the potential of digital tools and platforms to transform teaching and learning experiences. Understanding and addressing these barriers is crucial for promoting meaningful integration of technology in Social Studies instruction.

Limited Access to Technological Infrastructure: A fundamental challenge to the integration of technology in Social Studies education is the lack of adequate infrastructure across many Nigerian schools. Urban schools may have some access to devices like computers, projectors, and internet services, but rural and underserved areas often face acute shortages of these essential tools (Okoye & Nwogu, 2020). The persistent issue of unreliable electricity supply further disrupts efforts to use digital resources effectively, thereby limiting both teachers and students from benefitting from technology-enhanced learning environments.

High Cost of Technology Acquisition and Maintenance: The financial burden associated with procuring, maintaining, and updating technological resources represents a major obstacle. Many schools lack the funding needed to acquire necessary devices such as laptops, tablets, and interactive whiteboards, which are vital for effective technology integration in Social Studies classrooms (Akinwumi & Kolawole, 2020). Furthermore, the recurring costs of software licenses, subscriptions to educational platforms, and IT support add additional strain to already limited school budgets.

Lack of Teacher Training and Continuous Professional Development: Another pressing barrier is the insufficient training of teachers in the effective use of TELL for Social Studies instruction. Although some educators possess basic ICT literacy, many lack the pedagogical skills required to incorporate digital tools into their teaching practices meaningfully (Oladele & Agboola, 2019). The absence of structured, continuous professional development programs contributes to low confidence among teachers and hinders the widespread adoption of digital pedagogies in the classroom.

Limited and Unstable Internet Connectivity: Reliable internet connectivity remains a challenge in many parts of Nigeria. While some urban schools have intermittent access, rural areas suffer from poor infrastructure and high data costs, making online learning tools and resources difficult to use consistently (Ojo & Olaniyan, 2019). Even when internet services are available, they are often slow or unreliable, preventing real-time access to digital content such as videos, virtual simulations, and collaborative platforms that are crucial for enriched Social Studies instruction.

Resistance to Change and Technophobia among Educators: A cultural barrier affecting TELL adoption in education is the resistance to change among teachers and school administrators. Many educators are more comfortable with traditional, chalk-and-talk methods and may view digital tools as cumbersome or intimidating. Technophobia, fear of using technology still exists among some teachers, limiting their willingness to

explore and adopt innovative approaches to Social Studies instruction (Udu & Nwankwo, 2020). Moreover, school leadership may hesitate to invest in TELL due to unfamiliarity with its educational benefits or concerns about cost-effectiveness.

Inadequate Curriculum Integration of Technology: Although the national curriculum acknowledges the importance of ICT, many Social Studies teachers are uncertain about how to align digital tools with curriculum objectives effectively. Without clear guidelines or structured frameworks, TELL often remains underutilized or misaligned with learning goals (Okoye, 2021). This disconnect results in fragmented efforts where tools are used sporadically, limiting the deeper pedagogical transformation that TELL can offer.

Poor Maintenance and Technical Support: Even when schools manage to introduce TELL resources, ongoing maintenance is often neglected due to a lack of technical personnel and funding. Broken or outdated equipment, unresponsive software, and unresolved technical glitches hinder regular classroom use (Udu & Nwankwo, 2020). The absence of reliable support systems leads to disuse over time, discouraging both teachers and students from depending on digital tools for teaching and learning Social Studies.

Strategies for Promoting Effective Integration of Technology-Enhanced Language Learning in Social Studies Education

To fully harness the potential of TELL in Social Studies education, effective integration strategies must be developed. These strategies involve addressing technological, pedagogical and instructional challenges while ensuring that digital tools align with educational goals. The following are strategies for effective TELL integration in Social Studies teaching and learning:

Professional Development and Teacher Training: A critical strategy is ongoing professional development and training for teachers. Educators must be equipped with the skills and knowledge to use TELL effectively in the Social Studies classroom. This includes training on the use of educational software, digital tools, and the integration of multimedia resources that align with Social Studies curriculum objectives (Oladele & Agboola, 2019).

Developing a Technology-Integrated Curriculum: Integrating TELL into the curriculum is essential. Schools and educators should collaborate to design curricula that include digital learning tools, online resources and interactive media relevant to Social Studies. Examples include using online databases, historical archives, geographical information systems (GIS) and digital simulations. A well-integrated curriculum ensures that TELL use is purposeful and enhances the delivery of Social Studies content (Akinwumi & Kolawole, 2020).

Incorporating Interactive and Multimedia Resources: The use of interactive tools and multimedia resources significantly enhances student engagement and learning outcomes. Teachers can include video documentaries, virtual field trips, podcasts, educational games, and digital simulations to explore historical events, geographic concepts, and social issues. Tools like Google Earth and interactive maps enable students to visually engage with content, while multimedia resources bring complex topics to life (Kanu, 2020).

Encouraging Collaborative Learning through Digital Platforms: Collaboration is central to Social Studies education, and digital platforms can enhance it. Teachers should utilized tools such as online forums, collaborative documents (e.g., Google Docs) and video conferencing platforms (e.g., Zoom, Microsoft Teams) to promote student interaction. These platforms support group discussions, historical analysis, and joint projects, promoting teamwork, critical thinking, and communication skills (Udu & Nwankwo, 2020).

Providing Access to Resources and Equipment: Successful integration depends on access to the right TELL tools and resources. Schools must provide students and teachers with computers, tablets, internet access and appropriate software to support learning. Also, regular maintenance and technical support should be in place to ensure smooth functionality. Ensuring equitable access to these resources is vital for inclusive and effective education (Ojo & Olaniyan, 2019).

Implementing Blended Learning Approaches: Blended learning, which combines traditional classroom instruction with online learning, is an effective method for integrating technology. For instance, students can explore digital content at home such as videos or reading materials and engage in discussions or collaborative projects during in-person classes. This approach supports self-paced learning while preserving the benefits of face-to-face interaction (Olufemi & Olaniran, 2021).

Fostering Digital Literacy and Critical Thinking: TELL integration should also aim to develop students' digital literacy and critical thinking. Students need to learn how to evaluate online sources for credibility, distinguish between fact and opinion and use digital tools responsibly. These skills are essential for preparing students to navigate and analyse information in today's digital world (Okoye & Nwogu, 2020).

Conclusion

The integration of TELL into Social Studies education has the potential to improve teaching and learning outcomes in Nigerian schools. It offers innovative opportunities for Social Studies teachers and students to engage with educational content in more dynamic, interactive and meaningful ways. The use of digital tools and multimedia resources can enhance students' understanding of complex historical events, geographical phenomena and socio-political and cultural issues. Despite these benefits, several challenges hinder the effective adoption of TELL in Social Studies classrooms. These include inadequate infrastructure, limited teacher training and socio-economic disparities. However, with the implementation of effective strategies such as sustained professional development for teachers, improved access to TELL tools and meaningful curriculum reforms. TELL can play a transformative role in advancing Social Studies education in Nigeria.

Recommendations

The following recommendations are proposed to facilitate the effective integration of TELL in Social Studies education:

1. Continuous professional development for Social Studies teachers is essential. Training programs should focus on equipping educators with practical skills for using digital tools and integrating TELL effectively into classroom instruction.
2. Schools need to be adequately equipped with TELL resources such as computers, tablets, stable internet access, and educational software. Efforts must be made to ensure equitable distribution of these resources across both urban and rural areas to bridge the digital divide.
3. The Social Studies curriculum should be updated to include TELL based instructional strategies. This includes the incorporation of interactive content, online learning platforms, and multimedia tools that align with learning objectives and foster technological competence.
4. Digital literacy should be embedded into Social Studies instruction to help students critically evaluate information, use digital tools responsibly, and function effectively in a digital society.
5. Government policies should support the integration of TELL in education. This includes funding allocations for technological infrastructure, incentives for schools implementing innovative digital practices, and policies that ensure inclusive andequitable access to technology.

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APPLICATION OF DIDITAL TECHNOLOGY IN SOCIAL STUDIES EDUCATION FOR THE ATTAINMENT OF SUSTAINABLE DEVELOPMENT GOALS IN NIGERIA.

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Abstract

In pursuit of the United Nations' Sustainable Development Goals (SDGs), Nigeria's Education sector plays a pivotal role. This paper explores the application of digital technology in teaching Social Studies education to foster sustainable development. By integrating digital tools, such as interactive multimedia, virtual fieldtrips and online platforms, educators can enhance students engagement, promote critical thinking and increase access to quality education. The paper will discuss the potential benefits and challenges of digital technologies application into Social Studies education, highlighting successful case studies of and strategies for effective implementation. The fundamental components of the United Nations' sustainable development of 2030 agenda is quality education. It aims to ensure inclusive and equitable quality education for all. Digital technologies have emerged as an essential tool to achieve these goals. These digital technologies have made a paradigm shift in the entire education system. It is not only a knowledge provider but also a co-creator of information, a mentor, and an assessor. Technological improvements in education have made life easier for Social Studies teachers and students. Instead of using pen and paper, students nowadays use various software and tools to create presentations and projects. When compared to a stack of notebooks, an iPad is relatively light. When opposed to a weighty book, surfing an E-book is easier. These methods aid in increasing

interest in research. This paper is brief about the need for application of digital technology in Social Studies education and discusses major applications and challenges in education.

Keywords: Digital Technology, Digital classroom, Social Studies Education, Sustainable Development Goals, Students, Teaching.

Introduction

The Sustainable Development Goals (SDGs) are a global call to action to end poverty, protect the planet and ensure peace and prosperity for all. Nigeria as a signatory to the SDGs is committed to achieving these calls by 2030. Education is a critical sector in achieving the goals and Social Studies Education plays a vital role in equipping students with the knowledge, skills and values necessary to contribute to sustainable development. This paper explores the application of digital technology in teaching Social Studies education to foster sustainable development in Nigeria. Digital technologies offer numerous opportunities to enhance teaching and learning by making it more interactive, accessible, and personalized. They can improve student engagement, facilitate collaboration, and provide teachers with tools for effective assessment and curriculum development.

Technology provides instant accessibility to information, which is why its presence in the classroom is so vital. Smart phones, computers, and tablets are already an omnipresent element of everyday life for students and teachers alike. It's only natural that the uses of technological devices in the classroom are explored to create meaningful learning experiences for students of all ages.

Utilizing different types of technology in the classroom, including a virtual classroom, virtual field trip creates learners who are actively engaged with learning objectives. Adedoj & Abimbade (2016) implied that the implementation of technology also creates pathways for differentiated instruction to meet the unique needs of students as individual learners within a broader classroom climate.

Akinlaye (2003) supports the use of digital tools for the teaching and learning of Social Studies education at all levels where Social Studies education curriculum is being implemented. He has shown that introducing and intimating the individual to the wider communities is made possible through the agency of digital education. He believed that gaining access to the global communities is one of the basic rationales for the teaching and learning of Social Studies.

Conceptualization of Concepts

Digital technology refers to the use of electronic devices, software, and digital platforms to process, store, and communicate information. Digital technology is the use of electronic devices, systems, and resources to generate, store, and transmit data. It encompasses a wide range of technologies, from basic devices like smartphones and computers to more complex systems like the internet and artificial intelligence. It encompasses a wide range of tools and systems according to Aregbesola, Adejobi, & Ibrahim, (2015) includes the following:

Computers and laptops: Devices that process and store digital information.

Smartphones and mobile devices: Portable devices that enable communication, information access, and digital interactions.

Internet and online platforms: Global networks and websites that facilitate communication, information sharing, and digital transactions.

Software and applications: Programs and apps that enable users to perform specific tasks, create content, and interact with digital systems.

Digital media: Formats such as digital images, videos, and audio files that are used to convey information and entertainment.

Social media: Platforms like Facebook, Twitter, and Instagram that enable users to share information and connect with others.

E-learning platforms: Online platforms that provide access to educational resources and courses.

Digital payment systems: Systems like online banking, mobile payments, and digital wallets that enable digital transactions.

Digital tools for productivity: Software like Microsoft Office, Google Docs, and Trello that enable users to create, collaborate, and manage tasks.

This technology operates on the principle of converting information into a binary code (0s and 1s) for efficient storage, processing, and transmission

Digital classroom

Digital classrooms are defined by using electronic devices or platforms such as social media, multimedia, and mobile phones to teach students. With digital technology in education, today's educational landscape has altered for

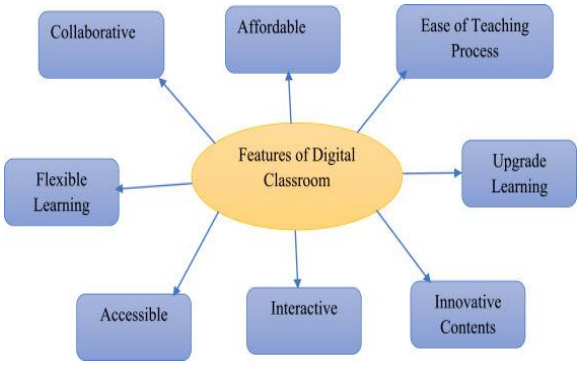

Fig. 1. Features of Digital Classroom. Source; Oluleye (2020).

Educational applications and websites are used in digital classrooms to assist students in improving their learning experience. Feedback loops and technology are two critical components of a digital classroom. Feedback loops are essential for students to obtain real-time feedback from their teachers. Teachers can use feedback loops to provide feedback depending on many factors such as student, lesson, group, etc. PPTs, video presentations, e-learning methods, online training, and other digital approaches are increasingly used in the teaching-learning process. As a result, classroom instruction is becoming more participatory. Students may now learn many topics on their own by using internet resources and digital classrooms. In schools, colour charts, graphs, and models describe the finest instruction of the class. However, Akinlaye (2003) is of the view that they are now considered old-fashioned methods of giving education. Education in the classroom is no longer restricted to reading books, writing on the blackboard to explain chapters and concepts, and taking notes in their books.

the better or improvements. Digital learning is a learning strategy that employs technology to fulfil the entire curriculum and allows students to learn quickly and rapidly. The digital classroom entirely focuses on teaching via the use of technology. Students use technological or internet-connected gadgets like laptops, tablets, Chromebooks, etc. Instead of taking notes on what the teacher has taught, most of the curriculum is delivered to students online through an engaging and interactive platform. Despite its many facets, education is fundamentally a kind of communication. The internet has resulted in the rise of new communication channels, which have extended the options for the transmission and access to educational information. These media and virtual venues serve as learning facilitators] Various features of a digital classroom are shown in Fig. 1

Application of Digital Technology in Teaching Social Studies Education

Integration of technology in education simply refers to the use of technology to enhance the student learning experience. According to Tunmibi eta'l Utilizing different types of technology in the classroom, including a virtual classroom, creates learners who are actively engaged with learning objectives. The implementation of technology also creates pathways for differentiated instruction to meet the unique needs of students as individual learners within a broader classroom climate.

There is a common misconception that the integration of technology in the classroom can be a financial burden for school districts, but

students do not necessarily need their own tablets or Educational applications and websites are used in digital classrooms to assist students in improving their learning experiences. Feedback loops and technology are two critical components of a digital classroom. Feedback loops are essential for students to obtain real-time feedback from their teachers. Teachers can use feedback loops to provide feedback depending on many factors such as student, lesson, group, etc. PPTs, video presentations, e-learning methods, online training, and other digital approaches are increasingly used in the teaching-learning process. As a result, classroom instruction is becoming more participatory. Students may now learn many topics on their own by using internet resources and digital classrooms. In schools, colour charts, graphs, and models describe the finest instruction of the class. However, they are now considered old-fashioned methods of giving education. Education in the classroom is no longer restricted to reading books, writing on the blackboard to explain chapters and concepts, and taking notes in their books.

Social Studies Education:

Social Studies Social Studies is a subject that has many definitions. To a lay man, it is the study of man and his physical and social environment. Social Studies according to Akinola, (2018) is the study of man within the context of his environment. Social Studies Education is a discipline that seeks to equip students with the knowledge, skills and attitudes necessary to become informed, active and responsible citizens in a diverse and complex world (source). Schug, Taranto & Cudmore, (2017) define Social Studies Education as a framework that encourages students to develop critical thinking skills by engaging with historical, political, economic, and social issues. Hall (2018) defines Social Studies Education as the interdisciplinary study of human society that incorporates a variety of disciplines such as history, geography, economics, and political science. Muller (2019) provides a definition of Social Studies Education that focuses on building informed, active citizens who are capable of critically analyzing their own roles within a global society. Muller suggests that Social Studies Education should go beyond the traditional boundaries of history and politics, encompassing global citizenship education, sustainability, and social equity.

In the same vein, Jensen (2020) defines Social Studies Education as an academic discipline that aims to empower students to engage in the democratic process, emphasizing issues such as social justice, equality and human rights. She highlights the significance of the interdisciplinary approach and the need for critical media literacy in addressing contemporary global issues within the curriculum. Perkins (2021) describes Social Studies Education as an educational approach that integrates a variety of subject areas, emphasizing the development of citizens who are aware of social justice issues and can engage in problem-solving. Bennett (2022) defines Social Studies Education as a holistic and interdisciplinary process aimed at developing students' abilities to analyze and address complex social issues.

Social Studies Education in Nigeria

Social Studies education in Nigeria plays a vital role in the intellectual and moral development of students, focusing on the cultivation of responsible citizenship, social awareness, and critical thinking (Ogunyemi, 2003). It aims to equip learners with the necessary skills and knowledge to understand and solve societal issues (Aluede, 2014). The discipline is designed to foster an understanding of human societies, their structures, cultures, histories, and the various social forces shaping them (Adesina, 2015). Social Studies education also emphasizes the development of democratic values, such as respect for human rights, justice, and the promotion of national integration, which are crucial in a diverse

society like Nigeria (Akinade & Osifeso, 2016).

Objectives of Social Studies Education

Promotes Civic Education and participation: Social Studies aims to instill in students a sense of civic responsibility, encouraging them to become active participants in their communities and contribute positively to societal development (Ogunyemi, 2013).

Fostering National Integration: Given Nigeria's ethnic and cultural diversity, Social Studies education plays a crucial role in promoting national unity and understanding among different groups. The curriculum encourages tolerance, respect for diversity, and peaceful coexistence (Akinade & Osifeso, 2016).

Enhances Critical Thinking: Through the study of various social issues and historical events, Social Studies helps students develop critical thinking skills thereby enabling them to analyze situations in other to make informed decisions, and contribute to solving societal problems (Adesina, 2015).

Preparing Future Leaders: Social Studies education equips students with the knowledge and skills necessary for leadership roles in society. This includes understanding the structures of governance, the rights and responsibilities of citizens, and the importance of ethical leadership (Aluede, 2014).

The Social Studies curriculum in Nigeria is structured to cover a wide range of topics. At the primary level, the focus is on developing basic social knowledge and skills, including an understanding of the family, community, and national symbols (NERDC, 2017). In secondary schools, the curriculum broadens to include more complex topics such as democracy, governance, human rights, environmental issues, and global challenges. Pedagogically, Social Studies in Nigeria is taught using a variety of methods. These include traditional lecture-based teaching, group discussions, field trips, case studies, and project-based learning (NERDC, 2017). The goal is to make learning engaging and relevant to students' lives, while also helping them develop problem-solving and decision-making abilities. The use of multimedia resources and technology in recent years has also enriched the learning experience, allowing students to access up-to-date information and interact with global social issues (NERDC, 2017).

Benefits and Importance of Social Studies Education in Achieving SDGs

Social Studies education is an interdisciplinary field that draws from history, geography, economics political and sociology to study human relationship and interaction. It provides students with a comprehensive understanding of the social, economic and political and political contexts that shape their lives and communities. Social Studies education is essential in achieving the SDGs because it:

Enhanced engagement: Digital technology can make social studies education more engaging and interactive, increasing student motivation and participation.

Access to information: Digital technology provides access to a vast array of information and resources, enabling students to explore complex social issues and develop a deeper understanding of national development.

Critical thinking and problem-solving: Digital technology can facilitate critical thinking and problem-solving skills, essential for addressing the complex challenges facing national development.

Increased efficiency: Digital technology can automate tasks, streamline processes, and improve productivity.

Improved access to information: Digital technology provides access to vast amounts of information and resources, enabling users to learn, research, and stay informed.

Enhanced communication: Digital technology enables users to communicate and collaborate with others across geographical distances

Promotes cultural awareness: Social Studies education curriculum explores diverse cultures by the study of various cultures, traditions and customs from around the world. This exposure

helps students understand and appreciate the diversity of human experiences.

Strategies of Integrating Digital Technology in the Teaching of Social Studies Education

Digital storytelling: Using digital tools to create interactive stories and simulations that explore social issues and national development.

Online resources: Utilizing online resources, such as educational websites, videos, and podcasts, to supplement traditional teaching methods.

Collaborative projects: Encouraging students to work on collaborative projects that utilize digital technology to explore social issues and develop solutions.

Challenges of Digital Technology in Social Studies Education

While digital technology offers numerous benefits for social studies education, there are also several challenges that educators and students may face are as follows:

Information overload: The vast amount of information available online can be overwhelming, making it difficult for students to discern credible sources and prioritize relevant information.

Digital divide: Not all students have equal access to digital technology, creating a disparity in learning opportunities and outcomes.

Bias and misinformation: Online sources can perpetuate biases and misinformation, requiring students to develop critical thinking skills to evaluate information effectively.

Distractions and decreased attention span: Digital technology can be distracting, leading to decreased attention span and reduced engagement with course material.

Technical issues: Technical problems, such as connectivity issues or software glitches, can disrupt the learning experience.

Cyberbullying and online safety: Educators must ensure students' online safety and address issues like cyberbullying.

Copyright and intellectual property: Educators and students must navigate copyright and intellectual property laws when using digital resources.

Mitigating Challenges of Digital Technology in Social Studies Education

Developing digital literacy: Educators can help students develop digital literacy skills, including information evaluation, online safety, and responsible digital citizenship.

Ensuring equitable access: Educators and institutions can work to ensure equitable access to digital technology and internet connectivity.

Implementing effective pedagogy: Educators can design engaging and effective learning experiences that integrate digital technology in a meaningful way.

Monitoring and addressing technical issues: Educators and IT staff can work together to minimize technical issues and ensure a smooth learning experience.

By acknowledging and addressing these challenges, educators can harness the potential of digital technology to enhance social studies education.

Digital technologies offer significant opportunities to enhance social studies education in Nigeria, including engaging students with multimedia resources, fostering communication, and personalizing learning experiences. However, challenges like inadequate infrastructure and teacher training need to be addressed for successful implementation.

Benefits of Digital Technology in Social Studies:

Impact on National Development

Informed citizenship: Social studies education, enhanced by digital technology, can foster informed citizenship and promote national development by equipping students with the knowledge, skills, and values necessary to participate in the democratic process.

Critical thinking and problem-solving: Digital technology can facilitate critical thinking and problem-solving skills, enabling students to address complex social issues and contribute to national development.

Economic growth: By promoting digital literacy and skills, social studies education can contribute to economic growth and national development.

Conclusion

The Application of digital technology in teaching Social Studies Education has the potential to foster Sustainable development in Nigeria by leveraging digital tools and strategies, educators can enhance students' engagement, promote critical thinking and problem-solving skills and increase access to quality education. However, addressing the challenges and limitations of digital technology integration is crucial to ensuring that all students benefit from these innovations. By working together, we can harness the power of digital technology to achieve the SDGs and promote sustainable development in Nigeria.

Sustainable Development goal in Nigeria. By leveraging on digital technology, educators can create engaging, interactive, and effective learning experiences that equip students with the knowledge, skills, and values necessary to contribute to national development.

Recommendations

The paper recommends that; policy makers develop policies that support the integration of digital technology into Social Studies education. Teachers in Social Studies education should also deploy digital devices for classroom interaction to encourage effective and efficient implementation of the Social Studies curriculum especially at the tertiary levels of education.

Moreso, students should adopt the use of digital devices for their learning; as the Internet have been shown to increase the potentials of academic improvement among tertiary education students. Therefore, while using the devices for social interaction, a greater proportion of the air-time should be directed to education purposes in and out of the classroom, since it can be used to promote academic performance for Social Studies students in higher institution and other levels. Students should abstain from using digital devices for time wasting, idle social media chat and other immoral and uncultured behaviour.

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ANALYSIS OF ECONOMIC IMPACT OF CYBER THREATS ON ANDROID APPS IN NIGERIA

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Abstract
The rapid diffusion of Android applications has transformed Nigeria's digital economy by enabling innovation, financial inclusion, and service delivery across diverse sectors. However, the open-source nature of the Android operating system has simultaneously exposed users and firms to significant cyber threats, including malware, phishing, ransomware, and data breaches. These vulnerabilities undermine consumer trust, escalate business costs, and weaken the broader trajectory of Nigeria's digital transformation. This study adopts a thematic and positional analysis to examine the economic impact of cyber threats on Android apps in Nigeria, focusing on five central themes: Android apps as drivers of digital growth, cyber threats and vulnerabilities in the Android ecosystem, the economic consequences of cyberattacks, machine learning as a technological response, and policy and governance gaps. Findings indicate that while Android apps serve as catalysts for economic growth and inclusion, their security weaknesses create systemic risks that hinder investor confidence and digital adoption. Although machine learning offers promising pathways for threat detection and mitigation, challenges persist due to infrastructural deficits, limited institutional capacity, and weak policy enforcement in Nigeria. The study concludes that safeguarding Android applications is not merely a technical requirement but an economic necessity for sustaining Nigeria's digital economy. Policy recommendations emphasize stronger regulatory enforcement, mandatory incident reporting, capacity building, financial support for SMEs, and international cooperation to strengthen cybersecurity resilience

Keyword: Economic Impact; Cyber threats; Android Apps; Digital.

Introduction

Nigeria's digital economy keeps increasing day-by-day because it is extensively driven by widespread smartphone adoption and the usage of mobile internet. This has made Android apps a vital e-tool for technology, commerce, finance, and communications. The Android operating system (OS) is an open-source platform that empowers a diverse range of mobile devices, such as smartphones, tablets, and wearables. Android applications have become central to Nigeria's social and economic landscape. With Android controlling the majority of the mobile market, applications power mobile banking, e-commerce, education, and healthcare services (GSMA, 2022; World Bank, 2021). They have improved financial inclusion, supported entrepreneurial ventures, and created employment opportunities, thereby contributing to Nigeria's digital economy (Olaleye & Adebayo, 2020).

Nevertheless, this expanding growth has also exposed vulnerabilities to cyber threats that trigger significant economic risks. Owing to its accessibility and unrestricted nature, the Android Operating System (OS) is vulnerable to diverse cyber menaces that jeopardize users' security and privacy several research reveals that cyber threats to Android applications impose significant economic costs, including billions lost annually through data breaches, ransomware, and fraud (Symantec, 2020; Liu et al., 2021). Android's open-source design facilitates innovation but creates vulnerabilities in app vetting and distribution, particularly through third-party platforms (Androulidakis & Kandus, 2020). The open-source design of the Android operating system exposes it to vulnerabilities such as malware, phishing, ransomware, and data breaches (Kaspersky, 2021; McAfee, 2020). Cybercriminals exploit fragmented app vetting procedures and low user awareness, leading to significant financial and reputational risks (Afolabi & Olayemi, 2021; Symantec, 2020).

Statement of the Problem

In Nigeria cybercrime undermining consumer trust, discouraging foreign investment, and threatening country's global competitiveness (Nwokedi & Adeola, 2022; Liu et al., 2021). Nigeria faces persistent challenges in cybersecurity governance. Weak enforcement of the Cybercrimes Act of 2015, low institutional capacity, and inadequate coordination among regulators leave the Android ecosystem vulnerable (Aderibigbe, 2022; Fasiku & Olagunju, 2021). SMEs and financial institutions, heavily dependent on mobile applications, are particularly at risk of fraud, service disruption, and reputational damage (PwC Nigeria, 2020; Ibrahim & Musa, 2020).

Therefore, the aim of this study is to analyze the economic impact of cyber threats specifically on Android applications in Nigeria. The study seeks to employ thematic analysis of five central themes which includes; android apps as drivers of digital growth, cyber threats and vulnerabilities in android ecosystems, economic consequences of cyber threats, machine learning as a technological response, policy and governance gaps. This thematic approach allows the study to compare global evidence with Nigerian realities. This provides a solid foundation for advancing evidence-informed policy recommendations. (Aderibigbe, 2022). Although, the analysis is limited to secondary data sources, including peer-reviewed articles, policy documents, and industry reports.

Literature Review

Concept of Android Applications

Android applications, commonly referred to as "apps," are software programs designed to run on devices powered by the Android operating system (OS). The Android OS, originally developed by Android Inc. and later acquired by Google in 2005, is an open-source, Linux-based platform that enables third-party developers to create and distribute mobile applications (Syer et al., 2013; Statista, 2021). The apps widespread adoption stems from the affordability of Android devices, the diversity of applications, and the global reach of the Google Play Store (Alotaibi & Islam, 2019).

The Android ecosystem is distinctive because of its openness. Unlike Apple's iOS, which maintains strict control over app distribution, Android allows installation from multiple sources, including third-party marketplaces. While this fosters innovation and accessibility, it also creates vulnerabilities to security threats such as malware, ransomware, and phishing attacks (McAfee, 2020; Felt et al., 2011). Cybercriminals exploit this openness by embedding malicious code in apps, which can lead to data breaches, financial losses, and erosion of user trust (Kumar & Mallick, 2018).

Theory of Economics of Information Security

The Economics of Information Security provides a powerful lens for analyzing the economic implications of cyber threats on Android applications in Nigeria. Gordon and Loeb (2002) introduced a seminal model demonstrating that organizations often underinvest in cybersecurity because the optimal level of investment is not necessarily proportional to the magnitude of the potential loss. Their framework highlights that firms typically allocate resources based on perceived risks and expected benefits of security controls, yet in practice, uncertainty and incomplete information about threats lead to suboptimal investments.

Applied to the Nigerian context, this theory clarifies why many fintech startups, SMEs, and app developers fail to allocate sufficient resources for securing Android applications despite the high incidence of malware, phishing, and data breaches. Economic theory suggests that since individual firms bear only part of the loss, while broader societal costs such as reduced consumer trust, declining digital adoption, and reputational damage are externalized, there is little incentive for optimal investment in cybersecurity. This explains why cyber threats to Android apps in Nigeria not only affect individual firms but also generate wider economic losses across industries reliant on digital transactions (Olaleye & Adebayo, 2020; Nwokedi & Adeola, 2022).

The Gordon–Loeb model and Anderson's economic perspective therefore provide a strong theoretical underpinning by linking cybersecurity to economic performance. They underscore that safeguarding Android apps is not merely a technical necessity but an economic imperative. In policy terms, this suggests the need for stronger regulatory frameworks, public–private partnerships, and targeted incentives that encourage firms to internalize the true costs of insecurity. By applying this theory, the study situates Android cyber threats within the broader economic development agenda of Nigeria, emphasizing how inadequate security investment undermines trust, digital innovation, and inclusive economic growth.

Methodology

This research adopts a position paper design, anchored on conceptual and thematic analysis rather than empirical data collection. Its primary aim is to articulate a reasoned argument on the economic impact of cyber threats on Android applications in Nigeria, synthesizing insights from scholarly literature, industry reports, and policy documents (World Bank, 2021; PwC Nigeria, 2020).

Thematic Discussion and Findings

Theme1: Android Apps as Drivers of Digital Growth

Android applications have become a primary conduit of digital services worldwide, enabling access to finance, health, education, commerce and public services and delivering measurable productivity and inclusion gains in many low- and middle-income countries; industry and academic reviews link the proliferation of low-cost Android devices and expansive app marketplaces to faster diffusion of fintech and platform services, new firm formation, and expanded employment in app ecosystems (Senanayake, 2021; GSMA, 2022). At the continental level, GSMA and related analyses show that mobile apps predominantly Android in many African markets are central to financial inclusion and digital commerce, but that these gains are contingent on platform reliability and trustworthiness because interruptions and fraud

materially reduce transaction volumes and user uptake (GSMA, 2022). In Nigeria specifically, the World Bank's Digital Economy Diagnostic documents how mobile platforms and Android apps have materially expanded access to digital services and payments, supporting entrepreneurship and market access for micro, small and medium enterprises, while also stressing that the economic benefits of mobile apps depend on secure, resilient platforms and on investments in skills and institutional capacity (World Bank, 2021).

Android applications support Nigeria's digital economy by enabling mobile banking, e-commerce, and healthcare, thereby enhancing financial inclusion and entrepreneurship (GSMA, 2022; Ibrahim & Musa, 2020; World Bank, 2021). However, reliance on Android platforms increases exposure to cyber threats that can undermine these gains.

Theme 2: Cyber Threats and Vulnerabilities
Global empirical and technical literature documents a persistent, evolving threat environment for Android, with recurrent families of attacks banking trojans, spyware, ad-fraud, and smishing/phishing exploiting both application code vulnerabilities and insecure distribution channels; research in malware detection and large industry reports note that attackers continually adapt to defenses, with sophisticated supply-chain and ad-library compromises observed in recent years (Arp et al., 2014; Kaspersky, 2022; Senanayake, 2021). African regional studies and industry outlooks emphasize that market fragmentation, uneven patching, and the prevalence of third-party app stores amplify these vulnerabilities, while limited forensic capacity and reporting mean the observed incidents likely understate the true prevalence (Kaspersky, 2022; KPMG Africa reports). In Nigeria, security advisories, industry reports and forensic reviews highlight concrete Android-focused incidents including banking malware campaigns and insecure implementations in some local apps that illustrate how technical flaws (for example weak session handling or improper storage of credentials) interact with user behaviors (sideloading, granting excessive permissions) and weak platform governance to create high-risk conditions for users and service providers (McAfee Labs, 2020; World Bank, 2021).Nigeria ranks among the most affected by mobile malware, with ransomware and phishing posing major threats (Kaspersky, 2021; Symantec, 2020). Users often download applications from unverified sources, compounding risks (McAfee, 2020; Afolabi & Olayemi, 2021).

Theme 3: Economic Consequences
Globally, the economic burden of cyber incidents is large and multifaceted: direct remediation costs, fraud losses, regulatory fines and litigation are compounded by indirect and persistent effects such as reputational damage, customer churn, depressed transaction volumes and higher costs of capital; empirical studies and industry reports document firm-level declines in revenue and market valuation following disclosed breaches, demonstrating that security incidents translate into measurable economic harms beyond immediate remediation expenses (McAfee Labs, 2020; PwC analyses). In the United, Eisenbach et al., (2021) focused on how disruptions to the wholesale payment networks of banks could lead to economic losses. They also noted that banks' responses to uncertainty through liquidity hoarding could result in foregone payments activity, reaching more than 2.5 times the daily GDP (Eisenbach et al., 2021).

Duffie and Younger (2019) also noted that high-value payments and settlement systems remain a natural candidate for a malicious attacker's intent on inflicting largest possible damage to financial systems and the broader economy. At the African level, regional assessments indicate that cyber incidents disproportionately hit financial institutions and digital service providers, and that lost trust and operational disruption can significantly reduce the developmental benefits expected from mobile platforms, particularly where digital finance is nascent (GSMA; KPMG Africa). In the Nigerian context, national diagnostics and

industry reports point to substantial direct and indirect losses from mobile-related fraud and breaches: banks, fintechs and merchants incur remediation and compensation costs, suffer temporary transaction freezes and user attrition, and face higher fraud-control operating expenses; these microeconomic shocks aggregate into macroeconomic impacts by slowing digital adoption and reducing investor confidence in the digital economy (World Bank, 2021; PwC Nigeria, 2020).Cyber threats generate financial losses, reputational damage, and reduced investor confidence. SMEs and banks face operational inefficiencies and customer attrition, while Nigeria loses millions annually to mobile fraud (Olaleye & Adebayo, 2020; Liu et al., 2021; Nwokedi & Adeola, 2022). At a macro level, these threats weaken Nigeria's digital competitiveness (Ndukwe & Okoye, 2019). The economic impact includes direct financial losses, business disruption, and increased security costs, and all this damages Nigeria's reputation in the global digital economy (Philip, 2024).

Theme 4: Machine Learning as a Technological Response

Research on machine learning (ML) for Android malware detection shows strong performance in controlled and operational settings when models leverage rich static and dynamic features or hybrid approaches; systematic reviews and experimental studies report high detection rates for many ML classifiers and demonstrate that ML can identify novel malware families that signature-based tools miss, but they also stress challenges including dataset bias, adversarial evasion, the need for large labeled corpora and ongoing model maintenance (Senanayake, 2021; Arp et al., 2014). African pilot projects and regional initiatives illustrate that pooled datasets and collaborative frameworks materially improve ML detection performance, yet data-sharing constraints, privacy concerns, and infrastructure limitations hinder widespread deployment across smaller firms and telcos (regional security reports). In Nigeria, banks and a few cybersecurity vendors have piloted ML-based fraud and anomaly detection with measurable operational gains reduced false positives and faster triage but national adoption is constrained by limited local datasets that reflect Nigerian app usage patterns, shortages of ML engineering talent, and the cost of compute and model governance; consequently, policy recommendations for Nigeria emphasize public–private consortia and regulatory sandboxes to pool data and scale ML defenses in ways that yield quantifiable reductions in expected losses (Senanayake, 2021; PwC Nigeria, 2020).

Machine learning offers effective tools for detecting malicious apps by analyzing static and dynamic features (Choudhary & Kumar, 2021; Androulidakis & Kandus, 2020). However, Nigeria lacks the infrastructure and technical expertise to scale ML solutions effectively (Onifade & Aderemi, 2021; Fasiku & Olagunju, 2021).

Theme 5: Policy and Governance Gaps

Comparative global evidence indicates that jurisdictions with clear incident-reporting mandates, proactive supervisory frameworks and invested national CERTs demonstrate faster containment and, on average, lower aggregate losses from cyber incidents because transparency and coordinated response reduce externalities and improve market discipline (cross-country studies; industry evaluations). African scholarship stresses that limited institutional capacity and weak governance frameworks exacerbate these risks (Tella & Oladipo, 2021). In Nigeria, studies reveal that cyber threats disproportionately affect SMEs and financial institutions, eroding consumer trust and competitiveness (Nwokedi & Adeola, 2022; Afolabi & Olayemi, 2021).

Regional African analyses repeatedly find that governance deficits fragmented laws, underenforced disclosure requirements, limited incident response capacity and shortages of cyber talentcorrelate with longer incident resolution times and greater aggregate economic impact; these studies recommend targeted capacity building, harmonized reporting frameworks and incentives for

information sharing (KPMG Africa; GSMA). In Nigeria, despite the existence of the Cybercrimes (Prohibition, Prevention, Etc.) Act and related institutional structures, multiple audits and sector reports find enforcement gaps, slow disclosure practices and weak inter-agency coordination; empirical narratives of high-impact breaches that were disclosed late or only after public reporting illustrate the macroeconomic costs of these governance deficiencies delayed containment, amplified reputational spillovers and higher remediation costs leading analysts to recommend stronger mandatory reporting, minimum sectoral security standards and subsidized shared security services for SMEs to internalize social costs and strengthen systemic resilience (Cybercrimes Act; PwC Nigeria, 2020; World Bank, 2021).

Nigeria is hindered by infrastructural and skill gaps of machine learning (Fasiku & Olagunju, 2021). Policy and governance literature underscores that Nigeria's Cybercrimes Act remains inadequately enforced and lags behind evolving digital threats (Aderibigbe, 2022; PwC Nigeria, 2020). Effective cybersecurity governance requires multi-stakeholder collaboration, updated legislation, and stronger enforcement mechanisms (Ndukwe & Okoye, 2019).

Findings from the Thematic Analysis

The analysis of Android applications as drivers of digital growth revealed that these platforms are central to accelerating digital inclusion and economic development. Empirical evidence from global and Nigerian studies confirms that the affordability of Android devices and the accessibility of apps have expanded financial services, educational resources, and entrepreneurial opportunities. The findings underscore that Android apps are not only technological tools but also economic enablers, facilitating market access for small businesses and enhancing participation in the digital economy. However, these benefits are significantly moderated by the extent to which users and firms can trust the security and resilience of the platforms.

The exploration of cyber threats and vulnerabilities in the Android ecosystem highlighted a persistent and evolving risk environment. Globally, malware, phishing, and adware remain dominant threats, with attackers exploiting the openness of the Android operating system. The findings show that Africa, and Nigeria in particular, face amplified risks due to reliance on third-party app stores, outdated software patches, and weak user awareness. These conditions expose both individuals and businesses to frequent attacks, suggesting that Android's structural openness, while fueling innovation, also constitutes a systemic vulnerability in the Nigerian context.

The findings on the economic consequences of cyber threats demonstrate that cyber insecurity translates into measurable financial and developmental costs. At the global level, firms report revenue losses, reputational harm, and higher capital costs after security breaches. In Nigeria, banks, fintechs, and SMEs have incurred substantial remediation costs and experienced customer attrition due to breaches in Android-based platforms. The analysis indicates that the economic impact extends beyond individual firms to the macroeconomy, where digital adoption is slowed, investor confidence is weakened, and the promise of digital transformation is partially undermined.

Analysis of machine learning as a technological response revealed strong potential but limited deployment in Nigeria. Globally, machine learning models show effectiveness in detecting novel malware strains and anomalies that evade signature-based systems. Findings indicate that while African markets benefit from regional collaborations in building detection capacity, Nigeria still lags behind due to a shortage of technical expertise, limited datasets, and infrastructure costs. Nonetheless, pilot applications in the Nigerian financial sector show promising results, pointing to the importance of investment in research, public–private partnerships, and regulatory sandboxes to scale these solutions for broader economic protection.

The thematic analysis of policy and governance gaps identified systemic weaknesses that exacerbate the economic consequences of cyber threats. International comparisons suggest that countries with robust regulatory regimes and mandatory disclosure practices reduce the aggregate cost of breaches. The findings show that in Nigeria, despite the existence of the Cybercrimes Act, weak enforcement, inadequate incident-reporting frameworks, and limited institutional capacity hinder effective cybersecurity governance. This regulatory fragility perpetuates underinvestment in security by firms, prolongs breach response times, and magnifies financial losses. Consequently, governance shortcomings represent not only a technical challenge but also a core determinant of economic vulnerability in the Nigerian digital ecosystem.

Practical Implications

The findings of this study carry significant practical implications for multiple stakeholders in Nigeria's digital ecosystem. For businesses, particularly fintechs and SMEs, the results underscore the need to integrate cybersecurity as a core component of business strategy rather than treating it as a peripheral cost. Firms should adopt secure software development practices, conduct regular security audits, and invest in employee training to minimize risks from Android-related vulnerabilities. For policymakers, the study highlights the urgency of creating robust institutional mechanisms to enforce cybersecurity regulations and support coordinated national response systems. Stronger policy enforcement would not only protect digital transactions but also enhance public trust in mobile applications, thereby accelerating digital adoption. For end-users, the findings reveal the importance of digital literacy in minimizing risks from phishing, malware, and fraudulent applications. User education campaigns emphasizing safe app installation practices, permission management, and timely software updates are essential to reduce exposure to cyber threats. Collectively, these practical measures can strengthen Nigeria's resilience to cyberattacks while safeguarding the economic benefits of Android-driven digital growth.

Conclusion

The study concludes that while Android applications serve as powerful drivers of digital growth and economic inclusion in Nigeria, their potential is significantly undermined by pervasive cyber threats and systemic vulnerabilities within the Android ecosystem. The economic impact of these threats is evident in both microeconomic and macroeconomic dimensions, as firms incur direct financial losses, reputational damage, and increased operating costs, while the broader economy suffers from slowed digital adoption and reduced investor confidence. Although machine learning presents a promising technological response for detecting and mitigating threats, its adoption in Nigeria remains constrained by infrastructural, technical, and governance limitations. The persistence of weak policy enforcement and fragmented regulatory frameworks further exacerbates these challenges, highlighting the need for coordinated governance, targeted investment in cybersecurity technologies, and stronger institutional capacity. Therefore, safeguarding Android applications is not only a technical necessity but also an economic imperative for sustaining digital transformation and inclusive growth in Nigeria.

Suggestions

1. Policymakers should enforce compliance with the Cybercrimes Act by mandating standardized security protocols for app developers and introducing sector-specific guidelines for industries heavily reliant on Android platforms such as finance, health, and education.
2. There is need for Nigeria to establish a central cybersecurity incident registry, managed by a well-resourced Computer Emergency Response Team (CERT), to ensure transparency, accountability, and faster coordination in managing Android-related cyber incidents.

3. There should be public–private partnerships with universities, research institutions, and technology firms should be leveraged to build specialized expertise in malware analysis, threat intelligence, and machine learning applications for cybersecurity.
4. There is need for government interventions such as subsidized access to shared cybersecurity services, tax incentives for firms adopting certified security standards, and cybersecurity insurance schemes would strengthen SME resilience against Android-based threats.
5. Nigeria should deepen its engagement in global and regional cybersecurity initiatives, aligning with frameworks such as the African Union's Digital Transformation Strategy, to benefit from intelligence sharing, best practices, and collective defense strategies.

Recommendations for Further Research

While this study has provided insights into the economic impact of cyber threats on Android applications in Nigeria, further research is necessary to deepen understanding and strengthen the evidence base. Future studies should adopt mixed-methods or empirical approaches that combine large-scale quantitative data with qualitative insights from industry practitioners, policymakers, and users to capture the full spectrum of economic effects. Comparative studies between Nigeria and other African countries would also be valuable in identifying regional patterns of Android vulnerabilities and the differential effectiveness of policy responses. Moreover, there is a need for more sector-specific research to examine how Android-based cyber threats impact critical domains such as digital banking, e-commerce, healthcare, and education, where security breaches can have compounding social and economic consequences.

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IMPLICATION OF DIGITAL TECHNOLOGICAL TOOLS ON JUVENILE DELINQUENCY

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Abstract
Children and adolescents, in particular, are vulnerable to the detrimental effects of excessive digital technological use. Digital technology like social media has become a factor. Some heinous crimes that

are done by children are through social media like Instagram, Snapchat, Facebook, and YouTube. These digital platforms are widely used by teenagers and young adults. These platforms provide a space for interaction, identity formation, and access to global content. However, they can also amplify certain risk factors that contribute to delinquent behaviour. Hence, this paper examines the implication of digital technological tools on juvenile delinquency. It argues that it is through these digital platforms that different types of juvenile delinquency arise. It suggests that government at all levels and the NGOs should ensure extensive awareness creation and dissemination on existing policies regarding punishment for juvenile delinquency and there should be increased awareness about the risks associated with excessive digital use by children and promoting preventive measures.
Keywords: Implication, Digital Technology, Juvenile Delinquency, Social Media

Introduction

In the present time, there is no distinction between children and adults regarding technology access and use. Children are equally active participants in the technology driven world, impacting their lives as significantly as adults. According to Awasthi and Ahmed (2024), the pervasive peer pressure, particularly visible on social media, influences them. If these exposures are within acceptable bounds, children can adapt to the rapidly changing society. Unfortunately, technology is sometimes misused for wrongful purposes by children. Cyber fraud and various other cybercrimes are committed by minors seeking improper gain. These crimes include cyber frauds, cyberbullying, cyber stalking, identity theft, drug trafficking, digital piracy, cyber suicides, cyber theft, illegal hacking, and more. Crimes committed by children are referred to as juvenile delinquency. It is increasingly recognized as a serious crime in many countries, including Nigeria. According to Rogan (2022), living in the digital age, particularly since the rise of the internet in the late 20th century and the proliferation of smartphones in the 2000s, has introduced a wealth of exciting and constructive opportunities that enrich societies. People now enjoy unparalleled access to vast reserves of knowledge and entertainment, remote education systems, online financial services, and social platforms that connect people with a global community. Key developments during this period, such as the rise of social media platforms like Facebook, Instagram, and X (formerly Twitter), have fundamentally reshaped how we interact with technology and each other. However, these opportunities are accompanied by significant risks, particularly for children in the excessive use of digital technological tools like social media.

Children and adolescents, in particular, are vulnerable to the detrimental effects of excessive digital technological use. Narayanan (2021) posited that juveniles are always individuals with innocence and curiosity that sustains with their age. Due to the fact that digital technologies offer lots of places to explore irrespective of their good or bad characteristics, it stimulates the curiosity of the juvenile to an unforeseen level and offers him an escapade into the world of fantasy but it also causes an insurmountable damage to his views of reality and makes him numb towards the feelings of fellow brethren in the society.

The term juvenile delinquency is often used to describe children under 18 who have committed offenses (Vishwakarma & Awasthi, 2025). Thus, when a juvenile is exposed to the world of information technology it overwhelms him and when he gets attracted towards the more evil pathways of cyberspace, it fascinates him and causes him let go of the reality behind. When he is faced with real issues of life, he tries to implement the things he learned from cyberspace into motion which may be anti-social in nature, thus causing to be alienated from the society and make him to violate the laws on which the society is based upon, serving as an effective catalyst in creating juvenile delinquency. It is on this note that this paper examines the implications of digital technology on juvenile delinquency.

Theoretical Framework

There are multitude of different theories on the causes of crime, most if not all of are applicable to the causes of juvenile delinquency. Khuda (2019) highlights some of these theories that explain factors that contribute to juvenile delinquency to include the following:

Labelling Theory

Labelling theory is a concept within Criminology that aims to explain deviant behaviour from the social context rather than looking at the individual. It is part of Interactionism criminology that states that once young people have been labelled as criminal, they are more likely to offend (Walklate, 2003: 110). The idea is that once labelled as deviant, a young person may accept that role, and be more likely to associate with others who have been similarly labelled. Labelling theorists say that male children from poor families are more likely to be labelled deviant and that this may partially explain why there are more lower-class young male offenders.

Rational Choice

Classical criminology stresses that causes of crime lie within the individual offender, rather than in their external environment. For classicists, offenders are motivated by rational self-interest, and the importance of a free will and personal responsibility is emphasized. Rational choice theory is the clearest example of this idea. Delinquency is one of the major factors motivated by rational choice.

Social disorganization

Current positivist approaches generally focus on culture. A type of criminological theory attributing variation in crime and delinquency over time and among territories to the absence or breakdown of communal institutions (e.g. family, school, church and social groups.) and communal relationships that traditionally encouraged cooperative relationships among the people.

The Concept of Digital Technology

Digital technology means electronic tools, devices, systems, and resources organizations utilize as they process or store data and complete many other functions, increasing productivity and efficiency. Examples include personal computers, smartphones, and all devices that utilize increasingly fast data transmission speeds and that store or process data using digital signals. Digital technology also spans broader innovations like the Internet, which allows us to communicate instantly across the globe, and the blockchain technology behind cryptocurrencies, creating secure and decentralized financial systems.

Dancsa *et al*, (2023) and Alordiah *et al*, (2023) agreed that digital tools are software, applications, technologies, plug-ins, add-ons or websites that are accessible via an internet connection and enhance learners' ability to conduct a thorough literature review and to master the knowledge they need to learn. They are online resources and offline tools that streamline the teaching process, thus enabling practicality in learning and faster instructional delivery.

Types of Digital Technology

Business technology: Businesses can elevate their operations through cutting-edge technology and science. Business Technology includes information technology, digital marketing, data management, and E-commerce tech.

Information technology: By leveraging IT – Information Technology – comprised of both hardware and software, in addition to telecommunications, businesses can store, send and retrieve data effortlessly.

Communication technology: As an amalgamation of information and communication, Communication Technology (CT) involves digital communication networks for users and devices. Virtual assistants, social media platforms, Wi-Fi networks, and Bluetooth are examples of CT.

Operational technology: Operational Technology is a powerful combination of hardware and software that enables companies to secure their industrial networks.

Adaptive AI/Superintelligence:

Superintelligence uses artificial intelligence and computer systems to expand and upgrade human life. AI-based examples of digital

technology include chatbots, virtual agents, and self-driving cars.

Educational technology: EdTech, or educational technology, has revolutionized how students learn by offering breakthroughs such as computer-based instruction, interactive learning tools, audio-visual systems, and online resources.

Blockchain technology: Blockchain offers a secure, web-based financial system with encrypted data. Initially designed to manage digital assets, its applications now extend far beyond that; from online stock exchanges to social media platforms, this tech is quickly becoming an essential tool for businesses.

The Concept Juvenile Delinquency

Juvenile delinquency is known as teenage crime. Delinquency offences include, for example, homicide, robbery, assault, burglary, and theft. The term juvenile crime is used synonymously with criminal delinquency. Delinquency is associated to those children who indulge in wrongful, harmful or destructive behaviours. They are called juvenile delinquents because they are still children and may not be charged in a law court for such contrary behaviours (Uche, Orji & Ngwu, 2019). According to Thirunathan (2022), it is the act of participating in unlawful behaviour as a minor or individual younger than the statutory age of majority.

Khuda (2019) viewed juvenile delinquency, known as juvenile offending, as participation in illegal behaviour by juveniles, most legal systems prescribe specific procedures for dealing with juveniles, such as juvenile detention centers, and courts. A juvenile delinquent is a person who is typically under the age of 18 and commits an act that otherwise would have been charged as a crime if they were an adult. Depending on the type and severity of the offence committed, persons under 18 can be charged and tried as adults. Moreover, we can also consider the juvenile delinquency as a blameworthy child, blameworthy minor, culpable youth, derelict adolescent, derelict inexperienced person, derelict junior, immature youngster, misbehaving teenager, miscreant, misguided teen, misguided young person, neglectful fledgling, offending immature person, violator underage, young wrongdoer.

According to Ukwuije (2023), juvenile delinquency is a serious problem that occurs during adolescence period. It is an umbrella term used to describe any form of negative, inappropriate or unapproved behaviour among children in any given society. Idamokoro (2015) notes that there are two main categories of delinquent behaviours associated with children who are adolescents. These are criminal and status offences. The criminal offences include stealing, arson, rape, drug offences, murder, burglary, pick pocket, and armed robbery while status offences include running away from home, malingering, truancy and others. Behaviour could be tagged delinquent when it is contrary to the prevailing norms for an approved social conduct.

Factors Responsible for Juvenile Delinquency

Several literatures such as Ukwuije (2023); Uche, Orji and Ngwu (2019); Khuda, (2019); Bhagat (2019) have identified factors responsible for juvenile delinquency among today's Some of these factors include the followings:

Peer rejection: Peer rejection in childhood is a large predictor of juvenile delinquency. Although children are rejected by peers for many reasons, it is often the case that they are rejected due to violent or aggressive behaviour. This rejection affects the child's ability to socialize properly, which can reduce their aggressive tendencies, and often leads them to gravitate towards anti-social peer groups (Khuda, 2019).

Lack of legal awareness and guidance: One of the underlying issues with minors' engagement in delinquent behavior is their limited understanding of the legal consequences of certain online actions. Many adolescents are unaware that activities like cyberbullying, hacking, or sharing explicit content could lead to criminal charges or long-term consequences. Without sufficient guidance from parents,

educators, or mentors, they are left to navigate this complex digital landscape on their own, often making decisions based on peer pressure or incomplete information. This gap in digital education leaves them vulnerable to engaging in behaviours they do not fully understand the implications of, increasing their chances of crossing legal boundaries without realizing it.

Violence in the home According to Bhagat (2019), one of the largest contributing factors to delinquency is violence in the home. When a child is subjected to violence, they are in turn violent people. Lashing out at others for the violence they experience at home is very common. Children subjected to violent actions, or those who witness it to others, are more likely to act but their fears and frustrations. They often have a "don't care" attitude and this allows them to get into trouble more easily.

Violence in children social circles: If the neighborhood is in which a child lives is violent, the children will have a tendency to be more prone to delinquency. Many people describe this as street survival methods because the child gets into trouble as a way to stay out of trouble from area gang members or violent people. In many cases, when you remove the child from this type of situation, their tendency for delinquent actions is removed.

Peer pressure: Similar to neighborhood pressures, peer pressure from direct acquaintances can have an effect on how a child reacts to bad situations. If all of their friends are committing delinquent acts, the child may feel pressured to do the same to be accepted (Bhagat, 2019). According to Ukwuije (2023), peer influence is another factor responsible for delinquent behaviour among children.

Socio-economic factors: Juvenile delinquency is more common in poorer neighborhoods. While all neighborhoods are not exempt from delinquent activities, it is believed they happen more in areas where children feel they must commit crimes to prosper. Theft and similar crimes may actually be a result of necessity and not that of just a petty crime. The only true help for this situation is to make sure that children in these areas have access to what they need and understand that they do not have to commit a crime to get ahead in life.

Parental negligence of duties: The craze for wealth acquisition and the need to meet up with the economic demands of the family had prompted many parents to abandon their duty of training their children on the right way to go. Many parents live home in the morning before their children wake up from bed and come late in the night after their children might have gone to sleep. These children do not receive parental discipline as some of them are left with housemaids who have nothing meaningful to contribute to the children proper up-keep (Uche, Orji & Ngwu, 2019). Many of these parents do not have time to correct the children when they misbehaved.

Implication of Digital Technology on Juvenile Delinquency

Nowadays, digital technologies are getting updated faster in developing and dynamic countries. This is also useful to the people as well as it also harms the people. Children in age group between 12 years to 18 years are impacted negatively in the use of digital technological tools. According to Thirunathan (2022), cyber bullying is one of the juvenile delinquencies caused by the use of digital technological tools. This is deliberately using digital media to communicate false and embarrassing information about another person. It is the most common online risk for all teenagers and is a peer-to-peer risk. For example, nowadays people get mobile numbers from the people through social media for communication. People keep friendship and secret. But when friendship failed, some result to blackmailing with the photos and records of affairs they once shared. These are the most frequent issues in social media like Instagram, Facebook, etc.

Vishwakarma and Awasthi (2025) posited that digital technology like social media has become a factor because of which different types of juvenile delinquency arise. These teens are considered juveniles until they reach the age of eighteen. Some heinous crimes that are done by children are through social media like

Instagram, Snapchat, Facebook, and YouTube. These digital platforms are widely used by teenagers and young adults. These platforms provide a space for interaction, identity formation, and access to global content. However, they can also amplify certain risk factors that contribute to delinquent behaviour. The rise of digital technological has provided new avenues for juveniles to engage in criminal activities. Vishwakarma and Awasthi (2025) further exemplified some of the ways digital technological tools may directly contribute to juvenile delinquency to include:

Cybercrime: Young people, with their familiarity with technology, may become involved in cybercrimes, such as hacking, identity theft, or online scams. They may also be using someone else's personal information without their consent to commit fraud or plan illegal activities, such as theft or vandalism for example using someone's personal information or infecting a computer system with malware that locks access to data and demanding payment for its release.

Gang activity: Digital technological tools like facebook has become a tool for gangs to recruit members, organize activities, and promote their criminal activities. Teenagers drawn into these online communities may be more likely to engage in delinquent real-life behaviours, weapons trafficking, extortion demanding money or services from individuals or businesses under threats of violence or harm.

Drug use and trafficking: Digital technological tools like social media has been linked to the promotion of drug use, with users posting images or videos that glamorize substance abuse. In some cases, social media platforms are used to facilitate the sale or distribution of illegal drugs among young people. The digital content significantly contributes to juvenile delinquency through various mechanisms, including exposure to harmful behaviour, peer influence, and the development of negative self-concepts. The interplay of these factors creates an environment where minors are more susceptible to engaging in deviant behaviour in a high-profile case (Awasthi & Ahmed, 2024).

Conclusion/Suggestions

The digital environment has become an integral part of children's everyday lives and interactions. The benefits can be tremendous, but there also risks. Increasing awareness about the risks associated with excessive digital use and promoting preventive measures are crucial steps in safeguarding the mental health and well-being of children. Parents and caretakers play a pivotal role in this process by fostering a supportive environment that promotes healthy self-esteem and responsible digital habits. One of the underlying issues with minors' engagement in delinquent behaviour is their limited understanding of the legal consequences of certain online actions. Many adolescents are unaware that activities like cyberbullying, hacking, or sharing explicit content could lead to criminal charges or long-term consequences. Without sufficient guidance from parents, educators, or mentors, they are left to navigate this complex digital landscape on their own, often making decisions based on peer pressure or incomplete information. This gap in digital education leaves them vulnerable to engaging in behaviours they do not fully understand the implications of, increasing their chances of crossing legal boundaries without realizing it. Thus, government at all levels and the NGOs should ensure extensive awareness creation and dissemination on existing policies regarding punishment for juvenile delinquencies using existing community structures. Government at all levels should ensure proper and adequate legislative framework for the protection of children who comes into conflict with the law and the government should design strategies for economic empowerment of the urban poor like providing basic training on starting and managing a business and creating accessible financial support with low interest rate.

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