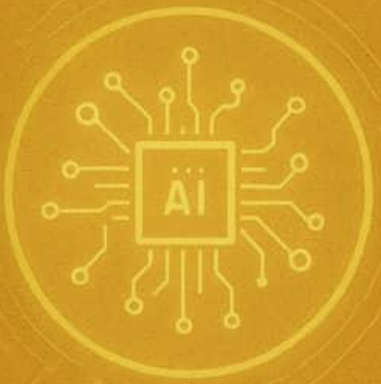
# DIGITAL DREAMS, ANALOGUE REALITIES

## TRANSFORMING IT AND AI EDUCATION IN NIGERIA FOR A GLOBAL FUTURE




Michael Udey Udam, PhD
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# Digital Dreams, Analogue Realities

Transforming IT and AI Education in Nigeria for a Global Future

**Michael Udey Udam, PhD**

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## Transforming IT and AI Education in Nigeria for a Global Future

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# Preface

In an increasingly interconnected world, where the very fabric of society is being rewoven by algorithms and data, a nation's future is inextricably linked to its digital prowess. The strength and relevance of its educational system, particularly in the critical domain of Information Technology (IT), no longer merely influence but determine its standing in the global arena. Nations that falter in cultivating a digitally literate and technologically skilled citizenry risk becoming perpetual consumers in a world relentlessly driven by creators and innovators.

As an educator and a fervent advocate for digital transformation in learning, I have borne witness to a stark, unsettling paradox within Nigeria's educational landscape: the immense, often untapped, potential of our vibrant youth frequently collides with a system struggling to adequately equip them. From the disheartening sight of dilapidated computer laboratories and obsolete curricula to the quiet struggles of dedicated teachers striving to keep pace with an ever-evolving digital toolkit, the reality of IT education in Nigeria paints a complex picture. Our young people, inherently "digital natives,"

are too often confined to what can only be described as "analogue classrooms."

This book, "The State of IT Education in Nigeria: Challenges, Innovations, and the Road Ahead," was born from a profound sense of urgency - a deep concern intertwined with an unwavering hope. Concern, because we simply cannot afford to overlook the glaring weaknesses that imperil our ability to compete and thrive in a tech-driven global economy. Hope, because amidst these formidable challenges, I have also encountered luminous "islands of excellence," vibrant "sparks of innovation," and countless individuals and institutions valiantly striving against formidable odds to propel Nigeria forward into the digital age.

This work is far more than a mere critique; it is a mirror reflecting our current reality - where we stand, what systemic changes are imperative, and how we can collectively rise to meet this defining moment. It meticulously documents our historical journey, rigorously evaluates the policy landscape, dissects institutional realities, assesses teaching capacity, illuminates student experiences, and confronts the widening digital divide. Crucially, it also shines a spotlight on the bright spots, showcasing where tangible progress

is being made and offering actionable recommendations for policymakers, educators, institutions, and private sector partners.

Ultimately, this book is a call to action. It challenges every stakeholder to fundamentally rethink IT education - not as an isolated subject confined to the classroom, but as an uncompromising national priority essential for youth empowerment, sustainable employability, ground-breaking innovation, and global competitiveness. If Nigeria is to truly thrive and claim its rightful place in the 21st century, its citizens must be digitally literate, its schools must be digitally equipped, and its national vision must be unequivocally digitally driven. May the insights contained within these pages ignite serious conversations, inspire bold innovations, and catalyse the practical steps necessary to forge a resilient, inclusive, and globally relevant IT education system across our beloved nation.

"Nigeria has the minds. Nigeria has the youth. What we need now is the system that empowers them to compete and to create in the digital world."

**Michael Udey Udam, PhD, and**
**Obeten Okoi Oka, PhD**

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# Chapter One

# Introduction

# Navigating Nigeria's Digital Education Landscape

In the 21st century, Information Technology (IT) is not merely a sector; it is the very nervous system of global progress, innovation, and economic power. From the bustling marketplaces of Lagos to the quiet villages of the Niger Delta, from the corridors of governance to the frontiers of healthcare, IT infiltrates and transforms every sphere of human endeavour. Nations that embrace this digital revolution, strategically investing in the technological education of their populace, are charting a course towards unprecedented prosperity and influence. Conversely, those that falter risk consigning themselves to the periphery of a rapidly advancing world, becoming consumers rather than creators, followers rather than leaders.

## Nigeria at the Crossroads of Digital Transformation

Nigeria, with its vibrant youth population and undeniable potential, stands at this critical global juncture. The world around us is undergoing rapid technological evolution, and our nation's future hinges on our ability to harness the power of digital innovation. While the enthusiasm for digital tools is palpable, a stark reality often underpins our aspirations: our IT education system, the very engine meant to propel us into this future, remains fragmented, under-resourced, and alarmingly disconnected from the pace of global innovation.

## The Paradox of Digital Natives and Analogue Education

We confront a paradox where a generation of "digital natives"—young people born into the era of smartphones, social media, and connectivity—too often receives an "analogue education." This disconnection between the digital world that our youth are familiar with and the traditional, outdated education system they are subjected to poses a fundamental threat to our national competitiveness. It is a challenge that undermines the future of our youth and jeopardizes Nigeria's

potential to become a leading player in the global digital economy.

## The Purpose of This Book

It is against this backdrop of immense potential and pressing challenges that this book, *"The State of IT Education in Nigeria: Challenges, Innovations, and the Road Ahead,"* has been meticulously crafted. This is not merely an academic exercise; it is an urgent, evidence-based exploration designed to confront our realities head-on. The book aims to serve as a catalyst for change, offering a comprehensive analysis of Nigeria's IT education system and providing a blueprint for improvement.

## Fivefold Purpose of This Book

This book has five core purposes:

1. **Documenting Our Historical Journey**: To meticulously chart the evolution of IT education in Nigeria, providing a context for where we have been and what we have achieved, however incrementally.
2. **Evaluating Our Current Realities**: To assess the state of our current IT education system across various institutions,

identifying strengths and weaknesses that impact both educators and learners.

3. **Spotlighting Gaps and Challenges**: To unflinchingly highlight the significant gaps and pervasive challenges faced by the system, including inadequate infrastructure, outdated curricula, and insufficient teacher training.
4. **Celebrating Innovations**: To showcase emerging innovations, initiatives, and efforts that are reshaping IT education for the better, offering hope and evidence of the progress we are capable of achieving.
5. **Charting a Clear, Actionable Road Ahead**: To provide a strategic roadmap for transforming Nigeria's IT education system, outlining concrete steps and practical recommendations for creating a digitally empowered future.

## A Balanced Narrative: Acknowledging Progress and Identifying Shortcomings

Through rigorous analysis of infrastructure, policy, curriculum, teaching capacity, and learner experiences, this book seeks to provide a balanced narrative—one that acknowledges the

progress we have made while unsparingly revealing where we are lagging and, critically, why. We will not shy away from confronting the systemic issues that impede our growth; instead, we will shine a spotlight on the obstacles that need to be overcome for progress to be realised.

## The Bright Spots: Innovations and Efforts worth Celebrating

More importantly, we will highlight the bright spots - dedicated efforts, strategic initiatives, and emerging technologies that are already making a difference in the lives of students, educators, and communities. These innovations provide the hope and vision for a future that is both digitally empowered and socially inclusive.

## An Invitation to Engage and Act

This book is not just a call to reflection; it is an invitation to action. It seeks to engage a broad spectrum of stakeholders, from policymakers and educators to tech entrepreneurs and students, inviting them to participate in a defining national conversation. Through understanding the imperatives and the challenges, we hope to catalyse the collective effort necessary to ensure Nigeria does not merely participate in the global digital revolution but thrives and leads it.

## A Vision for a Digitally Empowered Nigeria

Consequently, this book aims to provide not only a comprehensive analysis but also a roadmap for building a future where Nigeria's IT education system equips every young Nigerian with the skills, tools, and mindset needed to compete and excel in a rapidly evolving world. Let this be the beginning of a transformation that will secure a brighter, digitally empowered future for every Nigerian, making our nation a leader in the global digital economy

# Chapter Two

# The Historical Evolution of IT Education in Nigeria

Information and Communication Technology (ICT) stands today as the very engine of global progress, innovation, and economic power. In Nigeria, the journey of integrating ICT into the educational fabric has been a complex tapestry, woven with threads of ambitious vision, intermittent progress, and persistent challenges. While the indispensable influence of ICT on teaching, learning, and access has been universally acknowledged (Agbetuyi & Oluwatayo, 2012), Nigeria's narrative is one of both commendable effort and a pronounced imbalance - a persistent gap between grand policy pronouncements and the often-painful realities of implementation. This chapter delves into the historical evolution of IT education in Nigeria, tracing its trajectory from nascent awareness to its present, critical crossroads, revealing patterns that continue to shape our digital future and setting the stage for understanding our current realities.

## Pre-Digital Era (1960s–1980s): Seeds of Awareness

In the nascent decades following Nigeria's independence, Information and Communication Technology remained largely an abstract concept within the nation's educational sphere. This was an era defined by a predominantly manual and traditional pedagogical approach: classrooms relied on chalkboards and textbooks, learning emphasised rote memorisation, and access to information beyond the physical library was virtually non-existent. Computing, in its rudimentary forms, was a privileged domain, primarily confined to high-level, capital-intensive operations within burgeoning banks, nascent oil industries, and select government data centres. The prohibitive cost, technical complexity, and scarcity of trained personnel ensured that the concept of 'IT education' was then merely nascent, manifesting primarily within conventional business education curricula through vocational skills like typewriting, bookkeeping, and foundational office practice.

## The Introduction of Computer Education (1988–2000)

A pivotal moment in Nigeria's IT education landscape arrived with the Federal Government's bold National Policy on Computer Education in 1988. This visionary policy explicitly aimed to integrate basic computer literacy at both primary and secondary school levels (Agbetuyi & Oluwatayo, 2012), with objectives extending beyond mere exposure to preparing students for practical applications like word processing, computation, and foundational programming. Initial pilot implementation was cautiously attempted within select Unity Schools across Nigeria, signalling a national intent to embrace the digital age.

Concurrently, at the tertiary level, pioneering universities such as the University of Lagos, Obafemi Awolowo University, and Ahmadu Bello University began to establish formal Computer Science programs. These institutions laid crucial groundwork, yet their efforts were significantly hampered. The reality on the ground was characterised by minimal infrastructure, often meaning a handful of outdated computers for hundreds of students, inconsistent power supply, and a glaring absence of reliable internet

connectivity. Teacher training was alarmingly insufficient, with many educators lacking both practical skills and pedagogical knowledge to effectively deliver computer education. Consequently, access remained highly limited (Nlem et al., 2022), creating a significant disparity between policy ambition and practical capability.

## Policy Expansion and EdTech Growth (2001–2010)

The turn of the millennium ushered in an era of intensified policy focus on IT, culminating in the comprehensive National Policy on Information Technology (FRN, 2001). This policy represented a significant strategic leap, moving beyond basic computer skills to envision a holistic national IT ecosystem. It explicitly aimed to "empower youths with ICT skills to prepare them for competitiveness in a global environment" and vigorously advocated for ICT integration across mainstream education and training (Aworanti, 2016). This decade saw a surge in initiatives:

- The widespread development of basic ICT curricula for various educational levels.

- A mushrooming growth of private computer training centres, often filling critical gaps left by public institutions.
- Ambitious state-driven efforts, exemplified by projects like Lagos' E-School initiative, which sought to equip public schools with computer facilities.
- The formal introduction of Computer Studies as a core subject in secondary education curricula.

However, this period was characterised by a glaring paradox: while policies proliferated and ambition soared, the reality of actual implementation remained critically poor. Despite well-intentioned national initiatives, numerous studies consistently highlighted that the practical integration and effective use of ICT in Nigerian classrooms were still remarkably rare (Agbetuyi & Oluwatayo, 2012; Nlem et al., 2022). This persistent failure was largely attributable to systemic bottlenecks, including perennially poor infrastructure, an acute lack of reliable internet access, and a significant prevalence of technophobic teachers who, despite training efforts, resisted integrating digital tools into their

pedagogy due to fear, lack of sustained support, or insufficient practical skills.

## The Digital Shift and Youth Engagement (2010–2020)

The decade from 2010 witnessed a profound digital shift driven primarily by the explosion of mobile phone penetration and increasing, albeit often unstable, internet access across Nigeria. This era birthed a generation of true 'digital natives' - young people inherently comfortable with digital devices and online information in their personal lives - who paradoxically remained largely confined to 'analogue classrooms' (Aworanti, 2016). This widening chasm between students' digital realities and their formal educational experiences presented a significant challenge: informal digital exposure rarely translated into systemic, structured digital education, impacting both learning outcomes and the relevance of formal instruction.

According to Aworanti (2016), a critical barrier remained the pervasive lack of adequate infrastructure within many schools, severely hindering their ability to adopt ICT-based assessment systems or modern digital pedagogies. While a few forward-thinking

institutions like the National Open University of Nigeria (NOUN), Covenant University, and the University of Ilorin pioneered e-assessments, the vast majority of public schools remained stubbornly offline. Furthermore, the issue of teacher ICT literacy persisted, with national surveys revealing that over 80% of teachers still lacked the confidence and proficiency required to effectively integrate and utilise ICT tools in the classroom (Aworanti, 2016; Nlem et al., 2022).

Nonetheless, this decade was not without its encouraging developments and signs of progress:

- The Joint Admissions and Matriculation Board (JAMB) spearheaded a monumental shift by introducing Computer-Based Testing (CBT) nationwide for university entrance examinations, forcing a degree of digital adaptation across the secondary education landscape and influencing student preparation.
- The widespread adoption of online platforms for school registration and results checking brought basic digital interaction to millions of students and parents.

- Crucially, the vacuum left by public sector shortfalls began to be filled by dedicated NGOs such as Paradigm Initiative and a burgeoning ecosystem of private EdTech startups, which initiated vital grassroots digital literacy programs, often reaching underserved communities.

## COVID-19: A Painful Wake-Up Call (2020 Onward)

The onset of the COVID-19 pandemic in 2020 served as an abrupt and painful wake-up call, starkly exposing the inherent fragility and profound deficiencies of Nigeria's digital education systems. As lockdowns took hold, a sharp dichotomy emerged: many agile private schools swiftly transitioned to online learning platforms, often leveraging existing technological capacities. In stark contrast, the vast majority of public schools found themselves utterly paralysed, unable to deliver remote instruction. This crisis deepened existing inequalities, with students in rural areas and low-income urban communities, already disadvantaged, becoming even more marginalised as their access to education evaporated (Nlem et al., 2022). The

learning loss incurred during this period remains a significant concern for national development.

However, amidst the crisis, there was an undeniable silver lining: the pandemic acted as a powerful catalyst, spurring:

- An accelerated push for digital teacher training programs, often driven by necessity and innovative partnerships, highlights the critical skill gaps.
- A surge in public interest and demand for online learning solutions, as parents and students alike recognised its critical importance for educational continuity.
- Renewed advocacy for urgent government investment in ICT infrastructure, finally treating it as a non-negotiable component of educational resilience.

The pandemic unequivocally transformed the perception of ICT in education: it was no longer a futuristic aspiration or a tangential luxury; it became an immediate, present-day necessity, deeply integrated into the very continuity of learning.

## Summary

The historical evolution of IT education in Nigeria presents a compelling narrative of delayed recognition, ambitious but often fragmented policy implementation, and recurring missed opportunities. Yet, it is also a story punctuated by pockets of remarkable innovation and resilient efforts. From the visionary 1988 policy blueprint that first laid the groundwork, to the forceful digital awakening triggered by the COVID-19 pandemic, Nigeria's journey has been undeniably uneven, marked by fits and starts, but also by an undeniable, growing urgency.

As leading researchers have pointed out, Nigeria remains largely in the "emerging phase" of ICT integration in education, with only a select few institutions truly progressing towards a transformative digital learning environment (Agbetuyi & Oluwatayo, 2012). To genuinely propel ourselves forward into the digital future, we must not only understand *where* we've come from but also critically analyse *why* our progress has been intermittent. This comprehensive historical understanding forms the bedrock upon which the subsequent chapters will build, as we delve into the current realities, celebrate

groundbreaking innovations, and collectively chart a robust road ahead for IT education in Nigeria.

# Chapter Three

# Assessing the Current State of IT Education in Nigeria

Despite decades of strategic policy formulation and the ambitious aspirations laid out in national development plans, Nigeria's IT education landscape in 2025 reflects a complex tapestry woven with threads of immense potential, pockets of undeniable progress, and persistent, often debilitating, paralysis. While dynamic urban centres boast modern smart classrooms, vibrant EdTech hubs, and increasing digital adoption, a vast majority of schools, particularly public institutions and those in rural areas, remain deeply analogue, tragically disconnected from the rapid digital revolution shaping global education. This disparity not only hinders national development but also exacerbates socio-economic inequalities.

This chapter undertakes a critical and empirical evaluation of the current realities of IT education in Nigeria. It systematically assesses key

indicators, including the foundational infrastructure, the relevance of existing curricula, the readiness and competence of the teaching workforce, the pervasive issues of access and equity, and the nature of learner engagement in the digital age. By dissecting these components, we aim to provide a clear and unvarnished picture of where Nigeria stands in its journey towards digital literacy and technological empowerment.

## Infrastructure: The Achilles Heel

Infrastructure remains, unequivocally, the most significant stumbling block and the very Achilles' heel in the consistent delivery of effective IT education across Nigeria. Many schools continue to operate in a state of profound deprivation, critically lacking:

- Functional computer laboratories: Often non-existent, or equipped with dilapidated, obsolete machines that are non-operational.
- Uninterrupted power supply: Erratic electricity renders even available equipment useless for extended periods, crippling practical learning.

- Reliable internet access or sufficient bandwidth capacity: Where internet exists, it is frequently slow, expensive, and unstable, preventing access to rich online resources.
- Up-to-date digital learning devices: Students often lack personal access to modern computers, tablets, or even smartphones for educational purposes.

According to Nlem et al. (2022), a staggering fewer than 30% of public schools in Nigeria possess operational ICT facilities. Even in the fortunate minority where some infrastructure exists, these facilities are often outdated, poorly maintained, or paradoxically, reserved strictly for administrative use rather than for active student learning. Furthermore, in states where promising pilot projects have been initiated, the pervasive absence of sustainable funding mechanisms and robust technical maintenance strategies continues to undermine long-term success, leading to rapid decay and abandonment of digital assets.

## Curriculum and Pedagogical Relevance

The formal introduction of Computer Studies into the national curriculum represents a commendable step towards digital inclusion.

However, this progress is significantly undermined by a persistent pedagogical challenge. As Agbetuyi and Oluwatayo (2012) accurately point out, many schools predominantly teach from static textbooks and theoretical frameworks, rather than fostering hands-on, practical experiences that are crucial for genuine digital literacy. A curriculum that focuses heavily on outdated software suites and theoretical concepts, neglecting the dynamic shifts in global technology (such as Artificial Intelligence, machine learning, cloud computing, and advanced data analytics), risks becoming profoundly irrelevant in today's rapidly evolving, AI and cloud-driven world.

Moreover, a critical disconnect exists between the current curriculum design and the actual needs of the burgeoning digital industry in Nigeria and globally. While students may successfully graduate with a Computer Studies result from examinations like WAEC, lamentably, few leave school with the vital practical digital problem-solving skills, real-world coding exposure, robust cybersecurity literacy, or critical thinking abilities that employers desperately seek. This gap means graduates are often ill-prepared for the demands of the modern workforce, perpetuating a cycle of

unemployment despite a recognised need for digital talent

## Teacher Competence and Professional Development

Perhaps one of the most persistent and debilitating gaps in Nigeria's IT education ecosystem is the alarmingly low level of digital literacy and pedagogical competence among teachers. As Aworanti (2016) starkly states, over 80% of secondary school teachers in public institutions lack the foundational confidence or demonstrated competence to effectively deliver ICT content and integrate digital tools into their teaching methodologies. This pervasive issue stems from a confluence of barriers:

### 1. Systemic lack of pre-service and continuous in-service training

Many teachers enter the profession without adequate digital skills and receive insufficient ongoing professional development to update their knowledge.

**2. Persistent technophobia among older teachers**

A fear or resistance to new technologies hinders their willingness to adopt digital tools, often due to a lack of confidence or perceived difficulty.

**3. Limited incentives for ICT mastery**

There is often insufficient recognition or reward for teachers who invest in developing their digital skills, dampening motivation.

**4. Irregular exposure to modern EdTech tools**

Teachers rarely get hands-on experience with the latest educational technologies that could transform their classrooms.

As a direct consequence, even in the limited instances where digital devices and infrastructure are available, their actual usage in the classroom remains deplorably low. The pedagogical approach continues to be overwhelmingly lecture-heavy, with minimal to no integration of digital tools to support collaborative learning, personalised instruction, or adaptive learning pathways, thereby stifling student engagement and limiting the potential of available resources.

## Digital Equity and Rural Marginalisation

Nigeria's digital divide is a profound and multi-faceted challenge, manifesting vividly across both geographical and socio-economic lines. While students in affluent private urban schools routinely benefit from interactive whiteboards, high-speed internet, and tablet-based assessments, their counterparts in public and rural areas often attend classes without even the most basic amenity: electricity. This glaring disparity deepens inequality and perpetuates educational injustice, where access to vital digital knowledge becomes an unfortunate function of one's location or income bracket. The digital divide is further exacerbated by a significant gender disparity, with many girls in rural regions facing additional barriers and having even less access to ICT tools due to deeply entrenched cultural norms and prevailing economic constraints (Nlem et al., 2022), thereby limiting their future opportunities.

## Emerging Innovations and Promising Interventions

Despite the formidable challenges that persist, Nigeria's IT education landscape is not devoid of

hope. There are noteworthy signs of vibrant grassroots innovation and remarkable resilience, often driven by the private sector and non-governmental organisations stepping in to bridge critical gaps:

- EdTech startups such as uLesson, AltSchool Africa, and Tuteria are leading the charge, offering highly scalable, app-based learning platforms, virtual tutoring, and alternative skills acquisition programs that extend educational access and quality across Nigeria.
- Dedicated NGOs like Paradigm Initiative and Tech Her Africa are making significant strides in bridging the digital inclusion gap through targeted projects that provide digital literacy and vocational IT skills to underserved youth, particularly women and girls.
- Forward-thinking universities such as the National Open University of Nigeria (NOUN), Covenant University, and Babcock University are modelling best practices in hybrid learning environments and robust digital skill empowerment

programs, demonstrating viable pathways for tertiary education.

Furthermore, some progressive states (e.g., Lagos, Edo, Ekiti) have commendably launched teacher digital literacy training initiatives, yielding modest but encouraging successes.The Federal Ministry of Education has also taken initial steps towards integrating foundational coding and robotics into select school programs, signalling a strategic alignment with future-oriented skills development.

These interventions, while not yet systemic, represent critical proof points of what is achievable with focused effort and strategic partnerships.

## What's Working - and What's Not

The current state of IT education in Nigeria can be effectively summarised by juxtaposing areas of progress against persistent setbacks:

| Component | Progress | Major Setback |
|---|---|---|
| Policy | National policies exist and are updated | Weak implementation and monitoring persist |

| | | |
|---|---|---|
| Curriculum | Computer Studies is in the national curriculum | Poor alignment with emerging global tech trends |
| Infrastructure | Available in some urban/private schools | Virtually absent in rural/vast public schools |
| Teachers | Some training programs are ongoing | The majority remain digitally illiterate or technophobic |
| Access | Mobile penetration is high among youth | Digital divide deepens in the education sector |

## A Nation at the Crossroads

Nigeria's current IT education framework vividly reflects a country poised on the edge of profound transformation, yet simultaneously constrained and often pulled back by deeply entrenched systemic barriers. The commendable progress made in policy formulation and the burgeoning digital awareness among the populace have,

unfortunately, not translated into universal, impactful change within the nation's classrooms. The journey forward is critical.

If Nigeria is to genuinely meet the ambitious digital aspirations outlined in its National Development Plan 2021–2025 and secure its competitive edge in the 21st-century global economy, a fundamental paradigm shift is urgently required. This shift must move decisively from mere policy intentions and fragmented initiatives to robust, ground-level execution. Real, sustainable reform must be anchored in deliberate teacher empowerment through continuous professional development, strategic and widespread infrastructure investment, a relentless commitment to digital equity that addresses rural and gender marginalisation, and a dynamic curriculum modernisation that genuinely reflects the rapidly evolving future of work and the demands of the global digital economy. The path is clear; the political will and collective action must follow.

# Chapter Four

# ICT in Education in Cross River State: Progress, Challenges, and the Path Forward

Cross River State, with its unique blend of dynamic urban hubs like Calabar and vast, diverse rural communities spanning regions such as Obudu, Biase, and Akamkpa, presents a compelling microcosm of Nigeria's broader aspirations and deeply entrenched challenges in Information and Communication Technology (ICT) education. The state's journey encapsulates both the immense promise and the significant pitfalls inherent in integrating ICT within a subnational educational ecosystem, mirroring the national narrative but with distinct local nuances.

This chapter undertakes a critical and in-depth evaluation of the current status of ICT in education within Cross River State. It meticulously draws from recent policy developments, rigorous academic research, official government reports, and observed on-ground interventions. By highlighting the

tangible progress achieved, dissecting the persistent roadblocks, and identifying key opportunities for strategic, sustainable reform, this analysis aims to provide actionable insights for the state's digital future and serve as a valuable case study for other Nigerian states.

## Government-Led Initiatives: Foundations for Reform

In a significant strategic move in 2023, the Cross River State Government demonstrated clear political will by restructuring its education ecosystem, consolidating science, technology, and innovation under a single, streamlined ministry (Cross River State News, 2023). This forward-thinking consolidation aimed to enhance coordination, streamline digital initiatives, and foster synergy across all educational tiers - from primary to tertiary levels.

Key programs spearheaded under this new framework include:

### 1. Digitization of Examinations

A critical step towards enhancing integrity and efficiency, placement tests such as the Primary Six common entrance, Basic Education Certificate Examination (BECE), and SS II mock

exams have been systematically digitized. This initiative aims not only to drastically reduce malpractice and human error but also to significantly improve transparency and the speed of results processing, thereby modernizing the assessment landscape.

## 2. Revitalized State Library

The Calabar Central Library, a vital knowledge hub, received a much-needed overhaul. It was reequipped with modern ICT tools, expanded e-resources, and functional computer laboratories, providing students and the broader community with a critical access point for digital learning and research.

## 3. TCTI & EFCC Partnership

In a groundbreaking collaboration, the Teachers Continuous Training Institute (TCTI) in Biase signed a three-year Memorandum of Understanding (MoU) with the Economic and Financial Crimes Commission (EFCC) in 2025. This unique partnership aims to proactively promote digital literacy, cultivate online safety awareness, and instil foundational cybersecurity knowledge among educators and youth, addressing critical areas often overlooked in basic IT education.

These programs undeniably reflect a proactive political will to embrace digital transformation. However, their long-term scalability and pervasive impact remain critically limited without sustained investment, robust funding mechanisms, and genuine grassroots implementation that reaches every classroom and community.

## Secondary Schools: Mixed Progress and Widening Inequality

While ICT policies for secondary education exist robustly on paper within Cross River State, their implementation remains jarringly uneven, creating and exacerbating a stark inequality particularly between well-resourced urban and vastly underserved rural schools.

A concerning 2024 study across 40 secondary schools revealed that computer studies, a core subject, is formally taught in less than 50% of them, and even fewer possess functional computer laboratories (Agbor & Edet, 2024). The situation is particularly dire in remote areas like Obudu LGA, where severe infrastructural deficits mean that even available ICT equipment frequently lies dormant and unused. This underutilization is directly attributable to

persistent challenges such as erratic power supply, a lack of secure storage, and a critical absence of adequately trained and motivated personnel to manage and teach with the tools (Ogar et al., 2025).

Crucially, research by Ogar and colleagues (2025) uncovered a strong positive correlation between effective supervision of ICT tools at the school level and actual teacher utilization. This finding underscores a vital insight: strong, visible leadership and consistent support at the school level are absolutely key to successful ICT integration, transforming equipment from mere assets into active pedagogical instruments. Without this localized leadership, even well-intentioned investments fail to yield meaningful educational outcomes, perpetuating the cycle of digital disparity.

## Teacher and Adult Digital Literacy: Training Without Tools

Efforts to bolster teacher capacity in digital skills are indeed growing within Cross River State, signaling a recognition of the human element in ICT integration.

- The TCTI has been commendably active, training a significant 1,475 teachers

between 2023 and 2025 in vital areas such as digital pedagogy, online assessment methods, and virtual classroom management techniques (The Whistler, 2024). This represents a substantial investment in human capital.

- However, a glaring paradox exists: adult literacy centers, crucial for wider societal digital upliftment, still predominantly lack any ICT facilities whatsoever. A sobering 2023 survey reported near-zero use of digital resources in these centers, citing the debilitating trinity of absent power, lack of equipment, and insufficient facilitator training (Nwosu & Udo, 2023).
- Even within tertiary institutions, the challenge persists. A study focusing on Federal College of Education, Obudu, found that business education lecturers rarely leverage digital platforms in their teaching, citing a persistent lack of infrastructure and, crucially, a palpable lack of confidence in their own ICT skills (Effiom & Ita, 2024).

Thus, while awareness of the importance of digital skills is undeniably growing, the

significant gap between theoretical training and actual, confident classroom transformation remains a critical barrier, limiting the practical impact of these investments.

## Curriculum Misalignment and Absence of Emerging Technologies

One of the most striking deficiencies in Cross River State's ICT education landscape is the pervasive absence of emerging technologies within the formal curriculum, rendering it increasingly out of step with global trends and future job market demands.

- As of 2025, advanced concepts like Artificial Intelligence (AI) education are conspicuously not included in the state curriculum at any educational level. Alarmingly, students and teachers alike report low to zero awareness of fundamental concepts such as artificial intelligence, machine learning, or data science, placing them at a severe disadvantage in a rapidly automating world (Pillar Today, 2025).
- Only a handful of elite private schools in urban centers like Calabar (e.g., Emerald Field School) are proactively

experimenting with AI concepts. These initiatives are typically driven by private partnerships and self-funded programs, further widening the divide between privileged and public education.

Moreover, the state has yet to develop or adopt a centralized repository for localized digital learning content. This crucial void severely hampers contextual learning, making imported resources feel distant and irrelevant, and actively discouraging ICT adoption among teachers unfamiliar with non-local content. Without content that resonates with the unique socio-cultural context of Cross River State, the efficacy of any digital learning platform is significantly diminished.

## UNICEF's Nigerian Learning Passport (NLP): Hope and Hurdles

In a significant move towards broader digital access, Cross River State, in partnership with UNICEF, launched the Nigerian Learning Passport (NLP) - a digital platform offering curriculum-aligned content for primary and secondary students. This initiative holds immense promise for bridging learning gaps.

Achievements so far include:

- Extensive Training: Over 300 Education Information Management Officers (EIMOs) across all 18 Local Government Areas have received training, laying a foundational human network for the platform's deployment.
- Accessibility Design: The NLP provides both online and crucial offline access to content, theoretically designed to reduce barriers for learners in remote and rural areas with limited connectivity.
- However, the journey towards widespread adoption and sustainability faces significant hurdles that mirror national challenges:
- Resource Scarcity: Many schools continue to lack sufficient digital devices (e.g., tablets, computers) and consistent power supply to effectively deploy the platform consistently, rendering its offline capabilities less impactful.
- Weak Monitoring and Follow-up: Insufficient monitoring and follow-up at the school level by state authorities lead to underutilization. The platform, despite its potential, often remains an unintegrated

resource rather than a core part of daily teaching and learning, struggling to transition from project to sustained program.

## Evidence of Impact: Pockets of Progress

Despite the myriad limitations, certain strategic reforms and interventions within Cross River State are undeniably beginning to yield measurable results, demonstrating the potential of thoughtful ICT deployment even in resource-constrained settings.

### 1. Improved Examination Performance

The state witnessed a notable improvement in NECO performance, rising from 68.9% in 2023 to 72.1% in 2024. This positive trend is partly attributed to concerted digital literacy efforts and ongoing teacher retraining programs (The Whistler, 2024), underscoring the direct link between ICT integration and academic outcomes.

### 2. Enhanced Student Engagement and Outcomes

A compelling 2025 study conducted in Abi LGA provided empirical evidence that classrooms purposefully equipped with digital tools experienced significantly better student

engagement and demonstrably improved academic outcomes (Asuquo & Ikpi, 2025). This localised success highlights that when ICT is thoughtfully and strategically deployed, with accompanying training and support, it unequivocally enhances learning, motivating both students and educators.

These pockets of success serve as vital proof points, demonstrating that despite the systemic challenges, targeted ICT interventions can indeed catalyse positive change in learning environments.

## Persistent Challenges

Despite the evident progress and promising interventions, a set of deeply rooted and interconnected challenges continues to plague the comprehensive development and scalable integration of ICT in education within Cross River State:

| Challenge | Description |
|---|---|
| Power Supply | The vast majority of rural schools, and many urban ones, continue to lack stable and reliable electricity, making |

| | |
|---|---|
| | consistent use of any digital equipment impossible. The adoption of alternative energy solutions like solar power remains critically slow and underfunded. |
| Teacher Capacity | A significant proportion of teachers, particularly older educators, lack fundamental digital literacy and pedagogical skills for ICT integration. Many actively resist adopting digital tools due to fear, inadequate training, or insufficient ongoing support and incentives. |
| Digital Divide | The digital divide is starkly evident, with rural learners, girls, and children with disabilities remaining disproportionately excluded from digital learning opportunities due to a lack of access, cultural barriers, and insufficient tailored interventions. |

| | |
|---|---|
| Underfunding | Budgetary allocations for ICT in education at the state and local government levels are consistently low, failing to meet the actual needs for infrastructure, maintenance, and training. Furthermore, funds often face diversion or mismanagement, hindering effective deployment. |
| Content Gap | There is no central, comprehensive repository for locally relevant, curriculum-aligned digital content. Schools and teachers struggle to find high-quality, culturally appropriate digital resources, leading to reliance on outdated materials or irrelevant imported content. |
| Monitoring | Weak or non-existent evaluation frameworks mean that ICT projects are often launched without robust mechanisms to track their deployment, utilisation, or actual impact on student |

| | |
|---|---|
| | learning outcomes, leading to a lack of accountability and an inability to learn from mistakes or refine strategies. |

## A Model in the Making, If Nurtured Properly

Cross River State, through its proactive initiatives and pockets of innovation, is undeniably laying the foundational groundwork for digital transformation in education. However, it is unequivocally far from achieving systemic, state-wide success. A few flagship programs and urban pilot projects, while commendable, cannot substitute for a comprehensive, holistic, and equitable state-wide approach that prioritises foundational infrastructure, ensures genuine access equity for all learners, commits to sustained teacher training and empowerment, and strategically invests in localised digital content creation.

The EFCC-TCTI partnership, the rollout of the Nigerian Learning Passport (NLP), and the revitalisation of the Calabar Central Library offer critical, promising starting points. However, the next crucial phase of ICT integration in Cross

River State must be unequivocally scale-driven and data-informed. This requires robust public-private partnerships, active and meaningful community participation, and the establishment of stringent, continuous monitoring and evaluation frameworks as core pillars. Only by moving decisively from isolated pilots to integrated policy, and from ambitious policy to demonstrable performance, can Cross River truly become a regional model for successful ICT integration in education, transforming its educational landscape for the benefit of every child.

# Chapter Five

# Innovations and Success Stories in Nigerian IT Education

While infrastructural deficits and teacher under-preparedness regrettably continue to plague much of Nigeria's IT education system, this reality does not tell the full story. Across the nation, vibrant pockets of innovation are not merely surviving; they are actively blazing new trails, reshaping the learning experience, and demonstrating that digital transformation is not a distant dream but an achievable reality. These compelling success stories serve as irrefutable proof that with visionary leadership, strategic partnerships, and an unwavering commitment, the landscape of digital education can be radically reshaped, even amidst challenging terrains.

This chapter is dedicated to highlighting some of the most impactful innovations, transformative projects, and pioneering institutions that are actively redefining the scope, accessibility, and delivery of IT education across Nigeria. By spotlighting these achievements, we aim to

provide a blueprint for scalable reform and inspire a renewed collective effort towards a digitally empowered future.

## EdTech Startups: Nigeria's New Digital Pioneers

A dynamic generation of homegrown EdTech companies is at the forefront of revolutionising how Nigerian students access and engage with learning. These agile pioneers are not just leveraging technology; they are fundamentally rethinking educational delivery, often in ways that traditional systems cannot.

### 1. uLesson (Founded by Sim Shagaya)

Launched in 2019, uLesson rapidly emerged as a game-changer, offering a comprehensive mobile-first learning experience. Through engaging video lessons, interactive quizzes, and real-time homework support, the platform meticulously tailors content for critical examinations like WAEC, JAMB, and NECO. Its remarkable growth, evidenced by over 2 million downloads across Africa within its first three years, stands as a powerful testament to the scalability and profound impact of Nigerian-led digital innovation in education. It democratizes access to

high-quality exam preparation, reaching learners far beyond the confines of physical classrooms.

## 2. AltSchool Africa

Recognising the critical gap between conventional university education and industry demands, AltSchool provides intensive, career-track digital training. Specialising in high-demand fields such as software engineering, product design, and data science, it offers accessible tuition and a flexible virtual learning model. This initiative is effectively bridging the talent gap by equipping African youth with job-ready tech skills, creating direct pathways to employment without the traditional four-year university commitment.

## 3. Tuteria

Founded by a visionary Nigerian engineer, Tuteria addresses the need for personalised learning by seamlessly connecting learners with qualified tutors, both online and in-person. Beyond traditional tutoring, the platform actively fosters peer-to-peer knowledge transfer and significantly supplements formal classroom instruction with practical, skill-based learning. This model enhances academic performance while nurturing critical thinking and problem-

solving abilities tailored to individual student needs.

These innovative platforms have profoundly expanded access to quality digital learning resources, simultaneously making IT education more interactive, adaptive, and personalised, catering to diverse learning styles and socio-economic contexts.

## Smart Schools and State-Level Models

Crucially, some progressive state governments have transcended policy rhetoric, launching bold and systemic reforms to modernise public education through direct digital innovation, offering replicable models for the nation.

### 1. EdoBEST (Edo Basic Education Sector Transformation)

Edo State's flagship program stands as a beacon of large-scale digital integration. It equips teachers with tablet-based teaching aids, providing real-time data through teacher dashboards, and enabling central monitoring of lesson delivery for fidelity and impact. The program's commitment to weekly digital training for teachers ensures continuous professional development and consistent pedagogical quality, demonstrating how technology can

fundamentally elevate basic education outcomes across an entire state system.

## 2. Ekiti Digital Literacy Project

In a strategic partnership with private firms, Ekiti State has made significant strides in human capacity building, successfully training over 1,000 teachers in essential basic and intermediate ICT use. Beyond training, the program has directly addressed the infrastructure deficit by distributing tablets and installing solar-powered charging stations in rural schools, ensuring sustained access to digital learning even in off-grid communities.

## 3. Lagos E-School Project

Following initial bureaucratic challenges, Lagos State, recognizing the post-COVID-19 urgency, has vigorously revived its digital school agenda. This renewed focus supports robust virtual classrooms, secure cloud storage of educational content, and the development of mobile-friendly learning resources, aiming to ensure continuity and quality of education for its vast student population even in times of disruption.

These state-level models offer a compelling blueprint for scalable reform, unequivocally demonstrating how proactive state leadership can effectively drive widespread digital inclusion and transform the public education sector.

## Higher Institutions and Hybrid Learning Innovation

Nigeria's tertiary education landscape has also seen remarkable shifts, with several universities rising to the challenge of delivering globally competitive IT education and fostering a culture of innovation.

### 1. Covenant University

Renowned for its state-of-the-art digital laboratories and robust infrastructure, Covenant University operates a sophisticated blended learning model. It seamlessly integrates advanced digital tools into traditional lectures, facilitates continuous online assessments, and leverages technology for research. Consequently, its graduates are consistently among the most competitive and sought-after professionals in Nigeria’s rapidly expanding tech sector, directly meeting industry demands.

## 2. National Open University of Nigeria (NOUN)

As the nation's pioneer open and distance learning institution, NOUN has become a leader in accessible IT education. It offers a comprehensive suite of fully online programs, provides virtual course delivery, conducts e-examinations, and maintains extensive digital libraries accessible to students nationwide. NOUN exemplifies how technology can democratize higher education, reaching learners who might otherwise be excluded due to geographical or economic constraints.

## 3. University of Ilorin & Obafemi Awolowo University

These venerable institutions have been instrumental in modernizing academic processes and fostering practical IT skills. They have successfully implemented Computer-Based Testing (CBT) for internal examinations, significantly improving efficiency and transparency. Beyond this, they actively provide cutting-edge coding bootcamps, innovation hubs, and startup incubators, nurturing an entrepreneurial ecosystem and equipping

students with highly relevant IT-related skills directly applicable to the digital economy.

Their collective success powerfully demonstrates how higher education institutions can model profound innovation and significantly contribute to national digital capacity, even in contexts of limited direct government funding.

## NGOs and Community-Based Interventions

Where formal government structures and market forces struggle to penetrate or scale, dedicated NGOs and faith-based organizations have stepped in, proving indispensable in bridging Nigeria's vast IT education divide and empowering marginalized communities.

### 1. Paradigm Initiative

With strategically located digital inclusion centers in underserved communities like Aba, Kano, and Ajegunle, Paradigm Initiative delivers crucial training to disadvantaged youth. Their programs focus on fundamental ICT skills, digital rights advocacy, and essential employability skills. Their acclaimed LIFE program has directly empowered thousands of beneficiaries with job-

ready tech competencies, fostering economic independence and digital citizenship.

## 2. Tech Her Africa

This vital NGO is laser-focused on addressing the pervasive gender gap in technology. Through targeted programs, it offers training to women and girls in digital safety, foundational coding, and entrepreneurship. Their mission is a powerful drive to enhance female participation, promote inclusivity, and ensure that women are active contributors and beneficiaries of the digital economy.

## 3. Royal Diadem Schools (Akwa Ibom)

As a model private school network, Royal Diadem Schools exemplifies how grassroots institutions can lead digital change. They integrate sophisticated learning management systems (LMS), utilize e-assessments, and foster engaging tech clubs to build robust IT competence in pupils from a very early age, laying a strong foundation for future digital leadership.

# Private Sector Partnerships and CSR Efforts

Recognizing the strategic importance of a digitally skilled workforce, forward-thinking corporate organizations are increasingly investing in IT education through impactful Corporate Social Responsibility (CSR) initiatives and strategic public-private partnerships. These collaborations are crucial for sustainable digital transformation.

## 1. MTN Foundation

Through its extensive CSR programs, the MTN Foundation has significantly bolstered digital infrastructure by equipping over 200 schools with modern ICT laboratories and providing critical training for ICT teachers, directly enhancing teaching capacity nationwide.

## 2. Google's CS First Nigeria program

This global tech giant has played a pivotal role in democratizing access to coding education. Its CS First Nigeria program has introduced foundational coding concepts to thousands of Nigerian students through engaging, interactive sessions, sparking early interest in computer science careers.

### 3. Microsoft Africa Development Centre in Lagos

As a major hub for tech innovation, the Microsoft ADC actively collaborates with Nigerian universities. This collaboration focuses on advanced AI training, providing invaluable internships, and strategically updating university curricula to align with cutting-edge industry standards, thereby building a pipeline of future-ready tech talent.

These significant private sector interventions are collectively building a crucial pipeline of future-ready tech talents, demonstrating a shared commitment to developing Nigeria's digital human capital.

## Impact Snapshot

The transformative impact of these innovations can be encapsulated by observing their reach and specific contributions:

| Innovation Area | Notable Example | Impact |
|---|---|---|
| Mobile EdTech | uLesson, AltSchool | Over 3 million learners reached; accessible career pathways |

| | | |
|---|---|---|
| Public Sector | EdoBEST, Lagos E-School | Real-time data-driven insights; digital lesson delivery at scale |
| Higher Education | NOUN, Covenant University | 100% online programs; blended learning models; industry-ready graduates |
| NGO Efforts | Paradigm Initiative, Tech Her Africa | Thousands trained in digital skills; gender gap reduction |
| Corporate CSR | MTN, Google, Microsoft | Critical infrastructure provision; teacher training; advanced tech skill development |

## Seeds of a Digital Revolution

Despite the deep-seated systemic challenges elucidated in previous chapters, these diverse and compelling success stories unequivocally signal that a digital transformation in Nigerian education

is not merely a possibility - it is already dynamically underway. These initiatives, spanning from agile startups to committed state governments, and from pioneering private schools to resilient public universities, represent the 'seeds of a digital revolution,' demonstrating that Nigerians are actively finding innovative ways to bridge the digital gap from within.

What is critically needed now is a concerted national effort to:

- Systematically replicate these successful models nationwide, adapting them thoughtfully to diverse local contexts.
- Ensure robust policy alignment with current innovation trends, creating an enabling environment for further growth rather than hindering it.
- Significantly increase investment in sustainable local solutions that are both cost-effective and scalable, reducing reliance on external models.

The next, crucial chapter of IT education in Nigeria profoundly depends on how effectively these precious seeds of innovation are nurtured - and how boldly they are allowed to proliferate

across the entire nation, ultimately transforming the learning experience for every Nigerian child and securing our collective digital future.

# Chapter Six

# Roadblocks to Scalable Transformation in Nigerian IT Education

Despite the exciting pockets of innovation and inspiring success stories outlined in the previous chapter, the larger picture of Information Technology (IT) education in Nigeria remains regrettably marred by pervasive systemic dysfunctions. For every glimmer of a smart classroom launched, thousands more operate without basic electricity. For every dedicated teacher trained in modern digital pedagogies, hundreds more have never had hands-on experience with a computer, let alone integrated it into their teaching. This stark dichotomy underscores a critical reality: innovation, however brilliant, cannot scale or achieve equitable reach without dismantling deeply entrenched barriers.

This chapter meticulously identifies and critically analyses the key roadblocks that continue to prevent Nigeria from scaling IT education equitably, sustainably, and effectively across all

segments of its society. Drawing rigorously on academic literature, candid government reports, and direct field observations, we demonstrate that without fundamental structural reform, even the most promising innovations will remain isolated, inherently unsustainable, and tragically elitist. Tackling these challenges head-on is not merely an option; it is an absolute prerequisite for unlocking Nigeria's full digital potential.

## Policy-Implementation Disconnect

Nigeria has consistently demonstrated a commendable capacity for crafting visionary national policies since the pivotal 1988 National Policy on Computer Education and the comprehensive 2001 National IT Policy. Ambitious frameworks and lofty targets have never been in short supply. However, the profound and persistent gap between policy formulation and its tangible implementation on the ground remains an enormous, self-inflicted wound.

According to Agbetuyi and Oluwatayo (2012), despite national policy documents explicitly advocating for ICT integration at all educational levels, the vast majority of schools never received the promised infrastructure or the necessary

support to realise these directives. This disconcerting trend regrettably continued into the 2010s, with subsequent policies often existing "more on paper than in practice" (Aworanti, 2016). Nlem et al. (2022) incisively argue that the systemic failure to adequately follow up policies with robust monitoring mechanisms, stringent accountability frameworks, and transparent feedback loops is a major, insidious cause of stagnation. While the federal government outlines grand targets, the reality is that budget allocations are frequently insufficient, prone to debilitating delays, or, in many documented cases, misappropriated entirely, particularly at state and local government levels. This chronic implementation deficit transforms well-intentioned visions into frustrating lost opportunities.

## Infrastructural Poverty

Infrastructural limitations represent the most visible, pervasive, and ultimately paralysing barrier to scaling IT education across Nigeria. This is not merely a technological deficit; it is a profound reflection of deeper socio-economic inequalities that disproportionately burden public and rural communities. Across countless public schools, the stark reality includes:

- Non-existent or severely outdated computers: Many institutions possess no functional IT equipment or rely on ancient machines that are slow, unreliable, and incapable of running modern software.
- Erratic or unavailable electricity: The absence of a consistent power supply, especially in rural and peri-urban areas, renders any installed equipment useless for significant periods, halting practical learning and skill development.
- Limited or absent internet access: Even where power exists, the lack of affordable, high-speed internet connectivity isolates schools from the vast global repository of digital knowledge and collaborative learning platforms.
- Overcrowded class sizes: The sheer number of students per classroom makes effective one-on-one digital engagement virtually impossible, even with limited devices.

These pervasive infrastructural gaps directly undermine pedagogical innovation, forcing a continued reliance on traditional, rote-learning methods. As unequivocally documented by Nlem

et al. (2022), nearly 70% of rural schools in Nigeria lack any form of functional ICT facility, critically widening the digital divide and severely limiting the potential of millions of students. This grim reality aligns perfectly with Unwin (2009), who emphasised that ICT-for-development initiatives in developing countries frequently falter precisely because they overlook these fundamental, underlying infrastructure deficits, building digital castles on analogue sand.

## Inadequate Teacher Capacity and Resistance to Change

Teachers are the indispensable fulcrum upon which successful IT integration hinges. Yet, a critical and persistent roadblock is the pervasive lack of digital literacy and, in some cases, outright resistance among the teaching workforce. According to Aworanti (2016), a staggering over four in five teachers in public schools lack formal training in ICT usage, severely impeding their ability to deliver modern IT education. Many, especially older staff, exhibit a palpable resistance to change, often rooted in:

- Technophobia: A genuine fear of new technologies, stemming from a lack of

exposure and confidence, leading to avoidance rather than engagement.

- Fear of embarrassment: Hesitation to experiment with new tools due to a fear of making mistakes in front of students or colleagues.
- Perceived irrelevance: A belief that ICT is an added burden rather than an enhancing tool, particularly in systems focused on traditional examination outcomes.

This challenge is further supported by Adebayo and Adesope (2021), who highlight that teacher readiness remains one of the most formidable barriers to successful ICT implementation in Nigerian schools. Even when digital devices are generously provided, many educators struggle to utilise them effectively - or, more concurringly, avoid them altogether. The absence of comprehensive, ongoing professional development tailored to practical classroom application, combined with systemic issues like poor remuneration, heavy workloads, and a lack of supportive school environments, further erodes the motivation among teachers to proactively engage with and master ICT (Okebukola, 2020).

This results in underutilised equipment and a perpetuation of outdated teaching methodologies.

## Funding Shortfalls and Financial Mismanagement

The financing of IT education in Nigeria is characterised by gross inadequacy and profoundly inconsistent disbursement, creating a chronic resource deficit. According to a critical UNESCO report (2021), less than 10% of Nigeria's annual education budget is typically allocated to technology and infrastructure development - a figure dramatically below the African Union's recommended benchmark for fostering digital economies. This underfunding starves IT education of the necessary capital for equipment, maintenance, training, and connectivity.

Moreover, many well-intentioned intervention programs are disproportionately funded by international donors or NGOs, and often remain poorly integrated within robust national planning and budgetary systems. This external reliance renders them inherently unsustainable once donor cycles conclude (Agbetuyi & Oluwatayo, 2012), leading to fragmented, short-lived projects. Compounding this, poor transparency and

pervasive mismanagement in fund allocation and utilisation, particularly at federal, state, and even institutional levels, severely exacerbate the issue. Nlem et al. (2022) provide multiple disheartening cases where vast sums allocated for ICT equipment through national contracts were either demonstrably diverted, poorly installed, or quickly rendered useless due to a glaring lack of technical support and maintenance, illustrating a systemic breakdown in accountability.

## Cultural Barriers and Digital Illiteracy

Nigeria's rich and diverse cultural landscape, while a source of strength, also presents unique and often subtle barriers to widespread digital acceptance and integration. In certain traditional and rural communities, particularly in the northern regions, ICT can be perceived not as an essential tool for development but as a luxury, or even as a foreign, 'Western' intrusion that threatens established cultural norms and traditional learning methods. This scepticism can lead to underutilization or outright rejection of digital initiatives.

Furthermore, pervasive digital illiteracy among parents, especially in low-income and rural households, significantly hampers the provision

of home support for technology use. This becomes critically apparent where online assignments, virtual learning platforms, or digital homework are involved, creating a further barrier for students (Afolabi et al., 2021). This lack of parental digital fluency means children often lack the crucial encouragement, supervision, and technical assistance necessary to truly integrate digital learning into their lives outside of school. In many conservative parts of northern Nigeria, deeply ingrained cultural views on female education further restrict girls' access to ICT tools and digital opportunities, thereby tragically deepening the already stark gender digital divide (Unwin, 2009; Nlem et al., 2022).

## Lack of Localised Digital Content

Even in the limited instances where technology infrastructure is available and functional, a critical scarcity of culturally relevant, curriculum-aligned digital content severely hinders the effectiveness and usefulness of ICT in Nigerian classrooms. Many existing EdTech platforms and digital resources, particularly those with foreign origins, either recycle Western content directly or utilise abstract examples that are profoundly disconnected from Nigerian realities, experiences, and pedagogical approaches.

Agbetuyi and Oluwatayo (2012) issue a pertinent warning: unless digital learning resources actively reflect the local environment, cultural nuances, and specific educational expectations, students will struggle to relate to the material, engagement will plummet, and teachers will simply avoid using them altogether, deeming them irrelevant. Moreover, Nigeria has yet to establish a robust, nationally coordinated open-source digital library or content repository specifically tailored for educators. This critical void leaves individual schools and teachers to improvise with limited resources, often relying on outdated textbooks or generic online materials that fail to capture the richness and specificity required for impactful learning, thereby hindering the potential for truly transformative digital pedagogy.

## Transformation Requires More Than Technology

The journey to scaling IT education in Nigeria is unequivocally more complex than merely providing laptops or internet access; it demands a radical, multi-layered reform agenda that addresses foundational systemic issues. The persistent roadblocks identified in this chapter - ranging from the pervasive policy-

implementation disconnect and crippling infrastructural poverty to inadequate teacher capacity, chronic funding shortfalls, enduring cultural barriers, and the dire scarcity of localised digital content - underscore the magnitude of the challenge.

As echoed by Nlem et al. (2022), genuine IT education reform must be holistic, inclusive, and strategically coherent - not scattered, reactive, or confined to isolated pilot projects. Without courageously tackling these deeply entrenched roadblocks head-on with sustained political will, transparent governance, and collaborative action, the impressive innovations currently emerging will regrettably remain a series of disconnected islands, unable to collectively transform the vast sea of systemic failure that continues to define Nigeria's IT education landscape. The path to a truly digitally empowered nation hinges on confronting these fundamental obstacles with unwavering commitment.

# Chapter Seven

# The Road Ahead: Policy Recommendations and Strategic Solutions for IT Education in Nigeria

Having meticulously examined the historical evolution, critically assessed the current state, celebrated the emerging innovations, and unsparingly identified the persistent barriers in previous chapters, it is undeniably clear: transforming IT education in Nigeria demands nothing less than bold, deliberate, and systemic reforms. This chapter moves beyond diagnosis to present pragmatic policy recommendations and strategic interventions meticulously designed to decisively close the digital divide, profoundly empower educators and learners, and strategically reposition Nigeria for a truly technology-driven future.

These proposed solutions are firmly anchored in robust empirical studies, globally recognised best practices, and the undeniable contextual realities reported in contemporary Nigerian scholarship

and development reports (Agbetuyi & Oluwatayo, 2012; Aworanti, 2016; Nlem et al., 2022; Adebayo & Adesope, 2021; UNESCO, 2021). They represent a comprehensive blueprint for actionable change, designed to foster resilience, equity, and innovation across the nation's educational landscape.

## Strengthen Infrastructure through Decentralised Investment

Reliable and pervasive infrastructure is not merely a component; it is the absolute bedrock of effective and equitable IT education. To overcome the debilitating infrastructural poverty, government and private actors must urgently prioritise targeted, needs-based investments:

- Solar-powered digital classrooms in off-grid areas: This directly addresses the chronic power deficit, ensuring that remote and rural schools can maintain consistent access to technology irrespective of national grid reliability.
- Community internet hotspots around public schools: Extending internet access beyond the classroom to the surrounding community fosters broader digital literacy

and enables continuous learning, turning schools into vital digital hubs.

- Device grants or low-interest leasing for students and teachers: This crucial intervention tackles the affordability barrier, ensuring that individual learners and educators have personal access to modern digital tools, moving beyond shared, often oversubscribed, facilities.

Policy must decisively shift from top-heavy federal programs, which have historically struggled with implementation, to more localised, school-specific investments. Each school should undergo a comprehensive ICT needs assessment, leading to a tailored implementation plan (UNESCO, 2021). States and Local Government Areas (LGAs) must be genuinely empowered and sufficiently funded to initiate, monitor, and rigorously audit these plans, fostering greater accountability and responsiveness to local conditions. This decentralised approach ensures resources are allocated where they are most critically needed and effectively utilised.

## Mandatory Digital Pedagogy Training for Teachers

As Aworanti (2016) and Okebukola (2020) both unequivocally affirm, empowered teacher capacity is the single most critical factor for successful IT integration. Without digitally competent educators, even the most advanced devices risk becoming mere decorations. The following actions are therefore non-negotiable:

- Revise teacher education curricula to embed digital pedagogy, EdTech tools, and online assessment methods: This ensures that new teachers enter the profession equipped with the skills to teach in a digital age, making digital literacy an intrinsic part of teacher formation.
- Make digital competence a non-negotiable condition for teacher certification and promotion: This incentivises existing teachers to acquire and demonstrate proficiency, directly linking professional advancement to digital mastery.
- Provide annual, practical ICT refresher courses via the Teacher Registration Council of Nigeria (TRCN) or state ministries of education: Continuous

professional development is essential to keep teachers abreast of rapidly evolving technologies and pedagogical best practices, combating technophobia and ensuring skills remain relevant.

- Incentivise ICT mastery with tangible salary bonuses or accelerated career advancement points: Financial and professional recognition will motivate teachers to invest their time and effort in developing and applying digital skills, fostering a culture of continuous learning.

## Align Curriculum with Industry-Relevant Digital Skills

To make IT education truly future-focused and economically empowering, the Nigerian curriculum must undergo a radical evolution beyond basic computer appreciation. It must pivot towards cultivating the critical digital skills demanded by the global economy. The National Education Research and Development Council (NERDC) must lead this transformation by:

- Integrating foundational coding, robotics, artificial intelligence (AI) literacy, data science principles, and robust cybersecurity fundamentals into secondary

school syllabi: This equips students with the computational thinking and specialised skills essential for 21st-century careers.

- Promoting project-based and collaborative learning methodologies using digital tools: Moving away from rote learning, this approach fosters problem-solving, critical thinking, and teamwork – skills crucial for innovation.
- Partnering actively and deeply with industry leaders to co-develop relevant content and establish real-world learning experiences: Direct collaboration with the tech sector ensures the curriculum remains dynamic, current, and directly aligned with market needs, preparing students for immediate employability.

As Agbetuyi and Oluwatayo (2012) presciently warned, a stagnant curriculum will perpetually limit student readiness, regardless of how robust the available infrastructure becomes. Dynamic curriculum reform is paramount for fostering a workforce capable of driving digital transformation.

## Establish a National Digital Content Repository

The pervasive absence of culturally relevant, curriculum-aligned, and locally produced digital content is a significant, often overlooked, barrier to effective ICT integration. To overcome this, a comprehensive national open-access repository should be established and actively curated:

- Host interactive lesson videos, simulations, and educational games: This transforms passive learning into engaging, experiential discovery, catering to diverse learning styles.
- Be accessible via offline apps or local school servers: This critical feature addresses connectivity challenges, ensuring that content can be accessed even in areas with limited or no internet.
- Be editable and adaptable by verified teachers across states: Empowering educators to localise content ensures cultural relevance and responsiveness to specific classroom needs, fostering ownership and creativity.

This approach not only supports crucial content localisation and teacher creativity but also drives inclusive learning, particularly through content available in indigenous languages (Nlem et al., 2022). It democratizes access to high-quality educational materials, reducing reliance on expensive, often irrelevant, external resources.

## Develop Alternative and Innovative Funding Models

Given Nigeria's persistent fiscal limitations and competing national priorities, funding IT education must move decisively beyond traditional, often insufficient, government subsidies. Innovative and sustainable financing models are essential:

- Implement ICT levies on telecoms and tech companies, specifically dedicated to education: A small percentage of profits from these industries, which heavily benefit from digital adoption, could generate significant, sustainable funding directly for IT infrastructure and training in schools.
- Promote community-led crowdfunding initiatives for rural ICT labs: This fosters local ownership and engagement,

empowering communities to directly invest in their children's digital future, often leading to better maintenance and utilisation.

- Establish mission-driven public-private partnerships (PPPs) modelled after successful initiatives like EdoBEST: Leveraging the agility and resources of the private sector in collaboration with government can accelerate infrastructure development, teacher training, and content delivery, ensuring efficiency and scalability.
- Integrate Corporate Social Responsibility (CSR) efforts with measurable impact indicators: Encourage corporations to direct their CSR budgets towards specific, verifiable IT education projects, with clear metrics for success and public accountability.

As Okebukola (2020) suggests, education finance in Nigeria must be fundamentally reimagined to unequivocally prioritise digital equity and innovation, moving away from reactive budgeting to proactive, strategic investment.

## Promote Inclusive Access and Gender Equity

Digital learning opportunities must be inherently equitable, leaving no child behind. Policies must intentionally address the historical marginalisation of girls, persons with disabilities, and remote rural communities. Recommended actions include:

- Develop gender-responsive EdTech platforms and content: Ensuring content resonates with and empowers girls, challenging stereotypes and promoting their participation in STEM.
- Establish vibrant school-based ICT clubs with strong female mentorship programs: Creating supportive environments that encourage girls to explore technology and see female role models in tech.
- Ensure devices are equipped with assistive technology for students with special needs: Providing screen readers, voice recognition software, and adaptive interfaces to guarantee digital access for all learners, regardless of physical ability.

- Launch nationwide public awareness campaigns to demystify ICT in conservative regions: Addressing cultural misconceptions and highlighting the economic and social benefits of digital literacy, particularly for girls and women.

Studies by Afolabi et al. (2021) strongly underscore that equity-focused interventions significantly increase both the enrollment and retention rates of disadvantaged learners in digital learning environments, making education more inclusive and impactful for all.

## Establish National and State-Level Digital Education Monitoring Units

A recurring and critical weakness in Nigerian policy implementation is the perennial absence of robust, independent evaluation and monitoring mechanisms. To rectify this, dedicated Digital Education Monitoring Units at both federal and state levels are indispensable:

- Systematically track ICT deployment, teacher usage rates, and student learning outcomes: Moving beyond mere procurement numbers to measure actual impact on teaching and learning.

- Publish regular, transparent annual digital education progress reports: This fosters accountability and allows for public scrutiny of investments and results.
- Provide open, accessible dashboards for public accountability: Making data readily available to citizens, civil society, and researchers encourages oversight and informed discourse.
- Utilize real-time data to adjust strategies and interventions adaptively: This ensures that policies remain responsive to on-the-ground realities and can be quickly refined for optimal effectiveness.

UNESCO (2021) consistently highlights data-driven accountability as a non-negotiable key to policy success in developing nations, ensuring resources are not squandered and goals are met.

## Foster Continuous Stakeholder Engagement

Sustainable transformation in IT education cannot be mandated from the top; it must be a collaborative, community-driven effort. Regular and structured dialogue among all key stakeholders - educators, parents, learners

themselves, EdTech startups, non-governmental organizations, and government agencies - will be vital to:

- Facilitate the sharing of innovations and best practices across states and institutions: Creating a learning ecosystem where successes can be replicated and challenges collectively addressed.
- Ensure bottom-up feedback is systematically integrated into national policies and program design: Empowering those on the front lines to shape the solutions that affect them directly.
- Encourage greater transparency in program funding and outcomes: Building trust and shared ownership among all participants.

Dedicated platforms such as annual national digital education summits, regular state-level ICT-in-Education roundtables, and online collaborative forums will cultivate a sense of shared ownership and ignite community-driven innovation.

The Future Demands Urgency

Nigeria stands at a pivotal crossroads. The nation's burgeoning youthful population is, without doubt, its greatest asset - but only if they are comprehensively equipped with the essential

tools to learn, compete, and innovate in the rapidly accelerating global digital economy. The stark choice is between harnessing this demographic dividend or allowing it to become a burden of unfulfilled potential.

The solutions outlined within this chapter are neither exhaustive nor utopian. Rather, they are pragmatic, rigorously research-backed, and, above all, urgently needed. They represent a clear, actionable pathway to bridge the chasm between Nigeria's digital aspirations and its educational realities. As Nlem et al. (2022) powerfully concluded, "IT education in Nigeria will remain aspirational unless all stakeholders act decisively to close the gaping chasm between policy promises and classroom reality." The time for decisive, coordinated, and sustained action is now. The future of Nigeria hinges on it.

# Chapter Eight

# Online Institutions and Their Pivotal Role in Expanding Access to Education in Nigeria

In an era defined by digital connectivity, online institutions have emerged as powerful tools for bridging educational gaps across Nigeria. As traditional learning models struggle to keep pace with the demands of a growing, youthful population, virtual platforms are breaking down barriers of geography, infrastructure, and cost, offering flexible, scalable, and inclusive learning opportunities that were once unimaginable.

## The Dawn of Digital Learning: Online and Distance Education Takes Root

Nigeria, a nation characterised by its rapidly expanding population and persistent infrastructural deficits, faces an enduring challenge in providing equitable access to quality education. In a strategic response, a growing number of accredited institutions have decisively embraced the transformative potential of distance

and online learning. This paradigm shift aims to broaden educational horizons and democratize knowledge. Foremost among these pioneers stands the National Open University of Nigeria (NOUN). Established with a visionary mandate, NOUN has become the bedrock of flexible, lifelong learning opportunities, meticulously designed around the principles of Open and Distance Learning (ODL) (Jegede, 2009). Its very foundation was a recognition that traditional brick-and-mortar institutions alone could not meet the nation's burgeoning educational demands.

Beyond NOUN, other esteemed conventional universities have also embarked on this digital journey. The University of Ibadan's Distance Learning Centre (DLC), a trailblazer in its own right, alongside similar initiatives at Ahmadu Bello University and the University of Lagos, has meticulously crafted robust e-learning platforms. These platforms are not merely supplementary; they are vital conduits for knowledge, specifically tailored to serve a diverse cohort of students who, for various compelling reasons, cannot engage with the rigid structures of conventional university attendance.

Complementing these public sector efforts, a vibrant ecosystem of private and hybrid learning platforms has emerged, pushing the boundaries of educational delivery even further. Innovators like ALX Africa, Utiva, EduBridge, and Nexford University are redefining the educational landscape by offering highly specialised, skill-based programs. Their curricula are acutely responsive to the demands of the modern economy, encompassing critical areas such as coding, digital marketing, and data analysis (Adamu & Adedoyin, 2021). This diverse array of offerings underscores a dynamic shift towards competency-based learning, equipping Nigerians with the practical skills needed to thrive in the 21st century.

## Bridging the Access Chasm: Online Learning as an Equaliser

The advent of online and distance learning programs has been nothing short of revolutionary in its capacity to dismantle educational barriers and significantly reduce exclusion. These flexible learning pathways have opened doors for a multitude of underserved populations, fostering a more inclusive educational environment.

Working adults find unparalleled liberation in the flexible schedules offered by ODL, allowing them to balance professional commitments with academic aspirations.

Women, often constrained by deeply ingrained cultural norms or demanding family responsibilities, discover in online learning a discreet and accessible avenue for self-improvement and intellectual growth.

Rural dwellers, geographically isolated from higher institutions, can now connect to quality education without the prohibitive costs and logistical challenges of relocation.

Learners in conflict-affected zones, particularly in regions like the North-East, where traditional schooling is frequently disrupted, gain a lifeline to continuous learning and a semblance of normalcy.

People with disabilities, who frequently encounter formidable mobility barriers and infrastructural limitations in traditional school settings, find in online platforms a more equitable and accommodating learning environment.

The inherent flexibility of ODL is thus a powerful catalyst for the democratisation of education, transforming it from a privilege into an accessible

right. It actively cultivates opportunities for lifelong learning, ensuring that education remains a continuous journey rather than a finite destination (Ozoemelem & Ugwoke, 2013).

## EdTech and the Digital Mission Field: Innovating for Impact

Nigeria's burgeoning EdTech sector is at the forefront of creating ingenious and impactful ways to deliver education, particularly to learners who have historically been underserved. These technology-driven platforms are not just mirroring traditional education; they are reimagining it. Platforms such as uLesson, Tuteria, SchoolTry, and LearnAM exemplify this innovative spirit. They provide mobile-based learning content, meticulously crafted exam preparation materials, and essential vocational training, all ingeniously optimised for low-data environments – a critical consideration in a region where internet access can be erratic and costly.

These groundbreaking innovations are in perfect alignment with UNESCO's overarching call for inclusive, equitable, quality education facilitated by technology (UNESCO, 2020). For an immense number of Nigerians, these digital platforms represent more than just a learning tool; they are

often the very first accessible entry point into formal learning, bypassing the traditional gatekeepers and rigid structures that have historically marginalised many. They embody a digital mission field, reaching out to the unreached with the promise of knowledge and opportunity.

## Navigating the Obstacles: Challenges Confronting Online Learning in Nigeria

Despite the immense promise and demonstrable potential of online education, its widespread success in Nigeria is currently tempered by several significant barriers. A clear-eyed understanding of these challenges is crucial for developing effective mitigation strategies.

Low internet penetration, particularly within Nigeria's vast rural areas, remains a formidable impediment. Many communities lack the fundamental infrastructure required for reliable online engagement.

The high cost of data and essential digital devices further exacerbates the digital divide, making online learning a financial strain for many households, especially those in lower-income brackets.

A pervasive limited digital literacy among both learners and educators poses a substantial challenge. Without the requisite skills to navigate online platforms and leverage digital tools effectively, the benefits of online learning cannot be fully realised.

Concerns surrounding accreditation and quality assurance in some of the rapidly proliferating private e-learning ventures raise valid questions about the value and recognition of the qualifications they offer (Afolabi & Loto, 2021). Ensuring rigorous standards across the board is paramount.

Ultimately, the digital divide persists as a major societal concern. This chasm is most acutely felt by public school learners who often lack fundamental access to personal devices or stable electricity, effectively precluding them from participating in the digital learning revolution.

## Paving the Way Forward: Policy and Strategic Recommendations

To unlock the full, transformative potential of online education in Nigeria and solidify its role as a cornerstone of national development, a concerted and multi-faceted approach is

imperative. The following strategic recommendations are proposed:

Aggressively expand broadband internet infrastructure, with a deliberate focus on extending connectivity to Nigeria's underserved rural zones. This is not merely an amenity but a fundamental utility for modern education.

Integrate comprehensive digital skills training directly into all teacher education programs, both pre-service and in-service. Empowering educators with digital fluency is critical for effective online pedagogy.

Promote robust public-private partnerships in the realm of content development and delivery. This synergistic approach can leverage the strengths of both sectors to create high-quality, relevant, and scalable educational resources.

Establish clear, transparent, and robust regulatory frameworks for online certification and degree programs. This will build trust, ensure quality, and provide learners with the assurance that their online qualifications are recognised and valued.

Crucially, the Nigerian government must fundamentally recalibrate its perception of online learning. It should not be viewed as a secondary or inferior alternative, but rather as a core,

indispensable strategy for mass education in the 21st century. Embracing this perspective will drive the necessary investments and policy shifts.

## A Bridge to a Brighter Educational Future

Online education is no longer a futuristic luxury reserved for a select few; it is a present-day imperative and a potent force for change. The commendable efforts of institutions like NOUN, alongside the dynamism of emerging EdTech platforms, unequivocally demonstrate the feasibility of reaching learners at scale, transcending the traditional boundaries of geography, financial constraints, and infrastructural limitations. If meticulously supported with visionary leadership and proactive policy implementation, online learning possesses the unparalleled capacity to become the definitive bridge that seamlessly connects Nigeria's ambitious educational aspirations with the millions of its citizens who have historically been underserved. It represents not just a pathway, but a promise of a more inclusive, educated, and prosperous Nigeria.

# Chapter Nine

# Artificial Intelligence Pedagogy in Nigeria: Practice, Challenges, and Prospects

Artificial Intelligence (AI) is rapidly transcending its role as a technological frontier, emerging as a pivotal force actively reshaping the global educational landscape. In Nigeria, where the journey of foundational ICT integration is still maturing, the discernible entrance of AI into the education ecosystem marks a bold, new, and undeniably complex frontier. This convergence offers both immense promise for unprecedented educational advancement and significant challenges in equitable implementation.

This chapter delves into Nigeria's nascent yet determined efforts to integrate AI into pedagogy. It meticulously highlights current practices, analyses impactful national initiatives and institutional efforts, critically examines the inherent challenges, and proposes strategic recommendations for forging an inclusive, AI-driven future in Nigerian education. By

understanding these dynamics, we can chart a course that leverages AI to leapfrog traditional barriers and democratize quality learning.

## National Efforts and Strategic Initiatives

In 2025, Nigeria took a definitive and crucial step forward by initiating a nationwide AI teacher training project, signalling a clear intent to embrace this transformative technology. Spearheaded by the Federal Government, through the National Senior Secondary Education Commission, this ambitious program successfully trained 6,000 senior secondary school teachers in foundational AI pedagogy. This intensive five-week program, implemented in a powerful collaboration with leading organisations like Data Science Nigeria, Google Research, and Olabisi Onabanjo University, covered a comprehensive curriculum ranging from the ethical implications of AI to practical, classroom-based applications (Guardian, 2025). This initiative represents a vital first stride in building human capacity for AI literacy within the teaching profession.

Concurrently, a groundswell of expert voices has emerged, advocating forcefully for the mainstreaming of AI into national curricula

across all levels of education. This critical call aims to ensure that students are not merely consumers but active participants and creators within the rapidly evolving Fourth Industrial Revolution. As one policy strategist cogently observed, "AI is not a luxury for elite schools; it is an existential necessity for national competitiveness" (Premium Times, 2025). This sentiment underscores the understanding that AI proficiency is no longer an optional add-on but a fundamental skill for national progress and global relevance.

Further solidifying this commitment, the National Artificial Intelligence Strategy - a comprehensive policy blueprint released in late 2024 - sets crucial minimum standards and establishes ethical frameworks for the responsible deployment of AI across critical sectors, including education, commerce, healthcare, and public service. This strategic document provides the foundational governance structure necessary to guide the ethical and equitable integration of AI into Nigerian society.

## Classroom Applications and Emerging Tools

Nigeria has actively begun experimenting with several innovative AI tools designed to both ease teacher workload and profoundly enhance student engagement, demonstrating practical applications of AI in diverse learning environments:

### 1. Schoola (Curri AI and Curri SRC)

Designed ingeniously by Nigerian developers, these tools represent a significant stride in localizing AI solutions for education. They automate time-consuming administrative tasks such as lesson planning, assessment generation, and even comprehensive classroom reports, all meticulously aligned with the Nigerian curriculum. Used in both formal and non-formal educational settings, these tools empower teachers by significantly reducing their administrative burdens, thereby freeing up valuable time and energy. This allows educators to focus on more interactive, inquiry-based, and personalized learning experiences, transforming the classroom dynamic (Guardian, 2025).

## 2. uLesson

This personalized learning app, already utilized by over 2 million Nigerian learners, leverages advanced AI algorithms to adapt content delivery to individual student learning speeds and styles. By providing tailored instruction and practice, uLesson has proven especially impactful during after-school hours and critical exam preparation periods. Its adaptive capabilities contribute directly to reducing dropout rates and significantly improving student retention by addressing individual learning gaps (SpursMedia, 2025).

## 3. AI-enabled Translation and Inclusion Tools

Solutions like RobiNLP and Google's text-to-speech extensions are breaking down linguistic barriers in the classroom. By allowing educational content to be seamlessly translated into major local languages such as Hausa, Yoruba, and Igbo, these tools are opening up access to quality learning resources for millions of learners in Nigeria's linguistically diverse regions, fostering greater inclusivity and understanding.

### 4. Chatbot Tutors

Preliminary trials of AI chatbot tutors, exemplified by the 'Kwame for Science' pilot, are being adapted for core Nigerian STEM subjects. These interactive, asynchronous tools provide students with instant, personalised support, enabling them to navigate complex topics at their own pace, seek clarification, and receive immediate feedback, effectively augmenting traditional instruction.

## Measurable Impact and Global Comparisons

The global precedent for AI-enhanced learning is unequivocally compelling, offering powerful evidence of its transformative potential. A landmark World Bank-supported randomised control trial conducted in Africa revealed astounding results: students who received AI-assisted tutoring made learning gains equivalent to two years of traditional schooling in just six weeks (World Bank, 2023). This highlights the unprecedented acceleration of learning that AI can facilitate.

In Nigeria, preliminary trials involving these nascent AI tools in Lagos and Abuja have yielded similarly encouraging results:

- Demonstrably improved academic performance was observed, especially among female learners and students who previously exhibited low engagement levels. This suggests AI's potential to democratize access to quality instruction and reduce long-standing achievement gaps.
- Analytics from uLesson further corroborated this impact: students consistently using AI-personalized content scored an average of 18% higher in mock WAEC and JAMB tests compared to their counterparts in conventional tutorial classes.

These compelling results robustly confirm that when AI is deployed equitably, thoughtfully, and appropriately, it significantly enhances learning outcomes, proving particularly beneficial in contexts characterised by large classrooms and limited human resources, which are common in many Nigerian schools.

## Challenges to AI Integration in Nigerian Schools

Despite the burgeoning enthusiasm and promising early successes, Nigeria's journey

towards comprehensive AI integration in education is not without its significant systemic barriers, mirroring many of the fundamental challenges identified in previous chapters:

## 1. Digital and Infrastructure Gaps

The persistent lack of foundational digital infrastructure remains the most critical impediment. A vast majority of rural schools continue to suffer from chronic issues such as erratic or non-existent electricity, limited or no internet access, and a dire scarcity of computing devices. Without these foundational elements, AI tools, regardless of their sophistication, remain entirely inaccessible to the majority of public school students (SpursMedia, 2025).

## 2. Limited Teacher Capacity

While the Federal Government's initiative trained 6,000 teachers in AI pedagogy - a commendable effort - this number represents a minuscule fraction of Nigeria’s approximately 1.5 million teachers. Compounding this, widespread digital illiteracy persists among many older educators, many of whom struggle to proficiently use even basic ICT tools, creating a significant bottleneck for advanced AI integration (Guardian, 2025).

## 3. Curriculum Misalignment

A major structural challenge is the current absence of formal AI integration into Nigeria's primary or secondary education curricula. Without explicit inclusion and systematic pedagogical frameworks, AI remains largely an extra-curricular topic, accessible predominantly to learners in well-resourced private institutions or through after-school programs, thereby exacerbating educational inequality.

## 4. Ethical and Data Concerns

As AI tools become more prevalent, experts rightly raise crucial concerns about their ethical implications. There is a tangible risk that AI algorithms could carry inherent biases (e.g., gender, regional), infringe on student data privacy, or inadvertently perpetuate existing inequities if not carefully localised, thoroughly audited, and rigorously regulated. Consequently, there is an urgent call for the development of robust AI Ethics Frameworks specifically tailored for educational tools utilised in Nigerian classrooms, ensuring responsible and beneficial deployment.

## Local Innovation and Institutional Leadership

Despite the aforementioned challenges, several forward-thinking Nigerian institutions and agile start-ups are utilised proactively stepping in to fill crucial innovation gaps, demonstrating inspiring leadership in the AI education space:

- University of Lagos (UNILAG) and Covenant University: These leading institutions have proactively launched dedicated AI research laboratories and strategically embedded AI ethics into their undergraduate courses. This ensures that the next generation of technologists and professionals understand the responsible application of AI.
- Afrilearn: This innovative EdTech startup is actively developing data-driven dashboards that provide teachers with real-time, actionable insights into students' individual weaknesses and strengths. This groundwork is crucial for the future implementation of full AI automation that can truly personalize learning at scale.
- Obafemi Awolowo University (OAU) and Federal University of Technology, Akure

(FUTA): These prestigious universities have initiated specialised postgraduate programs focused on AI and education technology. This vital investment is helping to build a critical pipeline of highly skilled, AI-literate teachers and researchers, essential for sustainable growth in the field.

These examples, while profoundly promising, currently remain somewhat isolated. There is an urgent need to effectively scale these successful innovations from pilot projects to widespread policy, and to robustly replicate these successful models across diverse geopolitical zones of the country to maximise impact.

## Complementary National Programs Supporting AI Adoption

Beyond direct educational initiatives, the Federal Ministry of Communications and Digital Economy has introduced several strategic programs that serve as crucial complementary pillars, indirectly yet powerfully supporting the broader adoption of AI in education:

### 1. 3MTT (3 Million Technical Talent)

Launched in 2023, this ambitious initiative aims to train 3 million Nigerians in high-demand digital skills, including AI, software engineering, cybersecurity, and data science, by 2027. The graduates of this program are expected to significantly influence both the corporate and academic sectors, providing a skilled workforce that can drive AI development and integration, including within education.

### 2. NITDA's Digital States Initiative

This program, focused on fostering digital literacy at the grassroots level, actively works with state governments to embed ICT and AI awareness across local government education authorities. By promoting digital literacy from the foundational administrative level, it creates a more receptive environment for AI adoption in schools across the country.

Together, these programs form a vital national ecosystem upon which AI pedagogy in Nigeria can thrive, provided they are effectively coordinated and synergised with the core efforts of the Federal Ministry of Education.

## Summary and Strategic Outlook

The following table provides a succinct overview of the current status of AI pedagogy in Nigeria and outlines strategic opportunities for future advancement:

| Area | Current Status | Opportunity Forward |
|---|---|---|
| Teacher AI Training | 6,000 teachers trained (2025); limited rural reach | Expand massively through TRCN, TCTI, and Colleges of Education |
| AI Tools for Learning | Active in private/urban schools (Schoola, uLesson) | Localise tools for low-bandwidth rural schools and public access |
| Curriculum Integration | Absent in basic/secondary curriculum | Mandate comprehensive AI modules in STEM from JSS (Junior Secondary School) level |

| | | |
|---|---|---|
| Institutional Research | Ongoing in select universities | Encourage multi-university, interdisciplinary AI-in-Education labs |
| Ethical Governance | National AI Strategy (2024) launched | Develop robust school-level AI ethics and data privacy policies |

## A Future Worth Building

Artificial Intelligence is emphatically not here to replace Nigerian teachers. Instead, its profound purpose is to equip, augment, and empower them, making learning more adaptive, intrinsically inclusive, and profoundly impactful for every child. However, this transformative promise will regrettably remain unrealised without a concerted effort involving systemic planning, rigorous ethical consideration, and a genuinely equitable rollout that reaches all corners of the nation.

To truly democratize AI pedagogy and harness its full potential for national development:

- The government must proactively mainstream AI into school curricula at all levels, making it a foundational skill for all students.
- Schools must prioritise and continuously invest in training and retraining teachers in AI literacy and its pedagogical applications, ensuring they are confident and competent users and facilitators.
- Innovators must be encouraged and supported to build context-relevant tools that address Nigeria's unique infrastructural and linguistic realities, ensuring accessibility and usability.
- Communities must be engaged and empowered to embrace the AI future, understanding its benefits and fostering local digital ecosystems.
- Policy must provide clear, adaptive guidance for growth, rather than stifle it with outdated regulations or insufficient foresight.

Nigeria possesses the demographic advantage of a youthful population, boundless creativity, and an undeniable national drive. What remains is the

unwavering will and coordinated execution. If done right, AI has the unparalleled potential to be the catalytic tool that leaps Nigeria's educational system forward, bridging decades of disparity in just a few transformative years, and securing its place as a leader in the global digital age.

# Chapter Ten

# Teachers' Perception and Utilisation of ICT and AI Across Nigeria's Geopolitical Zones

Teachers remain, unequivocally, the most critical agents in the successful implementation and sustained integration of Information and Communication Technology (ICT) and Artificial Intelligence (AI) in the classroom. Regardless of how robust national strategies are developed or how sophisticated digital tools become, the fundamental perception and practical adoption by the teaching workforce ultimately determine the real-world impact on learning outcomes. This chapter meticulously delves into how Nigerian teachers, across the country's diverse six geopolitical zones, perceive the promise and challenges of ICT and AI, and critically assesses the extent to which they are currently utilising these transformative tools in their daily teaching, learning, and assessment practices. Understanding these dynamics is paramount for charting an effective path forward.

## Perception of ICT in Teaching and Learning

Across the entirety of Nigeria, teachers generally exhibit a remarkably consistent and positive perception of ICT as an invaluable teaching aid. Multiple empirical studies conducted across various geopolitical zones converge on a common understanding: most educators firmly believe ICT possesses the transformative potential to:

- Simplify lesson delivery: By offering dynamic visuals, interactive simulations, and readily accessible information, ICT can make complex topics more digestible and engaging for students.
- Improve student engagement: Digital tools can captivate learners' attention, foster active participation, and move beyond traditional passive learning models.
- Facilitate access to educational resources: The internet opens up a vast repository of global knowledge, supplementing often scarce traditional textbooks.
- Enhance assessment and administrative tasks: Digital platforms can streamline

grading, record-keeping, and communication, freeing up teachers' time.

For instance, a study in Ogun State (South-West) involving 300 teachers found that a compelling 75% acknowledged ICT as a valuable classroom tool, even though a stark contrast was revealed: less than 30% were actually proficient in using it effectively (Owolabi & Olatunji, 2021). This highlights a significant "willingness-proficiency" gap. Similarly, in Ilorin (North-Central), history teachers readily agreed that ICT enhances knowledge delivery and actively encourages independent learning, recognising its pedagogical advantages (Aliyu, 2022).

In Ebonyi and Enugu States (South-East), social studies and biology teachers expressed profound enthusiasm for integrating ICT but simultaneously lamented the crippling impact of poor infrastructure and the pervasive lack of adequate training, which stifled their aspirations (Eze & Nweke, 2023). Even in predominantly rural northern states like Sokoto, chemistry teachers, despite facing extremely low awareness and near-zero access to digital tools, consistently showed keen interest in exploring both ICT and AI (Abdullahi et al., 2023). This consistent pattern across zones unequivocally reveals that

while the perception of ICT's value is generally favourable and high, its actual adoption and integration are severely hindered by tangible infrastructure deficits and critical skill constraints.

## Utilisation of ICT Across Nigeria

Despite the widespread favourable perceptions, the actual level of ICT utilization by teachers across Nigeria remains strikingly low overall, with pronounced and persistent differences observed between the geopolitical regions, highlighting entrenched digital disparities:

| Geopolitical Zone | Usage Level | Dominant ICT Use |
|---|---|---|
| North-West | Very Low | Limited predominantly to basic administrative tasks like registration and word processing in a few urban schools. Rural areas experience near-zero adoption due to |

| | | |
|---|---|---|
| | | severe infrastructural and access barriers, often compounded by insecurity. |
| North-East | Very Low | Minimal usage, largely unavailable and almost non-existent in rural schools. This region is significantly affected by insecurity, poverty, and displacement, which severely impede any form of digital progress in education. |
| North-Central | Moderate | Primarily used for administrative tasks and |

| | | |
|---|---|---|
| | | occasional digital presentations (e.g., PowerPoint). The urban-rural divide is very pronounced, with city schools having more access and rural schools lagging significantly. |
| South-West | Moderate-High | Most pronounced ICT use, especially in Lagos and Ogun states. Characterized by blended learning approaches, e-assessment, and access to more sophisticated EdTech in private and elite public schools due to better |

| | | |
|---|---|---|
| | | infrastructure and sustained investment. |
| South-East | Low-Moderate | Primarily for exam preparation, basic PowerPoint use, and personal lesson planning. While teachers express willingness, progress is hampered by infrastructure gaps and inconsistent training, limiting widespread integration into daily instruction. |
| South-South | Moderate | Generally higher in urban areas like Port Harcourt, with emphasis on basic computer |

| | | |
|---|---|---|
| | | studies and familiarity with CBT (Computer-Based Test) for NECO/JAMB. Rural areas face similar challenges as other less developed regions, creating a notable urban-rural disparity. |

In summary, the South-West stands out with the highest ICT utilization, largely due to more developed infrastructure and focused digital initiatives. Conversely, the North-East and North-West continue to struggle profoundly, with deep-seated insecurity, endemic poverty, and critically limited digital investments acting as formidable barriers to any meaningful progress.

## Teachers' Awareness and Perception of AI in Education

Artificial Intelligence is still a relatively nascent concept within the vast majority of Nigerian

teachers, particularly those operating within the public school system. However, recent national efforts have begun to make discernible strides in bridging this awareness gap:

- In 2025, the Federal Government initiated a significant intervention, training 6,000 senior secondary school teachers on foundational AI pedagogy. This program included vital modules on AI ethics, adaptive learning methodologies, and the practical application of AI-driven assessment tools (Guardian, 2025), aiming to equip a pioneer cohort of educators.
- However, considering Nigeria's colossal teaching workforce of over 1.5 million teachers, the impact of this initial training, while crucial, remains extremely limited in both scale and geographical reach. It barely scratches the surface of the national requirement for AI literacy.

A compelling 2023 study in Sokoto State revealed the profound extent of the awareness gap, showing that only a mere 15% of chemistry teachers had even heard of AI, and an even smaller fraction could accurately describe its potential applications in teaching (Abdullahi et

al., 2023). This underscores the vast educational chasm that needs to be bridged. A more comprehensive national teacher survey conducted by EdTechNG in 2024 further exposed the nascent stage of AI adoption:

- A staggering 68% of teachers reported that they had never used any AI tool in their professional or personal lives.
- Despite this, an encouraging 54% expressed a strong willingness to learn and adopt AI tools, provided that adequate training and necessary devices were supplied. This highlights a significant opportunity for future interventions.
- Conversely, a mere 8% had actively integrated AI platforms into their teaching practices, demonstrating that actual utilization remains embryonic.

These figures strongly suggest that while a foundational awareness of AI is gradually growing, its practical integration into teaching remains in its infancy, especially outside the privileged confines of elite urban private schools.

## Regional Comparison: ICT and AI Utilization by Zone

The disparity in the adoption of ICT and AI tools across Nigeria's geopolitical zones is pronounced, underscoring systemic inequalities in access to technology and training:

| Zone | ICT Use | AI Use | Remarks |
|---|---|---|---|
| North-West | Very low | Virtually nonexistent | This remains the weakest region for technology adoption due to a combination of severe infrastructure deficits, limited government investment, security challenges, and low digital literacy rates among |

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| | | | teachers and students alike. |
| North-East | Very low | No recorded AI use | Severely affected by protracted conflict, mass displacement, and extreme poverty. Educational infrastructure is often destroyed or non-existent, making any form of meaningful technology integration a distant reality. |
| North-Central | Moderate | Low but improving in Abuja | Characterized by a significant urban-rural divide. While |

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| | | | the Federal Capital Territory (Abuja) shows growing AI awareness and some initial use, rural areas in states like Niger or Benue lag considerably due to lack of electricity and internet. |
| South-West | Relatively high (urban centers) | Early-stage experimentation | Lagos State leads with dynamic EdTech initiatives and private school innovations. This zone benefits from |

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| | | | relatively better infrastructure and a more active tech ecosystem, making it a hub for early AI adoption and experimentation. |
| South-East | Low to moderate | Minimal AI awareness | While there's enthusiasm, actual usage is constrained by inconsistent power supply and limited access to devices. A significant gap exists between public and private |

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| | | | schools in terms of technology access and AI awareness. |
| South - South | Moderate (urban-rural disparity) | AI unknown in most schools | Urban centers like Port Harcourt and Calabar show better ICT integration, primarily for administrative tasks and basic computer literacy. However, AI remains largely unknown or inaccessible in the majority of schools, |

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| | | | particularly in rural areas. |

Across all zones, urban schools (especially private and well-funded unity schools) consistently demonstrate significantly higher adoption levels for both ICT and nascent AI tools. In stark contrast, public and rural schools continue to suffer from a critical lack of essential equipment, unstable power supply, and an acute shortage of adequately trained and supported personnel, perpetuating a two-tiered educational system.

## Barriers to Adoption

Several consistent findings from national and regional studies highlight common, pervasive barriers to the effective adoption and sustained integration of ICT and AI in Nigerian classrooms:

### 1. Infrastructure Deficiency

This remains the single largest and most crippling obstacle. Chronic issues include unreliable electricity, inadequate internet connectivity (especially in rural areas), and a severe scarcity of functional computing devices and smart

classrooms. These challenges are particularly acute in the northern geopolitical zones and remote parts of the southern regions, rendering advanced digital tools inaccessible.

## 2. Lack of Teacher Training

A fundamental barrier is the systemic failure to adequately prepare teachers for a digital age. Many educators have never received formal exposure to ICT or AI training, either during their pre-service education (teacher training colleges) or through consistent in-service professional development. This skills gap directly impacts their confidence and ability to integrate technology effectively.

## 3. Technophobia and Resistance to Change

A notable proportion of older teachers, in particular, exhibit resistance to adopting new digital tools. This reluctance often stems from fear of the unknown, unfamiliarity with complex technologies, a perceived complexity of digital platforms, or a lack of institutional support that could alleviate their anxieties and build confidence.

### 4. Curricular Gaps and Lack of Policy Coherence

AI, despite its growing global importance, has not yet been formally embedded or systematically integrated into Nigeria's national curriculum for basic and secondary education. This lack of explicit curricular mandate means AI remains an optional, often peripheral, subject, hindering widespread adoption and standardised teaching.

### 5. Equity Challenges and Digital Exclusion

The digital divide disproportionately impacts certain demographics. Female teachers and those serving in hard-to-reach areas are often excluded from critical training opportunities and equitable resource distribution, further entrenching gender and geographical disparities in digital literacy and access.

## Evidence of Positive Outcomes

Despite these formidable challenges, where ICT and, increasingly, AI are thoughtfully utilized, the results are consistently encouraging, providing compelling evidence of their transformative potential:

- A localized study in Abi LGA (Cross River State) found a direct correlation: schools

that actively used digital content experienced demonstrably improved student engagement and higher performance in critical examinations like WAEC (Asuquo & Ikpi, 2025). This showcases the power of relevant digital resources.

- The uLesson App, leveraging adaptive AI lessons, reported a significant 30% increase in test performance for learners who consistently engaged with its personalized content (uLesson, 2024). This highlights AI's ability to tailor learning to individual needs, leading to more effective knowledge acquisition.
- In Lagos, teachers who integrated AI-supported planning tools (like Schoola AI) into their routine reported a noticeable reduction in their administrative workload and, consequently, observed improved student outcomes, indicating that AI can free up teachers to focus more on pedagogy rather than paperwork.

These compelling examples underscore the immense potential of AI and ICT to enhance learning outcomes and streamline educational

processes, particularly when teachers are genuinely empowered with the right tools, relevant training, and ongoing support.

## Recommendations for Bridging the Divide

To decisively bridge the gap between perception and utilisation, and to significantly enhance the adoption of ICT and AI across Nigeria's diverse geopolitical zones, the following strategic and interconnected interventions are strongly recommended:

### 1. Massive National Retraining Program

Initiate a comprehensive, mandatory national retraining program for all teachers across all zones, partnering robustly with institutions like the National Teachers' Institute (NTI) and the National Commission for Colleges of Education (NCCE). This program must focus intensively on foundational AI literacy, practical ICT pedagogy, and strategies for effective virtual classroom management.

### 2. Systematic Curriculum Integration

Urgently incorporate AI education as a core component into the secondary school curriculum and, critically, embed it within all pre-service

teacher training programs. This ensures that AI skills are taught systematically and that future educators are equipped to teach them.

### 3. Equity-Focused Infrastructure Investment

Prioritise and implement targeted investments in solar-powered smart classrooms and distribute essential digital devices (e.g., tablets, laptops) to historically underserved regions, with a particular and urgent focus on the North-East and North-West, to address foundational access barriers.

### 4. Robust Digital Mentorship Programs

Establish structured digital mentorship programs that pair experienced and digitally proficient urban teachers with their less-experienced rural counterparts. This can be facilitated through online coaching, virtual workshops, and accessible resource-sharing platforms, fostering peer-to-peer learning and support.

### 5. Incentivise Usage and Innovation

Introduce clear incentive structures that recognise and reward teachers for their proactive integration of ICT and AI in the classroom. This could include incorporating ICT/AI integration into teacher evaluation metrics, offering salary bonuses, providing professional advancement

points, and creating opportunities for showcasing innovative digital pedagogy.

## From Awareness to Action

Across all six geopolitical zones, Nigerian teachers demonstrably recognise the inherent value of ICT - and are cautiously optimistic, even eager, about the transformative potential of AI. However, optimism alone is insufficient. The practical, widespread use of these technologies remains severely hindered by deep-seated structural inequalities, persistently insufficient training, and profound regional disparities in access and support.

Moving forward, Nigeria must adopt a resolute teacher-first strategy for ICT and AI adoption. This strategy dictates a clear mandate: train them, equip them, and sustain their support. Teachers are not merely facilitators of learning; they are the indispensable gateways to the comprehensive digital transformation of Nigeria's education system. Their empowerment is not just a recommendation; it is an imperative for unlocking the nation's future potential in the global digital economy. The time for concerted action, turning awareness into widespread adoption, is now.

# Chapter Eleven

# Assessing the Readiness of Secondary School Students for Computer-Based WAEC and NECO Exams in 2026

In a bold, albeit ambitious, move to fundamentally modernize Nigeria's examination process, the Federal Government has directed that by 2026, both the West African Examinations Council (WAEC) and the National Examinations Council (NECO) must transition entirely to Computer-Based Testing (CBT). While such a transition promises enhanced efficiency, increased speed in result processing, and critical alignment with global best practices, this chapter critically explores whether Nigerian secondary school students - across the nation's diverse regions, varying social classes, and different school types - are genuinely prepared for this monumental shift. Drawing on official data, rigorous expert analysis, and practical realities on the ground, we scrutinize the feasibility of this policy, questioning whether its current timeline is realistic or potentially

premature. The implications for educational equity and national development are profound.

## The Digital Literacy Landscape of Students

A robust foundation for CBT readiness is rooted in comprehensive digital literacy - the essential ability to proficiently operate computers, navigate complex digital environments, and type with minimal assistance and reasonable speed. A detailed examination of the current landscape reveals significant gaps:

### 1. Alarmingly Low Proficiency:

Recent reports paint a concerning picture: only 28.75% of secondary school students nationwide possess basic computer proficiency, as revealed in a sobering 2025 Guardian Nigeria survey. This stark figure means over 70% of the student population lacks even the fundamental skills required to comfortably interact with a computer-based examination interface.

### 2. Limited Formal IT Skills

Further exacerbating the challenge, among Nigerian youth aged 15–24 (the core demographic for WAEC/NECO exams), a mere 7% possess formal IT skills, according to the

National Bureau of Statistics (NBS, 2024). This highlights a systemic failure in integrating practical digital education into the curriculum.

### 3. Pronounced Regional Disparities

Digital literacy levels vary drastically across geopolitical zones. In the educationally disadvantaged North-East and North-West, digital literacy among senior secondary students plummets to as low as 12%, a stark contrast to the comparatively higher 45% recorded in the South-West (UNICEF Digital Learning Survey, 2023).

This gaping disparity indicates that the vast majority of Nigerian students, particularly those from rural areas and underserved northern regions, would likely struggle profoundly with the unfamiliar interface, complex navigation, and the time-sensitive nature inherent in CBT environments. Such a scenario, without significant pre-emptive intervention, poses an insurmountable barrier to equitable implementation and threatens to disadvantage millions of learners.

## School Infrastructure Realities

The successful and equitable rollout of computer-based examinations demands a robust underlying infrastructure: stable and consistent power

supply, reliable internet connectivity, and a sufficient number of functional computer systems per student. The current realities across Nigeria's six geopolitical zones present a formidable challenge:

### 1. Inadequate Computer Labs

Findings from 2024–2025 reveal that less than 30% of public secondary schools across the nation possess computer labs with up-to-date, functional equipment (Guardian Nigeria, 2025). Many existing labs are either defunct, sparsely equipped, or house outdated technology incapable of handling modern CBT software.

### 2. Crippling Power Deficit

The pervasive lack of electricity remains a critical impediment. In states like Ebonyi, a staggering 92% of rural public schools have no access to electricity whatsoever, rendering any form of digital learning or examination impossible.

### 3. Severe CBT Centre Scarcity

In regions like Sokoto State, the ratio of CBT-ready centres is abysmal: just one centre for every 8,000 students. This clearly illustrates the monumental logistical hurdle of accommodating millions of candidates simultaneously.

## 4. Urban-Rural Divide Even in Resourced Areas

While schools in states like Lagos and Ogun fare comparatively better, with computer labs in 60% of senior schools, many of these facilities remain severely underutilised due to the sheer volume of students needing access and frequent power outages.

## 5. National Audit Reveals Critical Gap

A comprehensive national audit conducted by the Universal Basic Education Commission (UBEC) delivered a stark revelation: only 18% of all secondary schools in Nigeria possessed the absolute minimum infrastructure required to conduct CBT for even a modest group of 30 students simultaneously. This finding alone casts serious doubt on the feasibility of a national, simultaneous rollout by 2026.

These infrastructure realities collectively represent a colossal barrier, indicating that a nationwide CBT transition without a massive, targeted, and immediate investment in digital infrastructure is practically unfeasible and risks catastrophic failure.

# The NECO and WAEC Mandate: A Bold but Risky Leap

The Joint Admissions and Matriculation Board (JAMB) successfully transitioned to CBT for its Unified Tertiary Matriculation Examination (UTME) in 2015. Proponents of the 2026 CBT mandate for WAEC and NECO often cite JAMB's success as a precedent, arguing that what JAMB achieved, so too can the other examination bodies. However, this analogy overlooks crucial distinctions that make the WAEC/NECO mandate a far bolder and significantly riskier leap:

## 1. Scale of Candidates

JAMB typically handles approximately 1.5 million candidates annually, with a flexible exam schedule spread over two weeks. This allows for staggered sittings and more manageable logistics.

## 2. Volume, Complexity, and Simultaneity

In stark contrast, WAEC and NECO collectively cater to over 3 million students annually, across a wider range of subjects, including essay-based papers and practical examinations. Their core challenge lies in the requirement for simultaneous exam delivery across numerous subjects

nationwide, often within tight schedules. The sheer volume and logistical complexity of these exams, coupled with the need for concurrent administration across thousands of centres, make a full CBT rollout without unprecedented investment and meticulous planning highly impractical, and indeed, perilous.

Experts caution that the unique volume, subject complexity, and rigid scheduling structure of the Senior School Certificate Examination (SSCE) exams distinguish them fundamentally from the UTME. A full CBT rollout for WAEC and NECO by 2026, without a preceding, massive, and rapid investment in infrastructure, training, and robust contingency planning, is widely considered an ill-advised and potentially destabilizing policy.

## Regional Readiness Disparities

The readiness for a nationwide CBT rollout is not uniformly distributed across Nigeria's geopolitical zones; instead, it is characterized by profound disparities that threaten to exacerbate educational inequalities:

| Zone | School ICT Readiness | Student Digital Literacy | CBT Centre Availability | Remarks |
|---|---|---|---|---|
| North-West | Very Low: Minimal or non-existent computer labs; chronic power issues. | Low (12–15%) | Extremely limited: Few functional centers, often outdated, serving vast student populations. Many LGAs have no functional CBT center, | This region faces the most severe challenges, with widespread digital exclusion. A direct CBT rollout would fundamentally disenfranchise millions of students |

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| | | | making exam access virtually impossible for most students without extensive, expensive travel. | here, deepening the educational marginalization rooted in poverty, insecurity, and systemic underinvestment in digital infrastructure. |
| North-East | Very Low: Devastated infrastructure, often no electricity or internet. | Very low (10–13%) | Inadequate and scattered: Centers are few, far between, and often | The conflict-affected North-East is arguably the least prepared. Imposing CBT |

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| | | | non-functional due to conflict and lack of maintenance. The ongoing humanitarian crisis and insecurity make any large-scale, secure CBT administration profoundly difficult, further | without addressing basic access to education, let alone digital tools, would be inhumane and lead to widespread failure, exacerbating the region's recovery challenges and potentially pushing more youth out of the formal |

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| | | | entrenching educational disadvantages for those already most vulnerable. | education system. |
| North-Central | Moderate in Abuja, low elsewhere: Some urban schools have labs, rural ones do not. | 20–25% | Moderate in state capitals: Limited functional centers primarily concentrated in state capitals, leaving | While slightly better than the far North, a significant urban-rural divide persists. Students from rural areas |

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| | | | vast rural areas underserved. Students in rural areas would face significant travel burdens and have limited opportunities for practice and exposure to CBT. | would be severely disadvantaged due to lack of exposure and access, leading to lower performance and contributing to internal migration pressures towards better-equipped urban centers. |

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| South-West | Relatively High in Lagos/Ogun: Better-equipped labs, more consistent power/internet. | 40–50% | High concentration: Highest number of functional CBT centers, especially in major cities, reflecting relatively better digital infrastructure and private sector investment. This region | This zone is the most prepared, yet even here, capacity may be stretched, and equity within the zone (urban vs. rural public schools) remains a concern. A uniform national rollout would place immense pressure |

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| | | | would be best positioned for a CBT transition, but even here, public schools outside major cities still face challenges with capacity and maintenance. | on existing infrastructure and expose capacity gaps even in the leading regions. |
| South-East | Moderate: Some public schools have labs, but | 25–30% | Moderate: Fair number of centers, but | The South-East shows potential but is |

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| | many lack maintenance/power. | | often plagued by power issues and maintenance challenges, reducing effective capacity. The inconsistency of electricity supply remains a major hurdle, requiring substant | held back by chronic infrastructure problems. A direct CBT mandate without addressing fundamental power and maintenance issues would lead to widespread disruption and frustration, |

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| | | | ial investment in alternative power solutions (e.g., solar) to ensure operational reliability during exams. | eroding trust in the examination system. |
| South-South | Uneven, urban areas better: Pockets of good infrastructure in cities, but rural lagging. | 25–35% | Fair: Decent number of centers in major cities like Port Harcourt and Calabar, but | This region faces similar urban-rural disparities. Students in rural, riverine, and |

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| | | | limited coverage in more remote areas. The reliance on urban centers for CBT access creates logistical nightmares for students from rural and riverine communities, potentially | remote communities would be severely disadvantaged, potentially leading to mass failure in those areas and further entrenching existing educational inequalities within the zone. The policy risks becoming a tool of |

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| | | | increasing costs and access barriers for the most vulnerable learners. | exclusion rather than modernization. |

Clearly, without massive and targeted intervention, students in rural areas, those from the northern geopolitical zones, and the vast majority attending public schools across the nation would be severely and unfairly disadvantaged by a premature CBT transition. This would inevitably lead to increased academic failure and a profound widening of Nigeria's already significant educational inequality gap.

## Expert Views and Stakeholder Concerns

The proposed 2026 CBT timeline for WAEC and NECO has been met with widespread caution and significant concerns from various stakeholders,

reflecting a deep understanding of the practical challenges involved:

- National Parent-Teacher Association (NAPTAN): NAPTAN has been vocal in calling for an extension of the deadline, urging WAEC and NECO to prioritize the establishment of at least one fully functional and adequately equipped CBT centre per Local Government Area (LGA) across the nation *before* the mandatory switch. Their concern is rooted in ensuring basic access and fairness for all students, particularly those from disadvantaged backgrounds.
- Education Policymakers and House of Representatives: Leading education policymakers and the House of Representatives Committee on Basic Education have publicly articulated that a nationwide CBT transition by 2026 is currently impractical and highly likely to deepen existing inequalities. They emphasize the need for a realistic assessment of ground realities rather than an ambitious, potentially disastrous, top-down mandate.

- On-the-Ground Challenges in Elite Schools: A revealing 2025 article in The Vanguard reported that even many elite private schools - typically considered better equipped - faced significant operational hurdles during their internal CBT mock exams. These challenges included persistent internet downtime, insufficient numbers of functional computers to accommodate all candidates, and frequent server failures, highlighting that even in optimal conditions, the infrastructure is fragile.
- Dr. Akin Oyetunji, Senior ICT Consultant: Dr. Oyetunji, a respected voice in ICT, issued a stark warning: "We need to train the teachers, build the labs, and prepare the learners before we throw them into digital examinations. The system is not ready, and we risk mass failure or a national embarrassment." His expert opinion underscores the critical need for a phased, foundational approach rather than an abrupt, unprepared transition.

These expert views and stakeholder concerns collectively paint a picture of an examination system that is simply not ready for a full-scale

digital leap within the proposed timeframe, emphasising the immense risks associated with an unprepared rollout.

## The Risk of Marginalisation and Academic Failure

Should the Federal Government's directive for a full CBT rollout by 2026 proceed as planned without significant and immediate remedial interventions and a more realistic phased approach, the risks are substantial and far-reaching, threatening to destabilise the entire secondary education system:

- Increased Exam Anxiety and Poor Performance: Digitally disadvantaged students, lacking familiarity and proficiency with computer interfaces, would experience heightened exam anxiety. This psychological burden, coupled with technical struggles, would inevitably lead to significantly poor performance, not due to lack of knowledge, but lack of access and preparation.
- Widening of Educational Inequality: The already significant gap between well-equipped urban and elite private schools versus under-resourced rural and public

schools would transform into an insurmountable chasm. Students from privileged backgrounds would have practised and adapted, while those from disadvantaged areas would be virtually disenfranchised, leading to an unfair playing field.

- High Rates of CBT Server Breakdown and Exam Disruption: The current national infrastructure is ill-equipped to handle the immense simultaneous load of millions of WAEC/NECO candidates. This would inevitably lead to frequent server breakdowns, widespread exam disruptions, corrupted data, and ultimately, a severe loss of public trust in the credibility and fairness of national examinations.
- Legal and Ethical Challenges: The policy, if implemented without equitable preparation, could trigger widespread legal and ethical challenges from aggrieved parents and state governments with poor ICT infrastructure. Accusations of systemic bias and discrimination would likely ensue, potentially leading to court cases and social unrest.

- Logistical Hurdles for Examination Bodies: WAEC and NECO themselves would face unprecedented logistical nightmares in scheduling exams across compromised centers, ensuring exam security in diverse technical environments, and uniformly monitoring performance when conditions vary so wildly. This could overwhelm their capacity and compromise their operational integrity.

These profound risks highlight that a premature CBT rollout would not only undermine the academic future of millions of Nigerian students but also erode the integrity and public trust in the nation's most crucial secondary school examinations.

## Arguments in Support of the Policy

While the risks associated with an immediate, full-scale CBT transition are substantial, proponents of the policy cite several compelling potential benefits that underscore its long-term desirability:

- Faster Result Processing: One of the most significant advantages is the potential for drastically expedited result processing. The current manual marking and collation

system can take up to 90 days; CBT could reduce this to a matter of weeks, alleviating student anxiety and speeding up university admission processes.

- Reduction in Exam Malpractice: CBT inherently reduces common forms of exam malpractice, such as impersonation, question leakage, and answer copying. The randomized nature of questions and secure digital platforms offer a more robust environment for maintaining exam integrity, crucial for combating academic corruption.
- Alignment with JAMB Standards and Early Digital Literacy: A unified CBT approach across JAMB, WAEC, and NECO would create consistency in the examination ecosystem, encouraging students to develop essential digital literacy skills much earlier in their academic careers, preparing them better for tertiary education and the digital economy.
- Boost to EdTech Investment and School Modernisation: The mandate could serve as a powerful catalyst for increased investment in educational technology

across the country. It would compel governments, private organisations, and communities to rapidly upgrade school infrastructure, procure digital devices, and invest in teacher training, effectively fast-tracking the much-needed modernization of Nigeria's secondary school system.

Indeed, anecdotal evidence supports these benefits: schools that have already proactively adopted CBT for internal examinations (e.g., Federal Unity Schools and progressive private academies in Lagos, Abuja, and Port Harcourt) consistently report higher student engagement, faster assessment cycles, and measurable improvements in students' digital skills. These examples demonstrate that when implemented thoughtfully, CBT can indeed deliver significant educational advantages.

## Recommendations for a Realistic and Equitable Transition

To navigate the complexities of this transition and ensure that the modernisation of WAEC and NECO exams is both successful and equitable, the following strategic and phased steps are strongly recommended:

**1. Adopt a Phased Implementation Plan (2026-2028):**

- 2026: Introduce CBT exclusively for multiple-choice papers, initially across select pilot states identified as having higher infrastructure readiness. This allows for critical learning and adaptation without overwhelming the entire system.
- 2027–2028: Gradually roll out essay and practical CBT components only in schools and centres that demonstrate verified digital readiness and sustained infrastructure. This gradual approach allows for necessary investments and capacity building.

**2. Conduct a Comprehensive National Infrastructure Audit:**

- Immediately undertake a detailed audit to map school readiness across all Local Government Areas (LGAs), precisely identifying existing gaps.
- This data-driven approach will prioritise investment in the most underserved zones, ensuring resources are allocated where

they are most critically needed to bridge the digital divide.

**3. Establish Robust CBT Centres per LGA:**

- Launch a massive national initiative to build or comprehensively upgrade at least 774 fully functional and secure CBT centers - one per LGA. Each center must be equipped with stable solar power backup, sufficient functional devices, and reliable internet connectivity to handle a large cohort of students.
- This creates accessible hubs for all learners.

**4. Implement Mandatory Digital Literacy Programs for Students:**

- Integrate compulsory, practical ICT lessons from Junior Secondary School (JS1) through Senior Secondary School (SS3).
- These lessons must include hands-on training in basic computer operation, touch typing proficiency, and intensive CBT simulation modules, ensuring all students acquire the necessary foundational skills long before their exams.

**5. Intensive Teacher and Supervisor Training:**

- Mandate and fund the comprehensive training of at least two ICT-capable teachers per school.
- Simultaneously, provide specialised training for all CBT exam supervisors on digital invigilation, troubleshooting common technical issues, and ensuring exam integrity in a digital environment.

**6. Establish an Equity Monitoring Framework:**

- Develop and implement a robust monitoring framework to continuously track digital access and CBT readiness by region, gender, socio-economic background, and school type.
- This data-driven approach will ensure that the deployment of CBT is truly inclusive and that no student is inadvertently left behind or marginalised.

**7. Promote Public-Private Partnerships for Infrastructure Development**:

- Encourage collaboration between government agencies, private sector organisations, and non-governmental

organisations (NGOs) to invest in the creation and upgrading of digital infrastructure in schools and exam centres.

- Private sector partners, particularly in the technology and telecommunications industries, should be incentivised to contribute to building the necessary infrastructure, providing affordable devices, and ensuring reliable internet access for students and educators across the country. This partnership will help share the financial burden and expedite the transition to digital exams.

## A Strategic Pause or a Leap Forward?

The Federal Government's push for computer-based WAEC and NECO examinations is, at its core, a commendable and visionary step towards modernising Nigeria's education system and aligning it with global digital standards. However, the comprehensive data and expert analyses from 2024–2025 unequivocally suggest that Nigeria's secondary school students - especially those attending public and rural schools - are not yet sufficiently equipped for such an abrupt and wholesale change.

Rather than adhering rigidly to an ambitious 2026 deadline, the government and the examination bodies must instead treat this as a strategic milestone, embarking on a phased and deliberate journey towards readiness. This requires building capacity and ensuring preparedness zone by zone, school by school, with an unwavering commitment to leaving no student behind. A strategic pause, coupled with meticulous planning and massive investment, is not a retreat but a necessary recalibration for long-term success.

Failure to pause, plan, and invest equitably will not only exacerbate Nigeria's already significant educational inequality, fundamentally disadvantaging millions of its most vulnerable youth, but it could also irrevocably undermine the credibility, integrity, and public trust in its vital national examinations, leading to widespread frustration and academic disenfranchisement. The choice is clear: a hasty leap towards potential chaos or a well-measured stride towards equitable and sustainable modernisation.

# Chapter Twelve

# A Peep into Teachers' Readiness to Utilize IT and AI in Teaching and Learning in Nigeria

Teachers are undeniably central to the success of any educational reform. Whether operating within traditional "chalk-and-talk" environments or navigating the emerging digital ecosystems powered by Information Technology (IT) and Artificial Intelligence (AI), the teacher remains the crucial mediator between content and comprehension, guiding learners through increasingly complex knowledge landscapes. As Nigeria continues its journey toward a comprehensive digital transformation, this chapter critically assesses the current state of readiness among Nigerian teachers to adopt, adapt, and effectively utilise IT and AI tools in their pedagogical practices.

## Understanding Teacher Readiness: A Multifaceted Construct

Teacher readiness in the context of digital education is far more than mere awareness or

superficial exposure to technology. It is a dynamic concept that encapsulates the inherent capacity, genuine willingness, and unwavering confidence of educators to embrace and skilfully deploy new pedagogical tools and approaches. This holistic readiness can be deconstructed into four pivotal dimensions:

1. **Digital Literacy:** This refers to the fundamental ability of teachers to effectively use and navigate various Information and Communication Technology (ICT) tools, platforms, and digital resources. It extends beyond basic computer operation to include proficiency in online collaboration, digital content creation, and secure internet usage.
2. **Pedagogical Integration:** This dimension assesses a teacher's skill in seamlessly embedding digital tools and AI applications into their lesson planning, delivery, assessment strategies, and overall classroom management. It moves beyond simply using technology to transforming teaching and learning processes with it.
3. **Professional Attitude:** This encompasses a teacher's openness to change, their

enthusiasm for innovation, their proactive engagement with new technologies, and a growth mindset that views continuous learning as essential for professional development in a rapidly evolving digital world. This also includes overcoming technophobia and addressing concerns about job security.

4. **Systemic Support:** This critical dimension acknowledges that individual readiness is heavily influenced by the institutional and governmental ecosystem. It includes the availability of structured training programs, robust technological infrastructure (reliable internet, functional devices, electricity), ongoing technical support, and motivational frameworks (recognition, incentives, career progression).

## General IT Readiness of Teachers: Acknowledged Importance, Fragmented Implementation

Studies and anecdotal evidence consistently reveal that most Nigerian teachers express a strong acknowledgement of the importance of ICT in modern education. However, a significant

chasm persists between this recognition and their actual usage and skill proficiency.

- A 2023 National Teachers' ICT Baseline Survey by the Federal Ministry of Education highlighted critical disparities:
    - Only 35% of public secondary school teachers had received formal, structured training specifically in ICT integration into the curriculum.
    - Approximately 62% of teachers primarily utilize ICT for administrative tasks, such as typing lesson notes, recording attendance, or preparing basic reports, rather than for instructional purposes.
    - Fewer than 25% consistently integrate ICT into actual classroom instruction, indicating a pervasive "digital disconnect" between tools and pedagogy.
- Regional Disparities: The South-West geopolitical zone and the Federal Capital Territory (FCT) Abuja demonstrably lead in ICT readiness. This can be directly attributed to better infrastructure, higher internet penetration, and greater access to

formal training workshops and private sector-led initiatives.

- Northern and rural areas continue to lag significantly, with teachers consistently citing formidable barriers:
    - The chronic absence of functioning ICT laboratories or sufficient digital devices.
    - Erratic and inconsistent electricity supply, rendering any installed equipment effectively useless without costly alternative power sources.
    - Severe lack of reliable internet connectivity, especially in remote communities.
    - Minimal exposure to contemporary digital pedagogical approaches, perpetuating traditional teaching methods.

In essence, while awareness of ICT's importance is high, the actual, practical readiness for deep and transformative ICT integration is still moderate to low across much of the country,

reflecting systemic challenges rather than merely individual willingness.

## AI-Specific Readiness: The Dawn of Curiosity, the Need for Cultivation

Artificial Intelligence remains a relatively nascent and often intimidating territory for the vast majority of Nigerian teachers, particularly those in public schools. Recent surveys and observations underscore the nascent stage of AI adoption:

- The 2024 EdTechNG Annual Teacher Survey (a key indicator for current trends) illuminated the early stages of AI penetration:
    - A mere 9% of teachers nationwide reported having used *any* form of AI tool in their classroom practice (e.g., ChatGPT for content generation, Quillionz for quiz creation, or Google's Socratic for learning support). This usage is predominantly informal and often self-initiated.
    - A staggering over 50% of teachers remained largely unfamiliar with

AI's broader potential in education, such as its capabilities in personalized learning pathways, adaptive assessment, or automated feedback systems.

- A significant disparity exists: teachers in well-resourced private schools in major urban centers like Lagos, Port Harcourt, and Abuja were found to be four times more likely to experiment with and utilize AI tools compared to their counterparts in public schools.

- In teacher training colleges across the country, AI pedagogy is not yet systematically embedded into pre-service teacher education curricula. This means new teachers are entering the profession without foundational knowledge of AI's educational applications or ethical considerations.
- Despite these low adoption rates, a silver lining exists in the expressed willingness to learn:
    - A substantial 71% of surveyed teachers indicated they would be

willing to adopt AI tools if provided with adequate training and resources. This highlights a clear demand for capacity building.

- Younger teachers (below 35 years old) were consistently and significantly more open to AI adoption, suggesting a generational shift in technological receptivity.

- New initiatives are emerging in 2025: The Federal Government, through the National Secondary Education Commission (NSSEC), kicked off a five-week AI Pedagogy training for 6,000 senior secondary school teachers in February 2025, supported by Google Research and Data Science Nigeria. Similarly, NerdzFactory and the Raspberry Pi Foundation, with Google.org funding, launched "Experience AI" in July 2025, aiming to train 3,150 secondary school teachers across five states (Lagos, Ogun, Oyo, Ondo, Ekiti) to reach over 157,000 students. These represent crucial steps towards formalizing AI training for public school teachers.

## Persistent Barriers to Readiness: A Multi-layered Challenge

Several interconnected factors continue to severely limit Nigerian teachers' effective and equitable utilization of IT and AI in schools:

### 1. Infrastructural Deficit

The foundational issue remains the pervasive lack of basic digital infrastructure. Many schools, particularly in rural and underserved areas, lack functional computers, consistent access to stable power supply (often relying on expensive and unreliable generators), or reliable internet connectivity. In extreme cases, teachers within entire departments may share a single desktop computer, severely limiting individual practice and integration. According to UBEC's 2025 data, approximately 50% of Nigeria's public schools still lack basic digital facilities.

### 2. Lack of Comprehensive Training

The vast majority of Nigerian teachers were educated and trained under traditional, analogue pedagogical models that did not account for digital integration, let alone AI. Despite recent promising initiatives, very few teachers have historically attended structured, in-depth digital

literacy, AI awareness, or EdTech certification programs that go beyond basic computer operation to focus on pedagogical application. The Teachers Registration Council of Nigeria (TRCN) reported in June 2025 that 32.38% of candidates failed the Professional Qualifying Examination (PQE) partly due to poor digital literacy skills, underscoring the systemic training gap.

### 3. Technophobia and Resistance to Change

A lingering psychological barrier, particularly among older generations of teachers, is a palpable fear of technology. This often manifests as discomfort with new tools, apprehension about breaking equipment, or a general reluctance to deviate from established teaching routines. Some educators also perceive advanced technologies like AI as a direct threat to their professional authority, relevance, or even job security, leading to passive or active resistance to adoption. Cultural and traditional mindsets in some communities may also resist AI adoption, viewing it as a threat to conventional teaching methods.

### 4. Absence of Formal Pedagogical AI Frameworks in Curriculum

Critically, AI tools are not yet officially recognised or explicitly integrated into the national teaching syllabus across all subjects and levels. This lack of formal endorsement means teachers have no clear guidelines on *how* to use AI effectively in their lessons or *what* AI concepts to teach students. There is no robust national framework for evaluating, rewarding, or incentivizing the innovative use of AI/IT in classrooms, leading to a lack of motivation for teachers to invest their limited resources and time in learning new tools. The Federal Ministry of Education's "Nigeria Education Sector Renewal Initiative (NESRI)" (May 2025) emphasises digital transformation, but granular details on AI integration for K-12 teachers are still awaited.

## Case Snapshots from the Field: Glimmers of Potential, Roadblocks to Scale

Real-world examples illustrate both the potential and the prevalent challenges:

- Oyo State, 2023-2025: A pilot project, deepened in March 2025 with a partnership between the Oyo State Government and

EIDU GmbH, trained 120 teachers on using platforms like Edmodo (for learning management) and Canva (for content creation). Within three months, participating students' engagement reportedly increased by 35%, and teacher confidence in digital tools soared. The pilot, in four public primary schools, focuses on foundational literacy and numeracy with plans for expansion.

- Kaduna State, 2024: A digital upskilling initiative led by UNICEF saw 300 teachers trained in basic Google Suite applications. While initial enthusiasm was high, fewer than 40 teachers sustained consistent classroom integration due to the persistent lack of personal or school-provided devices and reliable internet access in their respective schools.
- FCT Abuja, 2025: Teachers in a handful of elite private schools are at the cutting edge, reporting sophisticated uses of AI tools like ChatGPT to draft personalized lesson plans, summarize complex texts for diverse learners, generate creative writing prompts, and even simulate debates for critical thinking development. However,

such advanced practices remain entirely informal, unregulated by national policy, and inaccessible to the vast majority of public school educators.

- UBEC Smart Schools (Ongoing): While the Universal Basic Education Commission (UBEC) has established "Smart Schools" across the country, these often function as isolated pockets of excellence. For example, UBEC trained Master Trainers on E-Quality Assurance in April 2025 and launched teacher development programs in collaboration with the Federal Ministry of Education, but the widespread adoption of AI tools within these smart schools and replication in other public schools remain limited due to scalability issues and maintenance challenges.

## Recommendations for Enhancing Teacher Readiness: A Path Forward

To unlock the transformative power of digital education and adequately prepare Nigerian teachers for the demands of the 21st century, a multi-pronged, sustained, and equitable strategic approach is imperative:

## 1. Mandatory and Comprehensive Digital Pedagogy Training:

Integrate compulsory and practical ICT and AI modules into both pre-service teacher training (NCE, B.Ed programs) and the Postgraduate Diploma in Education (PGDE) curriculum across all teacher training institutions. This must go beyond basic computer skills to focus on pedagogical integration and ethical AI use.

The Federal Ministry of Education, in collaboration with TRCN and NTI, should develop a standardised, competency-based framework for EdTech and AI literacy for all teachers.

## 2. Sustained Continuous Professional Development (CPD) Programs

Partner strategically with leading global technology companies (Google, Microsoft, IBM, OpenAI) and robust local EdTech organisations (EdTechNG, Data Science Nigeria, NerdzFactory) to offer accredited annual CPD programs focused on practical EdTech and AI tools relevant to the Nigerian context. These programs should offer certification and be linked to career progression.

Leverage existing platforms like the UBEC Digital Resource Centre for blended learning models, combining online resources with localized, hands-on workshops.

**3. Implement Digital Incentives and Recognition Systems:**

Establish clear incentive structures to reward schools and individual teachers who successfully integrate IT and AI in lesson delivery, student engagement, and learning outcomes. This could include competitive grants for digital projects, recognition at national and state levels, professional advancement opportunities, and performance-based bonuses.

Encourage peer-to-peer learning and mentorship programs, where digitally proficient teachers can train and support their colleagues.

**4. Establish Accessible Regional Teacher ICT/AI Resource Hubs:**

Create and adequately fund at least one well-equipped EdTech Hub per senatorial zone, providing teachers with access to modern laptops, high-speed internet, AI tools for lesson planning and content creation, and dedicated technical support. These hubs can serve as training centres, collaborative spaces, and innovation labs.

Ensure these hubs also provide offline resources and solar power solutions to address connectivity and electricity challenges in surrounding rural areas.

**5. Embed AI Literacy and Usage in National Education Policy and Curriculum:**

The ongoing review of the National Policy on Education must explicitly include AI as an emerging teaching tool, a critical 21st-century skill, and a foundation for future career pathways.

The Nigerian Educational Research and Development Council (NERDC) should be mandated and resourced to revise the national teaching syllabus to include AI literacy, ethics, and practical applications across relevant subjects, from primary to senior secondary school.

## Curiosity without Capability Is Not Enough

Nigerian teachers are demonstrably interested and optimistic about the potential role of technology in transforming their classrooms. There is a clear appetite for learning and a recognition of the shifting educational landscape. However, without substantial and sustained

investment in foundational infrastructure, comprehensive and accessible systemic training, and clear policy support that formalizes and incentivizes AI integration, this widespread interest remains largely an unrealized potential.

To truly unlock the full power of digital education and ensure that Nigeria's burgeoning youth population is equipped for the AI-driven global economy, the nation must strategically prioritize its teachers. They are not merely content deliverers but must evolve into digital mentors, facilitators of personalized learning, and guides in an increasingly complex information age. The readiness to adopt IT and AI in education should no longer be a question of *if*, but a resolute commitment to *how fast* and *how far* we are willing to invest in empowering our educators for a digitally transformed future. The trajectory for 2025 and beyond hinges on decisive action now.

# Chapter Thirteen

# Comparative Utilisation of IT and AI in Education: Nigeria, Ghana, Egypt, Kenya, and South Africa

The digital revolution in education across Africa is a dynamic and deeply uneven phenomenon, intricately shaped by varying degrees of political will, economic capability, the robustness of existing infrastructure, and the cultural readiness of societies. While all countries under review - Nigeria, Ghana, Egypt, Kenya, and South Africa - unanimously recognize the pivotal role of Information Technology (IT) and the burgeoning potential of Artificial Intelligence (AI) in transforming their educational systems, the pace, depth, and strategic foresight of their adoption vary significantly. This chapter offers a critical and comparative assessment of their progress in integrating these transformative tools into their national educational frameworks, highlighting key areas of success, persistent challenges, and crucial lessons for the continent.

## National Policy and Strategic Vision

A nation's commitment to educational technology is most tangibly reflected in its national policies and strategic visions. Here, the approaches to integrating AI, in particular, reveal diverging priorities and levels of foresight across the five countries.

| Country | IT/AI in National Education Policy | Year Initiated | Implementation Strength |
|---|---|---|---|
| Nigeria | National ICT Policy (2001), eLearning Roadmap, *draft National AI Strategy (August 2024). Limited specific K-12* | 2001, revised 2019 | Weak to moderate |

| | | | |
|---|---|---|---|
| | *education initiatives*. | | |
| Ghana | ICT in Education Policy, National Digital Literacy Plan, *emerging AI integration objectives*. | 2003, revised 2015 | Moderate |
| Egypt | Egypt Vision 2030, National AI Strategy (launched 2021), Smart | 2017–2019 | Strong |

| | | | |
|---|---|---|---|
| | Education Initiative. | | |
| Kenya | Digital Literacy Programme (DLP), *Kenya National AI Strategy (launched March 2025)*, integrated within Vision 2030. | 2016 onward | Strong |
| South Africa | e-Education White Paper (2004), AI in Education Research Grants, | 2004, updated in 2021 | Very Strong |

| | | | |
|---|---|---|---|
| | National Development Plan 2030, Digital Skills Strategy. | | |

As evidenced, Egypt, South Africa, and Kenya have taken proactive steps to integrate AI into their national development plans and education policies. Egypt's comprehensive Vision 2030 provides a clear roadmap for AI across sectors, including a robust Smart Education Initiative. Kenya, with its recently launched National AI Strategy (March 2025), explicitly aims to position itself as an AI hub, with clear plans for integration into education and talent development. South Africa, building on its longstanding e-Education White Paper, continues to evolve its policies to incorporate AI research and application, underpinned by its National AI Policy Framework (April 2024) which emphasizes AI integration into education and specialized training. In contrast, Nigeria's National AI Strategy, while drafted in August 2024 and aiming to build an AI ecosystem (with initiatives

like a free AI Academy for youth and civil servants starting 2025), *has not yet translated into comprehensive, widespread specific initiatives for K-12 education*. Ghana has recently integrated AI learning objectives into its national curriculum, signaling a significant step forward, but broader policy implementation is still nascent. This policy disparity significantly impacts the systematic and large-scale integration of AI into public school systems across the continent.

## Infrastructure and Device Availability

The theoretical commitment to IT and AI in education is only as effective as the underlying infrastructure that supports it. Equitable access to devices and reliable internet connectivity are fundamental enablers of digital learning.

| Country | Access to Computers/ Devices in Schools | Internet Penetration in Schools | Notable Initiatives |
|---|---|---|---|
| Nigeria | <30% public schools equipped; severe rural- | Low in rural schools, inconsist | UBEC digital classrooms (limited, often |

| | | | |
|---|---|---|---|
| | urban disparity | ent overall | non-functional without sustained support) |
| Ghana | ~45% ICT penetration in secondary schools; 'One Teacher One Laptop' program nearing completion | Fair in urban, low in rural | Ghana Learning TV, Raspberry Pi Labs, ongoing laptop distribution to teachers |
| Egypt | >75% of public schools connected and equipped | High in urban areas, expanding | Smart Classroom Initiative, Tablet Schools, Egyptian Knowledge Bank, national |

| | | | |
|---|---|---|---|
| | | | fiber rollout |
| Kenya | 1.2M devices distributed in public primary schools (DLP) | Moderate to high in most counties | DLP tablets, KICD eLearning portal, community networks, DigiSchool initiative, last-mile connectivity projects |
| South Africa | 70% of secondary schools ICT-equipped; robust provincial initiatives | High in most provinces, focus on broadband rollout | Gauteng e-Schools, WCED ICT for Learning, SA Connect |

| | | | |
|---|---|---|---|
| | | | broadband project |

Kenya, with its ambitious Digital Literacy Programme (DLP) having distributed over 1.2 million devices, and Egypt, boasting a high percentage of connected and equipped public schools and a strong national fiber rollout, clearly lead in nationwide device distribution and connectivity. South Africa's robust provincial-level ICT efforts, such as the Gauteng e-Schools project, offer a scalable model for concentrated investment in urban and semi-urban areas, though rural disparities persist. Ghana's "One Teacher One Laptop" program has made significant progress, with nearly 300,000 teachers reportedly supplied with laptops by August 2024, though its direct impact on student device access and widespread internet in classrooms is still evolving. Nigeria's rollout, despite initiatives like UBEC digital classrooms, remains largely inconsistent and insufficient, particularly in rural areas, thereby exacerbating the national digital divide. UBEC's efforts, while aiming to equip schools, often face challenges of maintenance and sustained connectivity.

## Artificial Intelligence in Teaching and Learning

The actual application of AI tools in daily teaching and learning practices marks the true frontier of digital transformation in education. This is where the gap between policy intent and practical implementation becomes most apparent.

| Country | AI Integration Status | Popular AI Tools in Use | AI in Teacher Training? |
|---|---|---|---|
| Nigeria | Early-stage experimentation, largely informal | ChatGPT, Quillionz (predominantly in private schools), few localized tools | Rare in public teacher colleges, limited in professional development |
| Ghana | Pilot programs in Accra & Kumasi; *formal curriculu* | AI quizzes via open-source apps, basic chatbots, *emerging* | Minimal, *but increasing focus on AI in national teacher* |

| | | | |
|---|---|---|---|
| | *m integration beginning.* | *AI literacy tools.* | *training initiatives.* |
| Egypt | Embedded in national platforms, growing widespread use | AI tutors, adaptive e-learning via EduFlag, personalized learning systems | Included in teacher PD programs (since 2020), strong focus on AI ethics |
| Kenya | Piloting AI for special education needs, emerging applications, *focus on AI literacy* | AI speech recognition, chatbots for literacy, early adaptive learning tools | Emerging, with specific programs like Intel's Skills for Innovation and pilot projects for AI |

| | | | |
|---|---|---|---|
| | *for all students*. | | integration. |
| South Africa | Research-backed classroom AI, growing adoption, innovative solutions | AI grading, writing assistants, adaptive tests, content generation, AI-powered administrative tools | Integrated in Postgraduate Certificate in Education (PGCE) and Continuous Professional Development (CPD) |

Egypt and South Africa are at the forefront of leveraging AI for personalized learning, automated assessment, and teacher workload reduction. Egypt's EduFlag platform provides sophisticated adaptive e-learning experiences, while South Africa actively researches and implements AI in areas like automated grading

and adaptive testing, often integrating these into university-level teacher training. Kenya is making significant strides, particularly in piloting AI for special education needs and literacy programs, with its new AI strategy emphasizing AI literacy for all students. Ghana, having recently integrated AI learning objectives into its national curriculum, is moving towards more formalized AI tool integration. In contrast, Nigeria is still in the very early stages of exploring AI tools, with usage largely confined to informal settings, such as well-resourced private schools, or limited, localized pilot programs. The lack of formal, widespread inclusion of AI in teacher training in Nigeria means that even interested teachers often lack the necessary skills and confidence to utilize these tools effectively and systematically.

## Teacher Preparedness and Digital Literacy

Teachers are the primary agents of change in any educational system. Their readiness, encompassing both digital literacy and pedagogical skill in using technology, is critical for successful IT and AI integration.

| Country | ICT Literacy among Teachers | CPD Programs Focused on EdTech/AI | Notable Gaps |
|---|---|---|---|
| Nigeria | ~35% (2024 data, based on formal training received); high self-reported awareness but low actual usage | Sporadic, often donor-driven workshops; very low AI exposure, *though NITDA is collaborating on digital literacy for teachers*. | Significant rural-urban gap, outdated teacher training syllabus, lack of consistent incentives and sustainable training models. |
| Ghana | ~45% trained, often in basic ICT | National ICT Teacher Training since | Limited advanced AI pedagogy focus, |

| | | | |
|---|---|---|---|
| | skills; *improving with laptop distribution*. | 2017; *increasing focus on AI within these programs*. | uneven access to consistent, high-quality training. |
| Egypt | ~75% in urban public schools; high competency, growing AI literacy | AI modules included in PD since 2020, continuous upskilling and certification programs. | Rural infrastructure challenges, initial resistance to change among older teachers, need for deeper pedagogical integration. |
| Kenya | 60% ICT-trained; ongoing upskilling through | Digital skills part of Teacher Service Commission plan; | Weak deep AI pedagogical inclusion, ensuring practical application |

| | | | |
|---|---|---|---|
| | Teacher Service Commission | *emerging AI-specific modules*. | beyond basic skills. |
| South Africa | ~80% in high-performing provinces; strong overall digital literacy | Google Certified Educators, AI in PGCE tracks, ongoing research and development, *structured AI policy framework for talent development*. | Persistent provincial disparities, ensuring equitable distribution of high-quality training across all regions, particularly in disadvantaged schools. |

South Africa demonstrates strong teacher readiness, largely due to structured EdTech CPD programs and the proactive integration of AI

modules into pre-service teacher education (PGCE), further bolstered by its national AI policy's focus on talent development. Egypt also shows high levels of teacher digital literacy, particularly in urban areas, with AI modules now a standard part of professional development since 2020. Kenya is making steady progress, with digital skills being a key component of its Teacher Service Commission's plans for professional growth, and beginning to incorporate AI-specific training. Ghana's "One Teacher One Laptop" program, while enhancing basic ICT access for teachers, is now being followed by increased efforts to integrate AI into national teacher training. Nigeria's teacher training efforts remain largely fragmented, with a significant rural-urban divide in digital literacy and minimal formal AI exposure, despite some collaborative efforts by NITDA and UBEC to develop a digital literacy curriculum for teachers. The absence of a cohesive national strategy for upskilling teachers in AI, coupled with issues like an outdated syllabus, is a major impediment.

## Curriculum Integration

For IT and AI to become truly transformative, they must be intentionally embedded within the national curriculum, ensuring that students

develop necessary digital competencies and future-ready skills from an early age.

| Country | IT in Curriculum | AI Mention in Curriculum | Future Goals |
|---|---|---|---|
| Nigeria | Computer Studies (Junior/Senior Secondary) | Not yet explicitly included nationwide; *discussions for post-2026 introduction and NERDC/NITDA collaboration for digital literacy curriculum*. | Introduce AI concepts comprehensively post-2026; integrate computational thinking and robotics; align with NITDA's 95% digital literacy by 2030 target. |
| Ghana | ICT at basic level, *with recent* | Pilot inclusion in high school, *formal* | Expand AI literacy across all levels, integrate AI |

| | | | |
|---|---|---|---|
| | *integration of AI learning objectives*. | *integration initiated*. | into 2030 vision, promote coding and robotics. |
| Egypt | National eLearning platform, digital skills across subjects | AI ethics, coding, and data science concepts increasingly in STEM curricula; *AI-powered content development*. | Full AI-assisted learning by 2030, focus on responsible AI development and skills for AI-driven economy. |
| Kenya | ICT from Grade 4 upward, Digital Literac | AI tools piloted in STEM; *emerging AI literacy units and explicit AI* | Integrate AI into Competency-Based Curriculum (CBC) across subjects; |

| | | | |
|---|---|---|---|
| | y Programme | *integration in CBC*. | develop AI-enabled learning resources. |
| South Africa | ICT from Grade R (reception) upwards | AI and robotics introduced in high school; emphasis on ethical AI and data literacy. | Develop comprehensive AI career pathways in secondary and post-secondary education; foster AI innovation through curriculum. |

Kenya and South Africa are progressively integrating AI literacy and computational thinking into their curricula from early grades, preparing students for future AI-driven economies. South Africa explicitly includes AI and robotics in high school, aiming to develop AI career pathways. Egypt's curriculum increasingly incorporates AI ethics, coding, and data science,

leveraging AI for national performance tracking and student support. Ghana has recently initiated formal integration of AI learning objectives, signalling a significant move. In stark contrast, Nigeria is yet to formally align its curriculum with AI goals across all states and levels, with AI concepts largely absent from the national teaching syllabus, despite aspirations for introduction post-2026 and recent collaborations between NERDC and NITDA on a digital literacy curriculum. The lack of a national mandate and widespread implementation remains a critical barrier.

## Regional and Global Collaborations

International partnerships and regional collaborations are vital for knowledge transfer, resource mobilization, and scaling up EdTech and AI initiatives across the continent.

| Country | Major EdTech Partners | Regional Collaborations |
|---|---|---|
| Nigeria | UNICEF, MTN Foundation, Google for Education, Microsoft, | WAEC Digital Committee, ECOWAS (general ICT focus, increasing |

| | | |
|---|---|---|
| | *NITDA for digital literacy*. | emphasis on EdTech). |
| Ghana | UNESCO, GES-EdTech, Google, Huawei, Plan International, *World Bank for digital transformation*. | ECOWAS, African Union EdTech Forum. |
| Egypt | Huawei, Microsoft, UNESCO, Google, KOICA (Korea Int'l Cooperation Agency), *major global tech firms for Smart Education Initiative*. | Arab-Africa Digital Education Forum, AU AI Working Group. |
| Kenya | UNESCO, Safaricom, Mastercard Foundation, Intel, World Bank, *UNIDO*, | Digital School of Africa, AU-EdTech Alliance, Global Partnership for Sustainable |

| | | |
|---|---|---|
| | *GIZ, EU for AI Strategy development*. | Development Data. |
| South Africa | Google, Intel, EdTech Hub, UCT AI Labs, local EdTech startups, *extensive academic and industry partnerships*. | SADC, Commonwealth EdTech Alliance, specific university research partnerships, AU AI Working Group. |

Egypt and South Africa significantly benefit from deeper, often AI-focused, partnerships with global tech giants and research institutions, allowing them to access cutting-edge tools and expertise, and even funding for AI strategy development (as seen in Kenya). Kenya's recent AI strategy was developed with support from the EU and GIZ, highlighting the importance of such collaborations. While Nigeria and Ghana's partnerships with organizations like UNICEF and Google for Education are valuable, they have historically been predominantly ICT-oriented rather than specifically focused on advanced AI

integration at scale, though this is beginning to shift for Ghana. African EdTech funding remains significantly lower than in Asia; for example, African EdTech startups received only 1.4% of the continent's venture capital funding in 2023, while India alone attracted billions in EdTech funding in previous years. This stark funding disparity highlights the need for more strategic and large-scale investment and partnerships across the continent.

## Key Takeaways and Recommendations

The comparative analysis reveals a clear stratification in the digital transformation of education across these African nations:

### 1. Top Performers:

- South Africa: Demonstrates a highly structured, research-backed, and teacher-driven approach with a clear awareness of AI's role, supported by robust policy and a vibrant EdTech ecosystem. Its national AI policy explicitly targets talent development and AI integration into education.
- Egypt: Stands out for embedding AI deeply into its public education systems, driven by a strong national policy vision and significant, consistent investment, notably

through the comprehensive Smart Education Initiative and Egyptian Knowledge Bank.

**2. Emerging Players:**

- Kenya: Characterised by a rapid and extensive device rollout through the DLP and a newly launched national AI strategy (March 2025) that prioritises AI literacy. Challenges remain in ensuring robust and consistent AI teacher training and deeper pedagogical integration across all schools, especially rural ones.
- Ghana: Shows steady progress in basic ICT integration and teacher training, further bolstered by the near-completion of its "One Teacher One Laptop" program and recent, explicit integration of AI learning objectives into its national curriculum. Broader, scalable AI inclusion is still in early stages.

**3. Lagging:**

- Nigeria: Faces persistent and widespread challenges due to significant infrastructure gaps (electricity, internet, devices), low overall teacher preparedness for digital pedagogy, and the critical absence of a

formalised, comprehensive, and widely implemented national AI roadmap specifically for K-12 education, despite a draft national AI strategy.

## Recommendations for Nigeria Based on Comparative Lessons

To bridge the growing digital divide and effectively prepare its citizens for an AI-driven future, Nigeria must urgently learn from its regional peers and adopt a more aggressive, systematic, and equitable approach:

### 1. Fast-Track and Fully Implement a National AI-in-Education Strategy

Building on the existing draft National AI Strategy, Nigeria must quickly develop and execute a dedicated, funded, and actionable AI-in-Education policy. This strategy needs specific, measurable goals for AI integration across all educational levels (K-12 to tertiary), detailed timelines, and clear responsibilities for federal and state agencies, ensuring explicit provisions for infrastructure and teacher training.

## 2. Systematically Integrate Foundational AI Literacy into all Levels of Curriculum

Move beyond mere computer studies to embed practical and ethical AI concepts, computational thinking, and basic coding across relevant subjects from early primary to senior secondary levels. This requires a revised curriculum and the development of engaging, culturally relevant learning materials.

## 3. Mandate Comprehensive EdTech and AI Continuous Professional Development (CPD)

The Teachers Registration Council of Nigeria (TRCN) and the National Teachers' Institute (NTI) must make sustained EdTech and AI training a mandatory, credit-bearing component of both pre-service and in-service training for all teacher cadres. This should include practical, hands-on training, ongoing support, certification pathways, and performance-based incentives for AI adoption in classrooms.

## 4. Strengthen and Diversify Strategic Partnerships with Global and Local AI Education Providers

Actively seek deeper, outcome-driven collaborations with leading global AI companies (e.g., Google, Microsoft, OpenAI, IBM) to access

cutting-edge resources, platforms, and expertise. Simultaneously, cultivate and incentivize a vibrant ecosystem of local Nigerian EdTech and AI startups to develop context-specific, sustainable solutions.

**5. Prioritise and Equitably Fund Digital Infrastructure Rollout**

Aggressively address the foundational challenges of stable electricity supply (e.g., solar solutions for schools), pervasive internet connectivity (including last-mile solutions for rural areas), and adequate, affordable device availability in all schools. Without this critical infrastructure, all other efforts will be severely hampered and unsustainable, further widening the educational divide.

**6. Pilot and Scale AI Tools with a Focus on Equity and Impact**

Implement well-resourced and rigorously monitored pilot programs for AI tools in diverse settings, especially in underserved rural areas. Learn from these pilots to refine strategies and scale successful models nationwide, ensuring that AI becomes a tool for educational equity rather than exacerbating existing disparities.

## 7. Create National AI Research and Development Hubs for Education

Establish dedicated AI research and development hubs within universities and research institutions, focused on educational innovation. These hubs should foster collaboration between academia, government, and the private sector to create locally relevant AI solutions, adapt global innovations to Nigeria's context, and support the continuous development of AI-driven educational tools. Robust funding of research and incentivising innovation in AI can support Nigeria to build home-grown solutions that align with its educational needs and socio-economic realities.

# Chapter Fourteen

# Comparing IT and AI Utilisation in Education: Africa vs. Asia

The 21st century has witnessed a profound global shift in education - from analogue chalkboards to algorithm-driven smart classrooms. Across the vast and diverse continents of Africa and Asia, the integration of Information Technology (IT) and Artificial Intelligence (AI) in education has evolved at strikingly different paces and patterns, profoundly shaped by economics, policy frameworks, infrastructure development, and distinct geopolitical realities. This chapter provides a comprehensive continental comparative analysis, using specific case highlights from Nigeria, Kenya, Egypt, South Africa, and Ghana representing Africa, and India, China, Singapore, Indonesia, and South Korea, representing Asia, to illuminate these divergent paths and extract crucial lessons.

## National Policy and Strategic Vision

The foundation for digital education transformation lies in explicit national policies

and strategic foresight. Here, the contrast between the two continents is particularly stark, especially concerning the formal integration of AI.

| Continent | Countries | IT/AI in Education Policy Highlights | Implementation Strength |
|---|---|---|---|
| Africa | Nigeria, Ghana, Kenya, Egypt, South Africa | Primarily ICT-focused policies, with emerging AI pilots and strategies in select countries (e.g., Egypt, Kenya's new AI strategy). | Moderate and fragmented |
| Asia | China, India, | Robust national | Strong to very strong |

| | | | |
|---|---|---|---|
| | Singapore, South Korea, Indonesia | EdTech frameworks with dedicated AI masterplans, often linked to national economic and innovation goals. | |

Singapore and China, for instance, have embedded AI directly into their national education goals since as early as 2018, viewing it as critical for future economic competitiveness. India's National Education Policy (NEP) 2020 strongly emphasises digital education and AI literacy. Conversely, African countries like Nigeria and Ghana still largely lack comprehensive national AI-in-education blueprints, although Egypt stands as a notable exception, having integrated AI into its long-term national development vision. This policy

disparity creates a fundamental difference in the systemic push for AI adoption.

## Infrastructure and Access

The digital divide is most glaring in the realm of physical infrastructure and equitable access to digital devices and connectivity. This fundamental gap profoundly impacts the feasibility and scalability of IT and AI initiatives.

| Metric | Africa (Avg) | Asia (Avg) | Highlights |
|---|---|---|---|
| % of Schools with ICT Labs | 35% (heavily urban-biased, many non-functional) | 70%+ (including significant presence in rural areas in India, China) | Africa faces severe rural exclusion, with many existing labs poorly maintained or underutilized. Asia demonstrates a more balanced and widespread distribution, leveraging government |

| | | | |
|---|---|---|---|
| | | | and private sector investment for robust digital learning environments. |
| Electricity Access in Schools | ~50% in public schools, inconsistent supply | 85–100% in Asia's major education systems | Asia's near-universal rural electrification underpins consistent EdTech implementation. In Africa, erratic power supply remains a critical barrier, often rendering installed IT infrastructure useless without |

| | | | |
|---|---|---|---|
| | | | expensive backup solutions. |
| Device-to-Student Ratio | 1:25 to 1:50 in Africa | 1:5 to 1:10 in Asia | Asian nations prioritize large-scale device rollouts (e.g., India's PM eVIDYA program, China's ubiquitous Smart Classrooms). This direct access to personal or shared devices is a game-changer for interactive digital learning. |

Africa lags significantly in fundamental ICT infrastructure. While initiatives exist, consistent, continent-wide investment in broadband access and device distribution has not matched the scale seen in many Asian nations, where robust infrastructure is seen as a prerequisite for national development and educational equity.

## AI Integration in Classrooms

The true test of IT and AI adoption lies in their active integration into daily classroom practices, transforming traditional pedagogy into dynamic, data-driven learning experiences.

| Aspect | Africa | Asia |
|---|---|---|
| AI Literacy in Curriculum | Egypt, South Africa (pilot projects, limited scale) | China, Singapore, South Korea (nationalised, integrated across subjects and grade levels) |
| AI Tools in Use | ChatGPT, Quillionz, adaptive testing (limited and informal) | Squirrel AI, KooBits, Riiid Tutor, ClassIn, Century Tech (widespread, |

| | | |
|---|---|---|
| | | often bespoke platforms) |
| AI in Public School Classrooms | <20% (mostly confined to urban elite or specific pilots) | 60%+ in pilot zones, rapidly expanding (e.g., China's extensive AI-powered tutoring systems) |

Asia is arguably decades ahead in classroom-level AI integration. Countries like China leverage AI for personalised learning, automated assessment, and intelligent tutoring systems (e.g., Squirrel AI's reported 45% performance boost in learning). South Korea and Singapore employ AI for adaptive content delivery and comprehensive learning analytics. In contrast, African classrooms are still largely analogue. Even where basic computers exist, widespread, AI-driven pedagogy remains a rarity, mostly limited to informal experimentation in well-resourced private schools or small, donor-funded pilot projects.

## Teacher Training and Readiness

Teachers are pivotal for any educational transformation. Their readiness and capacity to effectively utilize IT and AI tools are paramount.

| Feature | Africa | Asia |
|---|---|---|
| Teachers trained in EdTech | ~40% (average, often basic ICT skills) | ~80% (average, with continuous updates) |
| AI-specific Teacher Training | Mostly absent, sporadic workshops | Included in pre-service and continuous professional development (CPD) programs (e.g., Singapore's National Institute of Education, India's DIKSHA platform) |
| Resistance to AI adoption | High in rural zones, fear of technology, job security concerns | Low; strong emphasis on upskilling, professional |

| | | |
|---|---|---|
| | | growth, and efficiency gains |

Asian countries have proactively invested in continuous professional development and robust EdTech certification pathways, often integrating AI literacy into foundational teacher education. This ensures that teachers are not only comfortable with technology but are also equipped to leverage AI for pedagogical innovation. In Africa, by contrast, the widespread issue of technophobia, combined with a significant lack of structured and comprehensive CPD for EdTech and AI, means many teachers feel unprepared and even threatened by technological advancements, hindering adoption.

## Curriculum Integration

The formal embedding of IT and AI into the national curriculum signals a long-term commitment to equipping students with 21st-century skills.

| Level | Africa | Asia |
|---|---|---|
| IT/ICT in Basic Education | Yes, but highly inconsistent in | Yes, standardised across regions |

| | | |
|---|---|---|
| | content and implementation | with clear digital competency frameworks |
| AI Literacy Modules | Rare; primarily at pilot or conceptual stages (e.g., South Africa's tentative steps) | Embedded in STEM from primary level, with increasing focus on AI ethics and applications |
| Coding & Robotics | Limited to few private schools and STEM academies (e.g., Lagos, Nairobi) | Widespread, often mandatory from early grades (e.g., South Korea, China, Singapore, India's Atal Tinkering Labs) |

China's 2023 mandate requiring AI and robotics in all senior secondary schools exemplifies Asia's aggressive approach to future-proofing its

workforce. Similarly, South Korea's "Software Education" initiative introduces coding and AI concepts early. In Africa, coding and robotics education is largely an elite-driven and donor-supported phenomenon, not yet systematically integrated into national public curricula, creating a potential skills gap for the future.

## Government and Private Sector Partnerships

Effective digital transformation requires strong collaboration between governments and the private sector, leveraging technological expertise and investment.

| Partnership Type | Africa | Asia |
|---|---|---|
| Big Tech Involvement | Google, Microsoft, UNICEF, MTN, UNESCO, Huawei | Baidu, Tencent, Huawei, Microsoft, Google, Alibaba, EdTech startups (deeply integrated) |

| | | |
|---|---|---|
| Public-Private Models | Fragmented, often project-based, and reliant on external funding | Robust Public-Private Partnership (PPP) ecosystems in EdTech (especially India, Singapore, China) |
| Investment Volume (EdTech) | Low (average <$500M/year continent-wide, largely donor-funded) | High (China alone invests >$10B/year in EdTech, India's market is rapidly expanding) |

Asia's private sector is deeply embedded in its EdTech ecosystem, characterized by significant domestic investment and vibrant startup hubs that develop tailored solutions. African EdTech, while growing, still relies heavily on NGO and donor-led pilots, leading to fragmented efforts and less sustainable models. The sheer volume of investment in Asia dwarfs that in Africa, allowing

for faster development and wider deployment of advanced solutions.

## Impact and Learning Outcomes

Ultimately, the goal of IT and AI integration is to enhance learning outcomes and ensure equitable access to quality education.

| Indicator | Africa | Asia |
|---|---|---|
| Digital Learning Engagement | Rising, but patchy due to access and pedagogical gaps | Strong, reinforced by comprehensive policy, robust data analytics, and teacher training |
| Student Performance Gains from IT/AI | Modest (due to usage limitations, lack of integration) | Significant, especially in personalized learning (e.g., China's Squirrel AI: reported 45% performance boost) |
| Equity of Access | Low, widening the | Moderate to High, with |

| | | |
|---|---|---|
| | existing educational divide | targeted policies to bridge urban-rural gaps |

AI in Asia is actively closing learning gaps and personalizing instruction for large student populations, leading to demonstrable improvements in academic performance. In Africa, however, the digital divide, if not urgently addressed, risks exacerbating existing educational inequities, as students without access to modern tools fall further behind their digitally empowered peers.

## Key Lessons and Recommendations for Africa

Based on Asia's accelerated trajectory and the clear disparities observed, Africa (and particularly Nigeria) has a crucial opportunity to learn and strategically adapt:

### 1. Develop a Cohesive Continental AI-in-Education Framework

The African Union (AU) should champion and facilitate a continent-wide strategy for AI integration, fostering shared resources, best

practices, and regional collaboration to accelerate progress.

## 2. Embed AI and Digital Pedagogy into all Teacher Education Curricula

This must be a mandatory component of both pre-service and in-service training, ensuring that every teacher is equipped with the knowledge and skills to effectively use and teach with AI.

## 3. Standardise Digital Literacy Benchmarks and Curriculum

Establish clear, progressive digital literacy benchmarks for students at every education level across the continent, alongside standardised curricula that include AI ethics, computational thinking, and practical AI applications.

## 4. Foster Local EdTech Innovation Ecosystems

Governments and development partners should actively support and incentivise the growth of African EdTech start-ups, fostering localised solutions that are culturally relevant and economically sustainable, mirroring Asia's thriving start up hubs.

## 5. Establish Dedicated National and Regional AI and EdTech Funds

Reduce dependency on external donors by establishing sustainable funding mechanisms, drawing from national budgets, public-private partnerships, and potentially regional development banks, to ensure consistent investment in digital infrastructure and innovation.

## 6. Prioritize Equitable Access

Deliberately focus on bridging the rural-urban digital divide through targeted infrastructure development, affordable device initiatives, and community digital literacy programs, ensuring no child is left behind in the digital transformation.

## 7. Leverage Pan-African Collaboration for AI Research and Development

Encourage collaboration between African universities, research institutions, and global AI companies to create region-specific AI models and educational tools.

Through forming research consortia across borders, African nations can pool resources, share expertise, and co-develop AI technologies that address unique challenges on the continent. This collaborative approach will help drive innovation, reduce knowledge gaps, and create AI solutions

that are adaptable, scalable, and rooted in African contexts.

## Two Continents, Diverging Speeds

While both Africa and Asia recognise the undeniable importance of digital transformation in education, Asia is firmly in the execution and scaling phase, driven by ambitious national strategies and robust private sector involvement. Africa, by contrast, largely remains in the experimentation and pilot phase, characterized by fragmented efforts and persistent foundational challenges.

The key difference lies not solely in economic wealth, but more profoundly in strategic planning, the prioritization of digital infrastructure, comprehensive teacher empowerment, and the cultivation of synergistic tech-industry partnerships. Africa has the unique advantage of learning from Asia's successes and avoiding its mistakes. With bold investment, strengthened continental cooperation, and a decisive overhaul of current policies, the African digital classroom revolution is still not just possible, but imperative. The time to act decisively and strategically is unequivocally now.

# Chapter Fifteen

# Conclusion

# Igniting Nigeria's Digital Renaissance – The Urgent Imperative for Transformative Action

Nigeria stands at a historic crossroads. The world is experiencing an irreversible shift, a digital transformation fuelled by artificial intelligence, data science, automation, and global interconnectivity. Education, long considered the backbone of national development, is now at the very heart of this revolution. For Nigeria, a nation of over 200 million people, where more than 60% of the population is under the age of 25, the stakes have never been higher. The decisions made today will determine whether this demographic majority becomes a formidable engine of innovation and prosperity or a burden of missed opportunities.

The landscape of IT and AI education in Nigeria presents a vivid duality. On one hand, there are potent signs of progress: the emergence of

pioneering EdTech start-ups like *uLesson*, which leverages personalised learning at scale; *AltSchool Africa*, redefining skill acquisition through industry-focused pathways; and robust public sector initiatives like *EdoBEST*, which has demonstrably improved learning outcomes through data-driven classroom technology. On the other hand, the sobering realities remain: digital infrastructure is still painfully inadequate in most public schools, curriculum reform is slow and outdated, and a significant portion of teachers remain ill-equipped to deliver 21st-century digital skills.

This contradiction between rising promise and persistent gaps characterises Nigeria's educational journey into the digital age. The narrative, however, is not one of despair but of urgent possibility. If anything, the deep challenges outlined throughout this book serve as a clarion call for transformation—a call that demands courage, coordination, and a collective leap in ambition.

# What We Have Learned: A Synthesis of Insights

Through the pages of this book, we have established the following:

## 1. A History of Delay, But Glimmers of Momentum

Nigeria's introduction to IT and AI education was sluggish and marked by inconsistent policy implementation. For decades, the sector suffered from neglect, fragmented planning, and limited investment. However, over the past few years, a wave of innovation—particularly in private and urban sectors—has signalled a shift in awareness. The problem is no longer a lack of ideas but the inability to scale them sustainably and equitably.

## 2. Systemic and Structural Barriers Still Dominate

The challenges confronting Nigeria's digital education ecosystem are formidable and deeply rooted. Crumbling infrastructure, especially in rural and public schools; lack of reliable electricity and internet connectivity; undertrained or digitally-illiterate teachers; outdated curricula with minimal alignment to the demands of the modern workplace; and policy frameworks that

are either dormant or poorly executed—all persist with alarming tenacity.

### 3. Innovation Exists—but It Is Still Disconnected and Uneven

Programmes like *EdoBEST* and platforms like *uLesson* are proof that innovation can thrive locally. However, these initiatives remain scattered and rarely integrated into national policy frameworks. Most of the success stories operate in silos, without the scale, consistency, or government backing required for national transformation.

### 4. The Digital Divide Is Widening

While urban centres are slowly advancing, rural communities continue to be left behind. Girls and young women remain disproportionately excluded from digital access and opportunities. Without deliberate, inclusive strategies that target these vulnerable groups, the divide will not only persist—it will deepen and solidify generational inequalities.

### 5. A National Vision without Execution Is Not Enough

There have been several commendable policies on ICT in education, but poor follow-through,

limited funding, and lack of institutional accountability have rendered many of them ineffective. For meaningful change, Nigeria must shift from aspiration to execution. A national strategy must be backed by political will, sustained investment, and measurable outcomes.

## The Urgency of Now

The COVID-19 pandemic laid bare the stark weaknesses in Nigeria's education system. Thousands of students were locked out of learning for months, not due to a lack of will, but because of inadequate infrastructure, digital illiteracy, and insufficient contingency planning. The crisis exposed not just gaps, but *chasms*, highlighting how digital exclusion can swiftly become educational exclusion.

But this moment in history also offers a rare opportunity: a reset. The global digital economy is rapidly evolving, with artificial intelligence projected to contribute over $15 trillion to global GDP by 2030. Countries that invest now in foundational digital education will not just survive this transition—they will lead it. Those who fail to adapt will be relegated to the economic periphery, dependent on imported talent and technology.

For Nigeria, the window to act is narrowing. This is not simply about catching up—it is about preparing to compete, to lead, and to redefine what is possible for an African nation in the 21st century.

## A Multi-Sector Call to Action

The road to a digitally literate and AI-empowered Nigeria cannot be travelled by the government alone. Every stakeholder has a role to play. It requires a unified effort from ministries, school administrators, teachers, parents, students, technology developers, civil society, and international development partners.

### 1. Government

- Increase budgetary allocations towards ICT in education, particularly for underserved areas.
- Institutionalise ICT performance metrics in national education quality frameworks.
- Reward states and schools demonstrating innovation and impact.
- Create a legal and policy environment that supports EdTech entrepreneurship.

### 2. Teachers and Schools

- Embrace lifelong digital learning; educators cannot teach what they do not understand.
- Adopt low-tech solutions where possible—such as using mobile phones and radio—while pushing for infrastructure upgrades.
- Share best practices through professional learning communities and teacher networks.

### 3. Parents and Communities

- Advocate for digital literacy in local schools.
- Encourage safe, responsible technology use at home—even if limited to radio or shared smartphones.
- Break gender biases by encouraging girls to pursue careers in science and technology.

### 4. The Tech Sector and Philanthropy

- Develop and support low-bandwidth, cost-effective, and offline-friendly EdTech solutions.

- Fund teacher training initiatives at scale, in collaboration with education ministries and teacher training colleges.
- Provide tools and mentorship for young developers to innovate localised digital content.

### 5. International Development Partners

- Align all interventions with Nigeria's national ICT-in-Education strategy.
- Focus on capacity-building rather than hardware donations alone.
- Support research, south-south collaboration, and regional centres of excellence across Africa.

## Vision 2030: A Digitally Literate, AI-Ready Nigeria

Imagine a Nigeria where:

- Every classroom is digitally enabled, from Lagos and Calabar to rural Borno and Ogoja.
- Every child is introduced to computational thinking in primary school.

- Every teacher is confident using AI-powered tools to personalise learning.
- Every student, regardless of income or geography, has a pathway to a career in the digital economy.

This vision is bold, but it is possible. Countries like Singapore and Estonia have already demonstrated the transformative power of national EdTech masterplans. Closer to home, South Africa's AI curriculum and Kenya's national literacy programmes offer inspiration for what can be done with clarity of purpose and political will.

## Final Reflections: From Blueprint to Reality

This book is not just a catalogue of Nigeria's educational struggles and successes. It is a call to arms. It is a reminder that education in the digital age is non-negotiable. IT and AI are no longer extracurricular topics; they are core life skills. The innovators, entrepreneurs, researchers, and leaders of tomorrow are sitting in our classrooms today. Some have no access to electricity. Some have no access to hope.

Let us not allow their potential to wither in silence.

Let us be the generation that chose to act decisively - to transform not only the education system, but the future of an entire nation. Let us reject incrementalism and half-measures. The time for pilot programmes has passed. Now is the time for national scale, strategic investment, and uncompromising vision.

Let Nigeria rise, not by imitation, but by innovation.

Let us teach our children not only to use technology, but to create it.

Let us light every classroom with the fire of possibility, and every heart with the power of purpose.

The future of Nigeria is not a distant dream - it is a decision we must make today.

The transformation must begin.

The task is clear.

The time is now!

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# Appendix

# An Open Letter to the Federal Ministry of Education

FEDERAL MINISTRY OF EDUCATION – POLICY BRIEF

Title: Assessing National Readiness for Full Computer-Based WAEC and NECO Examinations by 2026

Prepared by: Dr. Michael Udey Udam and Dr. Obeten Okoi Oka

Date: July 2025

Executive Summary

In line with the Federal Government's ambitious mandate for the West African Examinations Council (WAEC) and the National Examinations Council (NECO) to fully adopt Computer-Based Testing (CBT) for all examinations by 2026, this report critically evaluates the current readiness of Nigerian secondary school students and the broader supporting ecosystem. While the overarching goal of modernising the examination process is undeniably laudable, offering promises

of enhanced efficiency and global alignment, current realities across vital indicators such as infrastructure, digital literacy, regional access disparities, and overall policy readiness reveal significant, persistent gaps. These deficiencies, if left unaddressed and if the rigid 2026 deadline is enforced without strategic adjustments, pose a substantial risk of compromising educational equity for millions of students, undermining the integrity of national examinations, and ultimately challenging the overall feasibility of this transformative policy.

Key Findings

1. Low Digital Literacy Among Students
    - Only a concerning 28.75% of secondary school students nationwide demonstrate basic computer proficiency, highlighting a widespread lack of foundational digital skills essential for navigating a CBT environment.
    - This critical deficit is even more pronounced in rural areas, where less than 15% of students can operate computers independently,

creating a significant barrier to equitable access.

- Consequently, over 70% of Nigerian students may struggle profoundly with the interface, navigation, and time-sensitive nature of CBT exams, leading to increased anxiety and potentially unfair disadvantages by 2026.

2. Inadequate Infrastructure
    - A stark reality is that less than 30% of public secondary schools across Nigeria possess functional and adequately equipped ICT laboratories, making widespread CBT implementation logistically improbable.
    - The North-East and North-West zones report severe and systemic shortages in reliable power supply, functional computers, and consistent internet connectivity, rendering large-scale digital examinations virtually impossible in these regions.
    - Current CBT centres nationwide are critically insufficient in number and

capacity to simultaneously handle the colossal candidate volume of WAEC/NECO (over 3 million students across multiple subjects), posing an insurmountable logistical hurdle.

3. Uneven Regional Readiness
    - Digital readiness is starkly uneven across the country. It is highest in urban areas of the South-West, benefiting from relatively better infrastructure and private sector investment, but abysmally low in the rural northern zones, which are plagued by infrastructure deficits and digital exclusion.
    - These deeply entrenched nationwide equity gaps create a severe risk of educational disenfranchisement for millions of students from underserved regions, widening the existing disparities and undermining the principle of fair access to examinations.

4. Stakeholder Concerns
    - Influential voices, including the National Parent Teacher Association (NAPTAN), leading academic experts, and various state education boards, have issued serious warnings, indicating that:
        - The 2026 deadline is premature and unrealistic without a well-planned, phased rollout strategy.
        - An unprepared CBT adoption could drastically amplify existing educational inequality and lead to significantly higher failure rates, particularly among digitally disadvantaged students.
        - Critical infrastructure and teacher training gaps must be comprehensively addressed first as a foundational prerequisite for any successful digital transition.

## Opportunities and Long-Term Benefits

Despite the significant current limitations, there is a broad consensus among stakeholders regarding the undeniable long-term advantages of a successful CBT transition:

- CBT inherently enhances transparency, significantly reduces exam malpractice (such as impersonation and leakage), and accelerates result processing, potentially cutting the typical 90-day wait to just a few weeks.
- Aligning WAEC/NECO with JAMB's proven CBT success is strategically desirable, creating consistency across national examination bodies and fostering earlier digital literacy development among students.
- Modernizing examination formats is essential for equipping Nigerian students with the critical 21st-century skills necessary for success in a rapidly evolving digital global economy.
- The mandate itself can serve as a powerful catalyst for accelerated EdTech investment

and broader school modernization across the country.

Strategic Recommendations

To ensure a realistic, equitable, and successful transition to computer-based examinations, the Federal Ministry of Education must implement the following strategic recommendations:

1. Adopt a Phased Implementation Timeline 2026: Begin with objective-only CBT in select pilot states and Federal Unity Schools to gather critical data and refine processes without national disruption. 2027–2028: Gradually expand to essay and practical sections only where infrastructure and teacher/student training are demonstrably adequate and sustained, ensuring readiness before full rollout.

2. Conduct a Comprehensive National Infrastructure Audit Immediately identify CBT-ready schools and zones across all LGAs to provide a data-driven baseline. Prioritize LGAs with the greatest infrastructural need for urgent EdTech investment, focusing on stable power, robust internet, and functional devices to bridge critical access gaps.

3. Develop One CBT Centre per LGA Launch a national initiative to build or comprehensively upgrade at least 774 functional CBT centres, ensuring each Local Government Area has a dedicated, well-equipped facility. Each centre must be equipped with reliable solar power, at least 100+ modern computer terminals, and consistent high-speed internet access. Appoint and thoroughly train dedicated CBT administrators and support technicians per centre to ensure smooth operations and immediate technical assistance during exams.

4. Mass Digital Literacy Campaigns Implement nationwide, compulsory digital literacy programs targeting all SS2–SS3 students and their teachers, regardless of location or school type. These programs must integrate practical typing skills, digital navigation competencies, and extensive CBT simulation modules directly into the senior secondary curriculum, providing hands-on preparation.

5. Equity Monitoring Framework: Establish a robust framework to continuously track CBT access and performance data by gender, school type, and geographical region. Implement conditional waivers or provide alternative examination formats for students in demonstrably

disadvantaged zones or schools until full digital readiness is achieved, ensuring no student is unfairly penalized.

Summary

The aspiration to digitize national examinations by 2026 is undoubtedly timely and commendable, reflecting a commitment to educational modernization. However, forcing a full-scale CBT rollout across the nation without sufficient, foundational national readiness may lead to dire consequences: it risks profoundly worsening existing inequities, compromising the integrity and reliability of examination results, and ultimately undermining the credibility of the entire policy. A phased, regionally-sensitive, and equity-driven rollout is not merely an option but an essential imperative. This approach is vital to safeguard student welfare, preserve the integrity and standards of national examinations, and genuinely fulfil the ambitious digital transformation goals of the Federal Ministry of Education.

## Appendices

A. Data Sources:

- Guardian Nigeria, NBS Reports, UBEC School Audit (2024)
- UNICEF Digital Literacy Report (2023)
- WAEC and NECO Internal Infrastructure Reports (2024–2025)
- Stakeholder Interviews (NAPTAN, UBEC, State Ministries of Education)

B. Contact for Further Consultation: Dr. Michael Udey Udam, Educational Technologist & ICT Policy Researcher, and Dr. Obeten Okoi Oka, Science Educator & ICT Consultant.