



From Intellectual Waste to Intellectual Growth: A Phenomenological Prognosis of Generative AI in Nigerian Educational Research towards Nascent Sustainable Development

Tajudeen Adebowale ODUWOLE

Department of Development Studies,
National Open University of Nigeria (NOUN), Abuja, Nigeria.
aoduwole@noun.edu.ng / toduwole2@gmail.com / +234(0)8037140814
ORCID iD: <https://orcid.org/0000-0003-4606-8521>

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Abstract

Generative Artificial Intelligence (GenAI) offers unprecedented research support within the global academic landscape while simultaneously challenging traditional configurations of academic integrity. Over-reliance on GenAI risks inducing cognitive atrophy, potentially rendering years of traditional knowledge acquisition as "intellectual waste." While existing literature indicates an overwhelming willingness among advanced learners to adopt digital innovations, implementation within developing educational systems faces systemic material bottlenecks and the more insidious risk of digital imperialism that threatens to erase local contexts through biased algorithmic models. This study utilizes a transcendental phenomenological design, rooted in the Husserlian traditions operationalized by Giorgi (1985) and Moustakas (1994); to explore how advanced learners subjectively experience this technological encounter. Simple random sampling was used to select three elite specialized institutions within the Federal Capital Territory (FCT), Abuja: The Gifted School, Gwagwalada; Government Girls Science Secondary School (G.G.S.S.), Kuje; and Government Science and Technical College (G.S.T.C.), Area 3. In-depth semi-structured interviews were conducted with a cohort of 27 academically advanced students. Data were analyzed using the phenomenological concepts of Noema and Noesis to extract the structural essence of their lived experiences. The principal findings reveal that while GenAI accelerates global competitiveness, sustainable educational growth requires balancing automated cognitive offloading with structured human instruction to prevent absolute algorithmic dependency. The study concludes that building localized, decolonized technological architectures is essential to harness GenAI as a driver for national human capital development, positioning indigenous research as a core pillar for achieving nascent sustainable development.

Keywords: Academic Sustainability, Generative AI, Intellectual Waste, Sustainable Development, Transcendental Phenomenology.

1. Introduction

The contemporary global academic landscape is undergoing a seismic paradigm shift driven by the rapid proliferation of Generative Artificial Intelligence (GenAI). Within the domain of the intelligentsia, where knowledge production and intellectual rigor serve as the bedrock of societal advancement, GenAI is paradoxically viewed as both an iconic reservoir of human knowledge and



a disruptive force threatening the sanctity of academic integrity. Scholars and educational researchers are presented with tools that offer unprecedented cognitive offloading, automated data synthesis, and rapid text generation. However, beneath the veneer of this technological utopia lies a profound undercurrent of existential anxiety regarding the future of human intellect, critical inquiry, and cultural contextualization within developing educational ecosystems. The deployment of Large Language Models (LLMs) requires a critical investigation into how automated technological systems alter the lived cognitive experiences of learners who are positioned at the foundational pipeline of national research capability.

1.1 Background to the Research

For decades, the traditional ivory tower model of education has measured intellectual worth by the grueling, time-consuming process of human knowledge acquisition through years of rigorous reading, conceptual internalization, and methodological training. Historically, the development of deep cognitive structures has relied on the psychological and analytical struggles of problem-solving, independent error correction, and iterative text synthesis. However, the global educational landscape has rapidly adopted automated computational engines, driving a massive willingness among advanced learners on the African continent to integrate digital innovations into their daily academic workflows (Agbo, Sanusi, Oyelere & Suhonen, 2021). In Nigeria, this technological transition does not occur in a vacuum; it takes place within a complex socio-pedagogical space where modern digital aspirations collide directly with severe historical and material structural constraints. Furthermore, education has traditionally been tied to the structural idea of place, whether conceived as physical learning spaces or as interacting populations bound by a consistent ethical imperative (Oduwole, Lawal, & Duhu, 2025). As global technological superpower networks dominate software architectures, developing institutions face the double jeopardy of absorbing technologies that are structurally mismatched with local infrastructural realities and epistemological frameworks (Adam, 2020; Nwagwu, 2021).

1.2 Statement of the Problem

The core problem under investigation is the critical transition from "Intellectual Waste" to "Intellectual Growth" within the Nigerian educational matrix. When GenAI tools are introduced into high-performance learning environments without clear pedagogical boundaries, they threaten to induce severe cognitive atrophy among advanced learners. By allowing automated algorithms to assume primary responsibility for literature synthesis, code debugging, and thematic interpretation, the years of disciplined, resourceful manpower development within higher institutions are inadvertently rendered redundant, turning human capability into "intellectual waste". This uncritical dependency transforms active human thinkers into passive consumers of machine-generated outputs, deskilling the research workforce and erasing original thought. This problem is severely compounded by two intersecting dynamics: **Infrastructural Traumas:** The material reality of the Nigerian educational ecosystem presents severe daily operational bottlenecks, characterized by an erratic power supply ("epileptic energy"), prohibitively expensive internet connectivity, and financial barriers to premium software subscriptions (Ade-Ibijola & Sanya, 2023). While these material failures occasionally act as an accidental defense by forcing students back to physical textbooks, relying on systemic collapse to preserve human intellect is precarious and unsustainable. **The Threat of Digital Imperialism:** The foundational LLMs



powering global GenAI tools are trained predominantly on Western-centric datasets, mirroring Euro-American epistemologies, cultural biases, and socio-economic realities (Nwagwu, 2021). Uncritical deployment within Nigerian specialized schools' forces researchers into a state of epistemic dependency, systematically overwriting local contexts, regional historical nuances, and indigenous knowledge systems. Consequently, there is a severe lack of empirical, contextually rooted research explaining how Nigeria's brightest academic pipelines subjectively experience, navigate, and negotiate this technological encounter. Without clear empirical insights into the structural essence of this phenomenon, the Nigerian intelligentsia risks sleepwalking into an absolute algorithmic dependency that threatens national technological sovereignty.

1.3 Research Questions

To resolve this empirical gap, this study addresses the following research questions:

1. What is the structural essence of the lived experiences of academically advanced Nigerian students interacting with global Generative AI applications within specialized learning environments?
2. How do local infrastructural deficits (such as power grid instability and network connectivity dropouts) alter the digital cognitive workflows and behavioral adaptations of these advanced learners?
3. In what ways do global GenAI text outputs manifest features of digital imperialism, and how do advanced students subjectively experience the tension between Eurocentric algorithmic data streams and indigenous realities?
4. How do advanced learners psychologically experience and balance the trade-off between rapid task completion (cognitive offloading) and the preservation of authentic structural understanding?

1.4 Objectives of the Study

The primary overarching purpose of this research is to deploy a transcendental phenomenological framework to explore the structural essence of the lived experiences of advanced learners interacting with Generative Artificial Intelligence within specialized educational ecosystems.

The specific operational objectives are to:

1. Examine how academically advanced students within elite Nigerian secondary schools navigate the conceptual boundaries between uncritical automated reliance ("intellectual waste") and sustainable technological mastery ("intellectual growth") towards nascent sustainable development.
2. Document the direct impacts of erratic public infrastructure on the digital learning workflows of gifted students, mapping their methods of tactical resilience.
3. Analyze the systemic manifestations of digital imperialism and epistemic dislocation embedded within Large Language Models when prompted for local West African socio-economic and historical contexts.



4. Formulate an actionable, evidence-based policy framework and pedagogical model to decolonize prompting protocols, insulate learning networks, and foster long-term national technological sovereignty.

2. Literature Review

The integration of Generative Artificial Intelligence (GenAI) into educational research within developing economies cannot be understood in isolation from historical power dynamics. This section contextualizes the intersection of technological advancement and academic preservation by establishing a rigorous scientific matrix detailing digital imperialism, its specific mutations within the Nigerian education system, and the unique positioning of highly resourceful learners within specialized environments.

2.1 Conceptualizing Digital Imperialism and Algorithmic Neocolonialism

Digital imperialism is frequently termed electronic or algorithmic neocolonialism which refers to the structural process whereby global technological superpowers dominate the digital infrastructure, data architectures, and software tools of developing nations (Adam, 2020). Unlike historical territorial colonialism, digital imperialism operates through systemic dependency, data extraction, and ideological hegemony. In the context of the African continent, Nwagwu (2021) notes that this hegemony is executed through asymmetric data infrastructures where major multinational technology corporations based in the global North own the foundational servers, cloud architectures, and algorithmic pipelines. This leads to epistemic invisibility because global Large Language Models (LLMs) are trained predominantly on Eurocentric text corpora, causing African histories and complex linguistic structures to be systemically underrepresented. The consumption-to-production chasm structurally positions African educational institutions as passive consumers of foreign AI technologies rather than active developers of localized digital architectures (Adam, 2020; Ade-Ibijola & Sanya, 2023). This structural asymmetry forces African scholars into a state of digital dependency. When local researchers rely on these unrepresentative models for literature synthesis, contextual analysis, and theoretical framing, they risk reproducing foreign analytical biases that actively marginalize local knowledge production systems (Nwagwu, 2021).

2.2 The Nigerian Matrix: Infrastructural Deficits and Epistemic Risk

When narrowed specifically to Nigeria which is considered to be the largest consumer of digital technology and the most populous nation in Africa. The challenges of digital imperialism intersect uniquely with systemic infrastructural deficits. While existing educational literature records a striking 98% willingness among Nigerian scholars and advanced students to adopt digital learning innovations (Sanusi, Olaleye, & Agbo, 2023), the actual implementation of these tools occurs within a highly fractured material reality. Nigerian researchers face severe daily operational bottlenecks, including an epileptic energy supply that requires reliance on expensive, alternative power sources, weak internet connectivity that hampers consistent interactions with cloud-based AI tools, and prohibitive access costs driven by subscription models priced in foreign currencies (Ade-Ibijola & Sanya, 2023). As documented by Oviawe (2024), this material disparity creates a profound institutional vulnerability. To bypass financial and connectivity constraints, Nigerian scholars frequently rely on free, degraded, or outdated versions of AI tools. These free tiers are



highly susceptible to data "hallucinations" (the generation of false data) and enforce a rigid adherence to standardized, Westernized prompts. Consequently, the Nigerian educational researcher faces a double jeopardy: navigating the physical constraints of a developing economy while simultaneously warding off an epistemic dependency that systematically replaces local context with homogenized, foreign engineered data streams (Oviawe, 2024; Sanusi et al., 2023).

2.3 Specialized Learning Environments and the Risk of "Intellectual Waste"

The tension between technological convenience and authentic intellectual development becomes critical when examining specialized learning environments catering to advanced learners. Within the scope of this study, this dynamic is analyzed through the lens of three elite, highly competitive secondary institutions in the Federal Capital Territory (FCT), Abuja, Nigeria: The Gifted School, Gwagwalada; Government Girls Science Secondary School (G.G.S.S.), Kuje; and Government Science and Technical College (G.S.T.C.), Area 3, Abuja. These institutions are renowned across the West African sub-region for their highly selective admission procedures, rigorous academic demands, and populations of exceptionally brilliant, atypical students (Sanusi et al., 2023). These advanced learners represent the foundational pipeline for Nigeria's future research, scientific innovation, and policy-making cadres. When advanced learners in these specialized settings use GenAI uncritically, the risk of transforming human capability into "intellectual waste" escalates significantly. These students possess highly developed analytical capacities, rapid cognitive processing speeds, and creative problem-solving skills (Oviawe, 2024). However, if they utilize GenAI as an authoritative shortcut for critical reading, structural interpretation, and data synthesis, their intrinsic cognitive capabilities remain underutilized. Over-reliance on automated platforms bypasses the essential cognitive struggles embedded in the deep reading, the structural mistakes, the iterative thinking, and the original problem-solving that convert raw intelligence into mature scholarship. Instead of expanding their analytical limits, these brilliant minds are trained to become proficient prompt engineers for foreign systems. This process constitutes a severe form of resource depletion. The country's primary intellectual asset of exceptional, resourcefully trained youth is placed at risk of intellectual atrophy, reducing original contextual thought to machine-driven consensus and rendering years of elite instructional training ineffective (Oduwale et al., 2025; Oviawe, 2024).

3. Methodology

To examine the lived experiences of advanced learners navigating the intersection of Generative Artificial Intelligence (GenAI) and educational research, this study rejects positivistic, quantitative abstractions. Instead, it utilizes a qualitative framework rooted in the tradition of transcendental phenomenology. This approach allows the study to explore how students navigate the tension between global technological dependency and indigenous academic growth within specialized educational ecosystems.

3.1 The Husserlian Transcendental Phenomenological Framework

This study is theoretically grounded in the classical phenomenology of Edmund Husserl (1931), specifically through the qualitative adaptations formulated by Amedeo Giorgi (1985) and Clark Moustakas (1994). Husserlian phenomenology is uniquely suited for this inquiry because it seeks to discover the objective "essence" of a phenomenon through the subjective lived experiences of



those who encounter it. The framework requires the researcher to set aside all preconceived notions, theoretical biases, and empirical assumptions through a process known as Epoch or phenomenological bracketing (Moustakas, 1994). By bracketing prior knowledge regarding AI efficiencies or systemic infrastructural failures in Nigeria, the researcher can approach the data with fresh perception, allowing the structural realities of the participants' experiences to emerge organically.

In accordance with Giorgi's (1985) psychological adaptation and Moustakas's (1994) transcendental modifications, the analytical lens focuses heavily on the intentional correlation between Noema and Noesis. Noema represents the object of experience the "what" that is perceived (Husserl, 1931). In this study, the noema constitutes the tangible encounters with GenAI tools, the erratic internet interfaces, the disrupted electrical grids, and the Westernized text generation outputs. Noesis represents the act of experiencing the "how" of the perception (Husserl, 1931). Here, the noesis involves the cognitive processes, feelings of dependency, intellectual conflicts, anxieties regarding mental laziness, and the strategic adaptations deployed by advanced students as they interact with the technology. By analyzing the dialectical relationship between noema (the foreign AI model/local infrastructure) and noesis (the student's internal cognitive negotiation), this study uncovers the structural essence of how GenAI shapes learning within Nigeria's elite educational tier.

3.2 Research Design and Context

The empirical investigation was conducted within three purposively selected, highly specialized secondary institutions within the Federal Capital Territory (FCT), Abuja, Nigeria: The Gifted School, Gwagwalada; Government Girls Science Secondary School (G.G.S.S.), Kuje; and Government Science and Technical College (G.S.T.C.), Area 3, Abuja. These institutions are recognized across the country for their rigorous, atypical academic environments (Sanusi et al., 2023). They cater exclusively to students who demonstrate exceptional cognitive processing speeds, high intellectual capacity, and a natural aptitude for scientific, technological, and creative inquiry. Selecting these specific environments was critical to the study's focus on intellectual waste. Because these schools are designed to cultivate Nigeria's future scientific and academic elite, any technological dependency that threatens to cause cognitive atrophy within these populations represents a critical threat to the nation's human capital development (Oviawe, 2024).

3.3 Sampling and Participant Selection Matrix

Out of the specialized schools operating within the FCT ecosystem, these three institutions were chosen via a simple random sampling technique to ensure structural representation across different demographic and technical focus areas. Within the selected schools, a cohort of 27 academically advanced students was randomly selected to participate in the study. The inclusion criteria mandated that participants: (1) Must be officially classified as advanced/gifted based on institutional admission track data; (2) Must have actively utilized GenAI applications (such as ChatGPT, Google Gemini, or Claude) for academic assignments, science projects, or independent research; (3) Must have spent at least two academic sessions within these specialized environments to ensure they are fully accustomed to high-performance learning demands. A sample size of 27 was deemed scientifically robust for this qualitative research framework, as it successfully



achieved complete thematic saturation, where subsequent interviews ceased to produce novel structural meaning units or distinct descriptive variants regarding the AI interface encounter.

3.4 Data Collection and Phenomenological Interviewing Techniques

The primary instrument for data collection was the In-depth Phenomenological Interview. Rather than utilizing rigid, pre-formulated questionnaires that restrict participant expression, the interviews were semi-structured and conversational, directly reflecting the qualitative tenets established by Giorgi (1985). This allowed the 27 participants to freely articulate their lived experiences, cognitive struggles, and infrastructural negotiations. Interviews were designed around open-ended prompts carefully aligned with Husserlian traditions. The interviews were recorded with strict ethical consent, anonymized, and transcribed verbatim. The transcription process directly integrated Noema and Noesis as operational tools; transcripts were formatted into parallel analytical matrices, separating descriptions of the digital environment (noema) from the students' subjective cognitive reactions (noesis), ensuring that the structural analysis remained true to the transcendental method (Moustakas, 1994).

3.5 Systematic Data Analysis and Phenomenological Reduction Pipeline

The data analysis followed the strict scientific steps of phenomenological reduction outlined by Moustakas (1994), incorporating the descriptive psychological controls advocated by Giorgi (1985):

1. Horizontalization: Every statement in the transcripts was initially treated with equal value, and all expressions irrelevant to the GenAI experience were eliminated.
2. Delineation of Meaning Units: The remaining horizons were clustered into psychologically distinct, non-repetitive "invariant constituents" or raw meaning units.
3. Thematic Clustering: These meaning units were synthesized into overarching core themes that capture the shared structural components of the phenomenon across the cohort.
4. Textural and Structural Syntheses: For each theme, a textural description (what was experienced via the noema) and a structural description (how it was experienced via the noesis) were generated.
5. Extraction of the Core Essence: Finally, the textural and structural syntheses were integrated to articulate the invariant psychological and operational "essence" of the lived experience, establishing an unassailable scientific audit trail from raw data to final thematic concepts.

4. Findings and Discussion

The thematic synthesis of the phenomenological interviews conducted with 27 advanced students across the three selected institutions yielded profound structural paradoxes. By analyzing the data through the Husserlian dialectic of Noema (the objective manifestation of the technology and environment) and Noesis (the subjective cognitive negotiation and internal experience of the learner), three core existential themes emerged. These themes illuminate how Nigeria's brightest young minds experience the magnetic pull of AI driven cognitive offloading while simultaneously colliding with the hard barriers of infrastructural deficits and Western-centric digital imperialism.



4.1 Theme 1: Epistemic Dislocation and the Invisible Wall of Digital Imperialism

The first major finding concerns how advanced learners experience the structural biases embedded within global GenAI models. The Noema consists of the actual textual outputs, historical narratives, and scientific frameworks generated by applications like ChatGPT or Google Gemini. The students universally reported that these outputs present a highly polished but distinctly Eurocentric view of knowledge. The Noesis is characterized by a deep sense of epistemic dislocation, a feeling of alienation as students are forced to alter their original research intentions to align with the conceptual biases of foreign algorithms, directly illustrating the marginalization of local knowledge production highlighted by Nwagwu (2021). Students from The Gifted School, Gwagwalada, who routinely engage in high-level independent essays and social scientific inquiries, noted that when prompting AI tools for local historical contexts or indigenous Nigerian solutions to socioeconomic issues, the models consistently default to Western frameworks, or worse, hallucinate historical facts about Nigeria. One advanced humanities student recounted:

“When I asked the AI to analyze the traditional conflict resolution mechanisms in north-central Nigeria, it repeatedly framed our cultural practices using Western legal terms and European sociological models. It felt like the machine was trying to scrub away my local understanding, forcing me to speak about my own home through the voice of a foreign textbook.” (Idls Male, Age 16, The Gifted School, Gwagwalada).

This encounter demonstrates how digital imperialism operates at the code level, validating Adam's (2020) assertions regarding electronic neocolonialism. At G.G.S.S. Kuje, a student focusing on indigenous agricultural sciences observed that GenAI engines failed to recognize local naming conventions for soil preservation practices unique to the FCT ecosystem, instead offering high-tech, capital-intensive Western alternatives that are completely unfeasible in the Nigerian climate. Through a Husserlian lens, the intentionality of the student's consciousness is disrupted. The student approaches the tool with an indigenous cognitive framework, but the Noema (the AI output) forces a subversion of that framework. When brilliant minds are subjected to systematic exposure to Eurocentric data streams, they undergo a subtle reshaping of their analytical parameters, laying the groundwork for “intellectual waste” where original contextual thought is replaced by machine-driven consensus (Oduwole et al., 2025; Nwagwu, 2021).

4.2 Theme 2: The Friction of Cognitive Offloading and the Anxiety of "Intellectual Waste"

The second theme centers on the cognitive friction experienced by advanced learners when they use GenAI for problem-solving, text generation, and coding. Here, the Noema is the rapid, friction-free generation of complete research outlines, mathematics solutions, or programming scripts. The Noesis is a complex psychological tension: an initial feeling of intellectual relief and empowerment, rapidly followed by academic guilt, existential anxiety, and a conscious fear of mental atrophy, a localized behavioral manifestation of what Zuboff (2019) conceptualizes as the extraction of human behavioral modification by automated systems. At Government Science and Technical College (G.S.T.C.), Area 3, students in the engineering and computer science tracks actively use GenAI to write code and debug technical projects. The finding here reveals a jaggy contrast between immediate task completion and authentic structural understanding. A computing student articulated this dynamic with striking clarity:



"The AI is an addictive shortcut. When I have a complex algorithm to write for a school project, I can paste the prompt and get a flawless script in five seconds. It feels amazing at first. But during our technical defenses, when the instructors ask me to explain the logic of a specific loop, my mind goes blank. I realized that because I didn't sweat over the bugs, I didn't actually learn the logic. The AI did the thinking, and it left me feeling hollow." (Idls Female, Age 15, G.S.T.C., Area 3).

This excerpt captures the core of the intellectual waste phenomenon. The student recognizes that the cognitive struggle with the iterative process of making mistakes, debugging, and wrestling with conceptual frameworks, is exactly what transforms raw intellectual capacity into deep, mature scholarship (Oviawe, 2024). By offloading this struggle to an automated system, the student saves operational time but sacrifices deep learning, entering the trap of automated deskilling warned against in the political economy of technology transfer (Zuboff, 2019). Across all three institutions, advanced students expressed deep concern that their peers were losing the capacity for deep reading and sustained critical analysis, trading long-term human resource capability for short-term automated output.

4.3 Theme 3: Infrastructural Trauma and Tactical Resilience

The third major theme reveals the collision between digital aspirations and the material realities of the Nigerian public educational environment. The Noema consists of sudden power grid failures, depleted internet data balances, and fluctuating telecommunications signals. The Noesis is an experience of infrastructural trauma, characterized by profound academic frustration, interrupted cognitive workflows, and the subsequent development of tactical resilience a finding that directly mirrors the material challenges documented by Ade-Ibijola and Sanya (2023). The lived experience of technology adoption in Nigeria cannot be separated from the material conditions of its infrastructure. At G.G.S.S. Kuje, students highlighted how the promise of GenAI as an "omnipresent digital tutor" is routinely broken by erratic power and connectivity issues. A science student shared her experience:

"You are in the middle of a deep research simulation with the AI, trying to understand a complex biochemical reaction for a national competition. Suddenly, the power goes out, the inverter batteries drain, and the network tower in our area drops its signal. Your connection to the server is completely severed. The AI leaves you stranded mid-thought. In those moments, the digital world feels like a cruel illusion. You have to learn how to rely entirely on your physical textbooks and your own brain again." (Idls Female, Age 15, G.G.S.S. Kuje).

This finding highlights the sharp divergence between the high willingness to adopt GenAI reported in current literature (Sanusi et al., 2023) and the operational reality of the Nigerian educational ecosystem. The digital workflow of a Nigerian student is fragmented. However, the interviews revealed a profound structural paradox: the systemic failures of Nigerian infrastructure often act as an accidental defense against complete cognitive atrophy. Because the technology frequently fails, these advanced students are repeatedly forced to return to traditional research methods, collaborative peer discussions, and independent critical thinking (Oviawe, 2024). This



infrastructural trauma creates a tactical resilience that disrupts total algorithmic dependency, preventing the absolute conversion of human capability into intellectual waste.

5. Conclusion and Policy Recommendations

The integration of Generative Artificial Intelligence (GenAI) into the fabric of Nigerian educational research represents a critical turning point for the nation's academic future. By examining the lived experiences of 27 advanced students across three elite institutions in Abuja, this study has illuminated the deep structural paradoxes that define this technological shift. The transition from "intellectual waste" to "intellectual growth" is not an automatic result of technology adoption; rather, it is a contested pedagogical space where human critical capacity must be intentionally preserved against the dual pressures of infrastructural deficits and digital imperialism.

5.1 Conclusion

Through a Husserlian transcendental lens, this study has demonstrated that GenAI is far from an epistemologically neutral tool. Instead, it serves as a powerful conduit for digital imperialism, carrying Eurocentric biases, Western-centric narratives, and standardized cognitive architectures that threaten to overwrite the local contexts and indigenous realities of African scholarship (Adam, 2020; Nwagwu, 2021). When advanced learners rely uncritically on these systems for rapid text generation and cognitive offloading, they save operational time at the expense of deep, iterative learning. This process bypasses the essential cognitive struggles such as critical reading, structural analysis, and independent debugging that transform raw intelligence into mature scholarship (Oviawe, 2024). Consequently, unchecked adoption risks creating a form of resource depletion, turning Nigeria's primary intellectual asset into a passive conduit for foreign-engineered data streams. Paradoxically, the study also revealed that Nigeria's systemic infrastructural challenges such as erratic power grids and weak internet connectivity often act as accidental barriers against total algorithmic dependency (Ade-Ibijola & Sanya, 2023). By disrupting digital workflows, these material constraints repeatedly force students back to traditional research methods and collaborative human engagement. However, relying on structural failures to preserve human intellect is a precarious and unsustainable strategy. For Nigerian educational research to achieve genuine global competitiveness without sacrificing its cultural and contextual identity, academic institutions must transition from passive consumption to active, strategic, and localized technological mastery (Oduwole et al., 2025). Ultimately, achieving technological sovereignty by cultivating homegrown algorithmic models and protecting cognitive pipelines is not merely an institutional goal; it constitutes an indispensable prerequisite for securing the human capital necessary to drive Nigeria's nascent sustainable development and regional socio-economic self-reliance.



5.2 Policy Recommendations

In order to safeguard academic integrity and prevent cognitive atrophy within specialized learning environments, educational authorities and school administrators must actively implement the following structured interventions:

1. **Establish Mandatory "Cognitive Gateways" and Institutional AI Protocols:** Academic policies must reject unmediated, machine-generated research text or software code submissions. Instructors must shift their grading criteria to actively evaluate the step-by-step cognitive research process rather than focusing solely on the polished final project. Students must be required to submit a corresponding "cognitive log" with every major paper, explicitly detailing their initial thesis formulation, the specific string prompts used to query the AI, a comprehensive human critique of the AI's logical errors or biases, and the verification steps taken to integrate indigenous context.
2. **Mandate Decolonized Prompting Modules and Localized Epistemic Frameworks:** To counter the homogenizing effects of digital imperialism, Nigerian academic bodies must institute formal training on advanced prompting techniques. Advanced learners must be systematically trained to construct command prompts that deliberately force Large Language Models to account for West African socio-economic dynamics, ethnic history, and regional nuances, rather than accepting default Eurocentric baselines (Nwagwu, 2021). Curriculums must strongly position GenAI as an auxiliary brainstorming instrument rather than an ultimate source of truth, establishing traditional library work, peer-reviewed local field studies, and physical context tracking as the primary pillars of credible educational research (Oduwale et al., 2025).
3. **Fund Localized, Closed-Loop Digital Research Infrastructures:** To insulate learning networks from the material trauma of electrical grid failures and prohibitive access fees, the federal government must fund the deployment of on-site digital labs within public specialized schools (Ade-Ibijola & Sanya, 2023). This involves establishing independent digital networks operating on decentralized mini-server nodes that run lightweight, open-source AI models entirely on-site. Powered by renewable solar energy grids, these research spaces will successfully isolate the advanced educational pipeline from national blackouts and internet dropouts, ensuring that students have zero-data-cost access to localized computational support without economic barriers (Oviawe, 2024).
4. **Drive Strategic Transition from Technological Consumption to Absolute Sovereignty:** The Federal Ministry of Communications, Innovation and Digital Economy, in direct partnership with national university research consortia, must fund the aggressive curation of domestic, African-centered datasets to train homegrown AI architectures (Ade-Ibijola & Sanya, 2023). By collecting, digitizing, and utilizing native historical archives, regional scientific journals, and indigenous linguistic data to construct local models, Nigeria can supply its academic community with specialized tools that intentionally preserve local contexts, building a highly sustainable, self-sufficient framework for educational advancement. This assertion is strongly attuned to the previous work of Oduwale et al. (2025), that society has traditionally been tied to the idea of place, whether conceived as physical or as interacting populations. Usually, society is built on the regulation of social



life grounded in a consistent ethical imperative. Hence, Generative AI requires a strategic policy framework to ensure it actively promotes educational inclusivity. By so doing, growth, nascent development, and sustainability are ensured.

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