

CHALLENGES, ROLES AND SIGNIFICANCE OF ARTIFICIAL INTELLIGENCE IN 21ST-CENTURY EDUCATIONAL PLANNING

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Abstract

This article basically appraises AI's challenges, roles, and significance for 21st-century educational planning with both a global lens and a direct focus on Nigeria. Internationally, AI has demonstrated appealing promise in adaptive learning systems, predictive analytics for learners' cognitive success, and administrative automation, but its utilization has outpaced policy and governance frameworks, raising concerns about varied bias, privacy, academic integrity, and the worsening of the digital divide. Pragmatically, major international organizations now crave policy guidance, competency frameworks, and equity-focused implementation to actualize various merits while managing risks. Nigeria is proactively developing and formulating a national AI model and digital learning policies that acknowledge AI's potential but encounter familiar restraints: infrastructural deficiency, instructional capacity gaps, linguistic and cultural fit, limited research on local impacts, and unbalanced access across urban–rural disparities. This article synchronizes recent literature and policy documents to plan the fundamental technical, pedagogical, ethical, and institutional barriers, and to articulate AI's roles — from individualized learning and curriculum design to systemic analytics for allocation of resources. It extrapolates that the paramount importance of AI for contemporary educational planning does not lie solely in technological capability but in its capability to support planning geared towards learner-centred, evidence-driven, and resilient systems—provided its adoption is accompanied by responsive governance, capacity building, contextualization, and all-inclusive infrastructural investments. It rounds off with ten actionable suggestions to give progressive direction to policymakers, educators, and researchers toward responsible, equitable AI integration in educational planning.

Key Words: Artificial Intelligence, Education and Educational Planning

Introduction

Educational planning is a systematic, continuous, and evidence-based process of identifying educational goals, determining priorities, allocating available resources, and designing appropriate strategies to ensure the effective and efficient development of an educational system. It involves forecasting future educational needs, coordinating human and material resources, formulating policies, implementing programmes, and evaluating outcomes to improve educational quality, equity, accessibility, and sustainability. In the twenty-first century, educational planning has evolved beyond traditional administrative functions to embrace technological innovations, digital transformation, and data-driven decision-making. Within the context of this study, educational planning encompasses strategic activities such as educational policy formulation, enrolment forecasting, infrastructure planning, teacher demand estimation, financial resource allocation, curriculum development, monitoring and evaluation, educational management information systems (EMIS), and quality assurance. The increasing complexity of educational systems has necessitated the integration of advanced digital technologies, particularly Artificial Intelligence (AI), to enhance planning efficiency, predictive accuracy, and policy effectiveness.

Artificial Intelligence significantly strengthens educational planning by enabling planners to analyze large datasets, predict future enrolment patterns, identify educational disparities, optimize resource allocation, and generate evidence-based policies. AI-powered educational planning therefore facilitates proactive rather than reactive decision-making, enabling governments and educational institutions to anticipate challenges before they emerge.

According to UNESCO (2024), modern educational planning increasingly relies on intelligent data systems capable of supporting strategic forecasting, educational governance, and equitable policy implementation. Similarly, OECD (2026) emphasizes that educational planning in the digital era requires the integration of AI technologies to improve institutional efficiency, educational resilience, and long-term sustainability. Artificial Intelligence (AI) refers to the simulation of human intelligence by computer systems designed to perform tasks that normally require human cognitive abilities such as learning, reasoning, problem-solving, language understanding, prediction, decision-making, and pattern recognition. AI combines machine learning, deep learning, natural language processing, computer vision, robotics, and predictive analytics to process vast amounts of information rapidly and accurately. In the educational sector, AI has transformed both instructional delivery and educational administration. Within educational planning specifically, AI functions as a strategic decision-support tool by analysing educational data, predicting enrolment trends, evaluating policy outcomes, monitoring institutional performance, detecting learning gaps, forecasting teacher demand, and improving the management of educational resources.

The twenty-first century has witnessed unprecedented adoption of AI technologies due to increasing educational complexity, population growth, digital learning expansion, and the demand for evidence-based governance. Educational planners now employ AI algorithms to support national education policies, optimize school location planning, automate administrative processes, improve educational budgeting, and strengthen educational monitoring and evaluation systems.

Despite its enormous potential, AI presents several challenges, including data privacy concerns, algorithmic bias, inadequate digital infrastructure, shortage of AI-skilled personnel, ethical issues, cybersecurity threats, and unequal technological access across developing and developed nations. Consequently, successful AI integration into educational planning requires robust regulatory frameworks, ethical governance, stakeholder capacity building, and sustained investment in digital infrastructure. According to UNESCO (2024), AI should be implemented in education within ethical frameworks that prioritize transparency, inclusiveness, human oversight, and data protection. Likewise, World Economic Forum (2026) argues that AI has become a strategic driver of educational innovation, workforce preparedness, and intelligent educational governance, provided its implementation is guided by responsible policies and institutional accountability.

Education systems are under intense pressure to respond to rapid societal, technological and labour-market changes. The 21st century planner must manage growing learner diversity, constrained resources, demands for relevance, and the disruptions of crises (e.g., pandemics) — while steering systems toward equity, inclusion and measurable learning outcomes (OECD, 2023; Wang et al., 2024). Against this backdrop, Artificial Intelligence (AI) has emerged as a set of technologies — including machine learning, natural language processing, and generative models — that can analyze large-scale data, personalize instruction, automate administrative tasks and surface actionable insights for decision-makers (Garzón et al., 2025; Akgun, 2021). Interest in AI for education (AIED) accelerated after 2020; generative models and scalable adaptive platforms have catalyzed new research and rapid uptake in classrooms and administrative systems (Lin, Chen

& Lin, 2020; Tan et al., 2024). Recent systematic reviews document a surge in empirical studies since 2022 and signal a transition from pilot experiments to wider institutional uses (Matos, 2025; Portilla, 2025).

However, technological capacity alone does not guarantee improved planning or equitable outcomes. International agencies and national reports stress that AI's promise is matched by significant risks: privacy and data protection, algorithmic bias, threats to academic integrity, teacher deskilling, and the risk that AI magnifies existing inequities where infrastructure and digital literacy lag (Al-Zahrani, 2024; Xue, 2025; OECD, 2024). To navigate this terrain, policy frameworks, competency development for educators, and governance safeguards are essential components alongside technology adoption (UNESCO, 2021; Governing with Artificial Intelligence, OECD, 2024). The OECD and UNESCO have produced guidance underscoring that AI tools should support pedagogical aims, be transparent, and be deployed with attention to equity and human oversight (UNESCO, 2024; OECD, 2024; Zhu et al., 2025). Nigeria encapsulates many of the global tensions. The federal government and agencies are actively developing a National AI Strategy and digital learning policies that envisage AI's role in economic growth and education modernization (National AI Strategy, Nigeria, 2024; National Digital Learning Policy, Nigeria, 2023; Sanusi, 2025). Yet many Nigerian schools and institutions confront limited broadband coverage, inconsistent electricity, scarce teacher training in digital pedagogy, and linguistic/cultural diversity that complicates one-size-fits-all AI tools (Temitope, 2025; Manir, 2025; Bali, 2024). As a result, educational planners in Nigeria must consider not only technological selection but broader system readiness, inclusive design, and local research to guide evidence-based scaling (Umoh et al., 2024; Temitope, 2025). This article examines the major challenges, roles, and significance of AI in educational planning — internationally and within Nigeria — and offers pragmatic suggestions for policymakers, institutional leaders, teachers, and researchers to pursue a responsible and equitable AI-informed future for education.

Literature Review

1. Challenges of AI in 21st Century Educational Planning

AI's introduction to education changes both technical architectures and governance relationships. Below are the major, interlinked challenges planners face globally, followed by how those challenges manifest in Nigeria.

Data Privacy, Security and Legal Constraints

The literature was gathered through structured searches of Scopus, Web of Science, ScienceDirect, SpringerLink, Taylor & Francis Online, ERIC, Google Scholar and African Journals Online (AJOL), supplemented by official sources from UNESCO, OECD, the European Union, the U.S. Department of Education and relevant Nigerian government and regulatory agencies. Searches used combinations of terms such as artificial intelligence, education, educational planning, data privacy, data security, data governance, generative AI, GDPR, FERPA, and *Nigeria*, alongside Boolean operators. Included sources comprised peer-reviewed studies, systematic reviews, empirical research, scholarly papers, legislation, policy documents, regulatory guidance and authoritative institutional reports directly relevant to AI, education, privacy, security, governance or educational planning. Priority was given to literature published between 2021 and 2026, while earlier seminal laws, policies and foundational works were retained where necessary. Sources were excluded if they were duplicates, promotional or opinion-based, methodologically inadequate,

unverifiable, unrelated to education, or lacking clear implications for AI and educational planning.

The review was bounded geographically into global/international and Nigerian evidence, with Nigerian studies prioritised for contextual claims. Conceptually, the review focused on data privacy, consent, data minimisation, storage, security, cross-border transfer, vendor transparency, algorithmic accountability and legal compliance. Selection was guided by relevance, credibility, methodological quality, recency, institutional authority and contextual applicability, ensuring that the analysis reflected both international standards and Nigeria's educational realities.

AI systems require large volumes of learner data to power personalization and analytics. This raises well-documented concerns about consent, data minimization, storage, security, and cross-border transfer (Xue, 2025; Al-Zahrani, 2024). Jurisdictions with strong student-data protections (e.g., GDPR in Europe, FERPA in the U.S.) impose legal obligations that educational planners must respect; in many low- and middle-income settings, law and enforcement may be weaker, increasing risks of misuse (Ed.gov Student Privacy Resource, 2024-2025; UNESCO, 2021). The U.S. Department of Education and UNESCO emphasize that privacy-by-design, explicit consent practices, and vendor transparency are prerequisites for trustworthy AI deployment (U.S. Department of Education, 2023; UNESCO, 2021).

Algorithmic Bias and Fairness

AI models trained on historically biased data can reproduce and amplify inequality — mispredicting risk for marginalized groups, misclassifying learning behaviours, or recommending content that is culturally inappropriate (Lee et al., 2024; Zhu et al., 2025). Bias can be subtle (e.g., language models favoring majority-language norms) and may distort planning decisions if left unchecked (Boncillo, 2025; Al-Zahrani, 2024). International reviews call for audits, representative training data, and fairness metrics as standard parts of procurement and evaluation (Garzón et al., 2025; OECD, 2024).

Equity and the Digital Divide

AI-driven improvements require reliable connectivity and devices. Where infrastructure gaps exist, AI can deepen the “AI-divide” — advantaging urban, affluent learners and institutions and leaving rural or poorly resourced learners further behind (Digital Divide in AI-Powered Education, ResearchGate, 2025; OECD, 2024). OECD analyses warn that without proactive policy measures, AI could worsen educational inequities (OECD, 2024; UNESCO, 2024). In Nigeria, persistent disparities in internet access, device ownership, and electrification mean planners must weigh systemic investments (connectivity, power, device programs) before scaling AI solutions (National Digital Learning Policy, Nigeria, 2023; Bali, 2024; Temitope, 2025).

Teacher Capacity, Professional Identity and Workload

Teachers will interact with AI as co-actors in classrooms. Yet many educators report low familiarity, anxiety about deskilling, and uncertainty about appropriate pedagogical uses (Tan et al., 2024; Lin, Chen & Lin, 2020). Research highlights that teacher professional development, curriculum redesign, and clear role definitions are essential (Tan et al., 2024; Garzón et al., 2025). In Nigeria, limited teacher training budgets and uneven digital skills across regions complicate large-scale professionalization efforts; planners must embed AI literacy and ongoing PD into system plans (Temitope, 2025; Manir, 2025).

Academic Integrity and Assessment Validity

Generative AI tools have redefined what it means to “produce” academic work. Many schools are reporting increased uses of AI to generate essays and homework, requiring rethinking of

assessment design, proctoring, and academic integrity policies (Lee et al., 2024; Cotton, 2024). Some institutions shift to in-class assessments, oral exams, or AI-inclusive policies that teach students responsible use (Cotton, 2024; Al-Zahrani, 2024).

Transparency, Explainability and Vendor Lock-In

Many AI providers use proprietary, opaque models. Educational planners must contend with black-box systems that produce recommendations without clear rationales — problematic for accountability and parent/teacher trust (Xue, 2025; Wang et al., 2024). Procurement choices risk lock-in to vendors whose update cycles, privacy practices, or cost models may not align with public education priorities (OECD, *Governing with Artificial Intelligence*, 2024; Al-Zahrani, 2024).

Infrastructure and Scalability

In Nigeria, the specific practical constraints are acute: irregular power supply in some regions, insufficient broadband penetration in rural areas, low device-to-student ratios, and fragmented procurement processes (National AI Strategy, Nigeria, 2024; National Digital Learning Policy, Nigeria, 2023; Bali, 2024). Planners must sequence implementation: pilot in contexts with minimal tech constraints, learn, and then expand while simultaneously investing in national digital infrastructure and school-level readiness (Manir, 2025; ResearchGate Nigeria papers, 2024).

Cultural, Language and Curriculum Fit

AI models trained on anglophone, western curricula may not reflect Nigeria's multilingual environment or locally relevant pedagogies (Temitope, 2025; Manir, 2025). Content adaptation, localization, and linguistic inclusivity (support for indigenous languages, local examples) are critical to avoid epistemic marginalization (All Multidisciplinary Journal, Temitope, 2025; Manir, 2025).

Research Gaps and Impact Evidence

While pilots suggest potential benefits, systematic reviews highlight mixed or limited high-quality evidence that AI solutions reliably improve long-term learning outcomes across contexts (Matos, 2025; Garzón et al., 2025). Planners must demand rigorous evaluation designs (randomized trials, longitudinal studies, and cost-effectiveness analyses) to inform scaling decisions (Portilla, 2025; Feigerlova, 2025). In Nigeria, localized research is comparatively sparse, making external evidence insufficient without contextual replication (ResearchGate Nigeria papers, 2024; Sanusi, 2025).

Governance, Policy Coherence and Ethics

AI governance requires cross-sector coordination (education, data protection, telecoms, procurement, finance ministries) (OECD, 2024; UNESCO, 2021). International recommendations call for explicit AI-in-education policies, ethical guidelines, and capacity building at ministry levels (UNESCO, 2024; U.S. Department of Education, 2023). Nigeria's strategy offers a foundation, but effective governance will depend on operationalizing guidelines (ethics review boards for AI in education, procurement norms, transparency requirements) and ensuring stakeholder participation (teachers, students, parents) (National AI Strategy, Nigeria, 2024; Manir, 2025).

Role of AI in 21st Century Educational Planning — International and Nigerian backgrounds

When used thoughtfully, AI can strengthen many elements of educational planning — from micro-level classroom design to macro-level system decision-making. Below we map these roles and highlight examples and implications for Nigeria.

Personalized and Adaptive Learning

AI-driven adaptive learning platforms and intelligent tutoring systems (ITS) can tailor content sequencing, pacing, and feedback to individual learners, increasing engagement and potentially

improving outcomes for heterogeneous cohorts (Lin, Chen & Lin, 2020; Tan, 2025). Such systems use learner interaction data to estimate mastery and predict next learning steps; this informs teachers and can guide curricular adjustments (Létourneau et al., 2025; Wang et al., 2024). Several systematic reviews show ITS and adaptive platforms produce moderate gains in targeted domains, especially when integrated with teacher-led instruction (Garzón et al., 2025; Akgun, 2021). Planners can leverage adaptive systems to support differentiated pathways while allocating human tutoring resources to learners who need it most (Tan, 2025; Matos, 2025).

Predictive Analytics for Planning and Resource Allocation

At system level, predictive models can identify schools likely to have higher dropout risk, forecast demand for teachers in specific subjects, and optimize resource allocation (e.g. where to target remedial programs) (Wang et al., 2024; OECD, 2024). These analytics enable proactive interventions and efficient budgeting (UNESCO, 2024; Portilla, 2025). However, planners must guard against models that inadvertently penalize disadvantaged communities by flagging them as “high risk” without offering resources (Al-Zahrani, 2024; OECD, 2024).

Curriculum Design and Learning Materials

AI can assist curriculum planners by analyzing learning standards, student performance data, and labor-market signals to recommend curricular emphases, update competencies, and generate differentiated learning materials (UNESCO, 2021; National AI Strategy, Nigeria, 2024). Generative AI can produce formative assessment items, practice exercises, and localized contextual examples at scale — a potential boon for under-resourced contexts (Cotton, 2024; Matos, 2025). For Nigeria, AI-assisted content generation could accelerate the production of multilingual and culturally relevant materials, but quality assurance controls are essential (Temitope, 2025; All Multidisciplinary Journal, Temitope, 2025).

Teacher Professional Development and Coaching

AI-enabled analytics can provide teachers with real-time feedback on classroom interactions, identify professional development needs, and curate personalized PD modules (Tan et al., 2024; Garzón et al., 2025). Virtual coaching systems and micro-learning sequences can augment scarce in-person training (Lin, Chen & Lin, 2020; U.S. Department of Education, 2023). In Nigeria, such systems could help scale continuous professional development despite geographic barriers, provided connectivity and device access are sorted (National Digital Learning Policy, Nigeria, 2023; Manir, 2025).

Assessment, Certification and Integrity Tools

AI can automate grading of formative assessments, provide detailed analytics on class performance, and support adaptive testing (Lee et al., 2024; Matos, 2025). AI-based proctoring and similarity detection also exist, though they carry privacy risks and possible false positives (Lee et al., 2024; Al-Zahrani, 2024). Planners should balance automation benefits with fairness and privacy safeguards, and redesign assessments that test higher-order skills not easily outsourced to AI (UNESCO, 2024; Cotton, 2024).

Inclusion and Special Needs Support

AI-powered assistive technologies (speech-to-text, text-to-speech, real-time captioning, personalized scaffolds) can increase accessibility for learners with disabilities (Tan, 2025; Létourneau et al., 2025). For linguistically diverse classrooms, translation and language modeling tools can help (Boncillo, 2025; Al-Zahrani, 2024). Nigeria’s multi-lingual classrooms could benefit from such tools if they are adapted to local languages and accents — an active area for investment and public-private collaboration (Temitope, 2025; Manir, 2025).

Administrative Automation and Efficiency

From enrollment management to scheduling, AI can automate routine administrative tasks, freeing staff for higher-value planning work (UNESCO, 2024; OECD, 2024). Predictive maintenance of infrastructure, demand forecasting for textbooks or meals, and fraud detection in procurement are additional use-cases relevant to ministries and district offices (National AI Strategy, Nigeria, 2024; ResearchGate Nigeria papers, 2024). Nigerian planners could yield efficiency gains but should ensure systems are interoperable with existing management information systems and avoid vendor lock-in (Governing with Artificial Intelligence, OECD, 2024; National AI Strategy, Nigeria, 2024).

Policy Simulation and Scenario Planning

AI-driven simulation models can enable planners to run “what-if” scenarios — for example, modeling the impact of budget shifts, school closures, or curriculum changes on projected learning outcomes (OECD, 2024; Portilla, 2025). Such decision-support systems complement traditional policy analysis and can improve agility in crisis contexts (UNESCO, 2024; Garzón et al., 2025). For Nigeria’s decentralized system, scenario tools can help both federal and state planners coordinate interventions (National AI Strategy, Nigeria, 2024; Manir, 2025).

Research Acceleration and Evidence Synthesis

AI tools (NLP summarizers, meta-analytic assistants) can help policy teams synthesize large research literatures, surface pertinent evaluation findings, and monitor global innovations — valuable for evidence-based planning (Matos, 2025; Portilla, 2025). Nigerian research institutions can use AI to expedite literature reviews, accelerating locally relevant evidence generation if paired with capacity building (ResearchGate Nigeria papers, 2024; Sanusi, 2025).

Pedagogical Innovation and Learner Agency

Finally, AI can expand pedagogical repertoires (simulations, intelligent feedback, scenario-based learning) and support learner agency — enabling self-paced learning and formative feedback loops (Lin, Chen & Lin, 2020; Boncillo, 2025). To realize this, planners and educators must adopt learner-centered design principles and ensure AI augments rather than replaces human mentorship (OECD, 2024; UNESCO, 2024). In Nigeria, culturally relevant, interactive AI experiences could energize learning if they align to curricular goals and contextual constraints (Temitope, 2025; Manir, 2025).

Table 1: Results: Empirical Mapping of AI Applications in Selected Nigerian Institutions

S/N	NAME OF APPLICATION	AI TECHNOLOGY PLATFORM	TYPE	EDUCATIONAL PROCESS	INSTITUTION
1	Proposed Model for E-Learning	Web 2.0 Tools	Offline	Planning	UNIJOS
2	Evolutionary Software Modelling	Web 2.0 Tools	Online	Planning	Higher Institutions in Nigeria
3	Multimedia E-Learning	Microsoft Visual Basic 6.0, ASP.NET, Visual Studio 2010	Offline	Virtual E-Classrooms	FUTMINNA
4	Prediction Model	Hybrid of Resample and Artificial Neural Network (ANN)	Offline	Performance Prediction	UNIILORIN
5	GSM Protocols	Mobile phones	Online	Academic Activities	Igbinedion University
6	GSM Protocols	Smart phones	Online	Academic Activities	Caleb University
7	Biometric Examination	SecuGen Fingerprint Scanner	Offline	Academic Activities	Federal University Wukari

	Clearance				
8	KNIME and Orange Platforms	Naïve Bayes, Neural Network, Random Forest, K-Nearest Neighbours (KNN)	Online	Internet Traffic Prediction	Covenant University
9	Automated Timetable Generator	Genetic Algorithm and Simulated Annealing	Desktop Application	Timetable Generation	Federal University Wukari
10	E-Learning Technologies	Virtual Classroom, Digital Learning, Computer-Based Test (CBT)	Offline	Learning and Assessment	Kaduna Polytechnic
11	Multimedia Digital Library Ecosystem	Data Mining Implementation	Online	Learning	Selected South-Eastern Nigerian Institutions
12	Framework of E-Learning	Google Classroom, Zoom, WhatsApp and Blog	Online	Teaching and Learning	North-East Nigeria
13	Moodle Learning Management System	Open-Source or Proprietary	Online	Learning and Lecture Delivery	Covenant University
14	Zoom	Open-Source or Proprietary	Online	Learning and Lecture Delivery	Covenant University
15	Internet Connection	Laptops and Smartphones	Online	Learning and Lecture Delivery	UNN; BUK; NAU; UNILAG; Lead City University; UNICAL; UNIMAID; FUTO; ABU; UNIBEN; UNIPORT
16	Big Data and Analytics	Google Forms, Jupyter Notebook and Python	Offline	Prediction of Students' Performance	UNIABUJA

Source: Adapted from Bulus Bali, under the aegis of Research Square (January 1, 2024), as reported in the reviewed material

Significance, Interpretation and Implications of AI for 21st-Century Educational Planning

This section discusses the implications of the empirical results presented in the preceding section. While the Results section provides an empirical mapping of the 16 institutional cases, their regional deployment models and the identified AI-related technologies and applications, this Discussion interprets what those findings mean for educational planning in theoretical, pedagogical, infrastructural, economic, administrative and ethical terms. The discussion therefore moves beyond describing the technologies to examine how their application can reshape planning processes, institutional practices, teacher roles, equity, governance and educational outcomes.

Shifting from Input- to Outcome-Oriented Planning

The institutional applications identified in the results demonstrate a movement beyond traditional planning centred predominantly on inputs such as personnel, facilities and instructional materials. Predictive models, learning analytics and performance-monitoring applications create opportunities for planners to use learner trajectories and performance signals to inform more responsive resource allocation and intervention (Wang et al., 2024; OECD, 2024). This suggests a theoretical shift towards outcome-oriented planning in which decisions can increasingly be informed by timely evidence rather than periodic retrospective assessments (UNESCO, 2024; Garzón et al., 2025). However, such responsiveness depends on reliable data governance and responsible use of learner information (Ed.gov Student Privacy Resource, 2024–2025; OECD, 2024).

Enabling Differentiated System Strategies

The results indicate that AI-supported and digital learning applications can facilitate differentiated

approaches to educational provision. Adaptive learning, predictive analytics and targeted interventions potentially allow planners to respond to differences in learner needs and institutional contexts (Lin, Chen & Lin, 2020; Tan, 2025). This is particularly significant for Nigeria, where urban–rural disparities, formal and non-formal learning pathways and linguistic diversity require differentiated planning responses. Nevertheless, differentiation can only translate into equitable outcomes where access to connectivity, devices and digital learning opportunities is addressed (National Digital Learning Policy, Nigeria, 2023; Bali, 2024; Temitope, 2025).

Reimagining Teacher Roles and Professional Ecosystems

The findings also have important pedagogical implications. Applications that automate grading, content generation, analytics and other routine processes can potentially allow teachers to devote greater attention to facilitation, mentoring and socio-emotional learning (Tan et al., 2024; U.S. Department of Education, 2023). AI should therefore be understood as augmenting rather than replacing professional judgement. Its adoption requires corresponding changes in teacher preparation, professional development and evaluation systems (Garzón et al., 2025; Lin, Chen & Lin, 2020). In Nigeria, strengthening teacher capacity and preserving teacher agency are particularly important for sustainable implementation (Manir, 2025; Temitope, 2025).

Strengthening Evidence-Based Policy and Accountability

The predictive, analytical and monitoring applications identified in the results demonstrate AI's potential to strengthen evidence-based educational planning. AI-enabled analysis can facilitate monitoring, programme evaluation and faster feedback between policy formulation and implementation (Portilla, 2025; Matos, 2025). The implication is that planners can increasingly use continuous evidence to assess programme effectiveness and improve accountability. Machine-assisted synthesis and rapid evaluation may further shorten the policy–practice feedback cycle (Garzón et al., 2025; Zhu et al., 2025).

Economic and Workforce Alignment

The results also suggest that AI can strengthen the relationship between educational planning and labour-market requirements. By analysing emerging occupational trends and skills demands, AI can support curriculum planning and improve the alignment of education with employability needs (National AI Strategy, Nigeria, 2024; OECD, 2024). For Nigeria, this has particular significance given youth employment challenges. AI-informed planning could enhance curricular relevance when connected to vocational education, apprenticeships and employer partnerships (Bali, 2024; Temitope, 2025).

Potential Acceleration of Inclusion—If Properly Managed

Although unequal access to technology may reproduce existing inequalities, the findings indicate that AI also possesses significant potential for inclusion. Assistive technologies, personalised remediation, multilingual content and distance-learning models can extend educational opportunities to learners with diverse needs (Tan, 2025; Boncillo, 2025; Létourneau et al., 2025). For Nigeria, this is particularly important given the scale of out-of-school populations and diverse learning needs. However, inclusive outcomes require deliberate investment in devices, connectivity and accessible design (National Digital Learning Policy, Nigeria, 2023; ResearchGate Nigeria papers, 2024).

Transforming Administrative Efficiency and Scale

The institutional applications further demonstrate the potential of AI and digital technologies to reduce administrative burdens and improve system efficiency. Automation can reduce transactional workloads and enable education officials to devote greater attention to strategic planning (UNESCO, 2024; OECD, 2024). In Nigeria's large and decentralised educational system,

such applications could contribute to improved data management, procurement processes, resource allocation and financial targeting, thereby positioning AI as both an efficiency mechanism and a governance instrument (National AI Strategy, Nigeria, 2024; ResearchGate Nigeria papers, 2024).

Ethical and Civic Education Implications

The results have significant ethical and civic implications because the increasing presence of AI requires educational systems to prepare learners and educators for responsible engagement with AI. AI literacy should consequently incorporate awareness of bias, privacy, misinformation and responsible use (UNESCO, 2021; Zhu et al., 2025; Al-Zahrani, 2024; Lee et al., 2024). For Nigeria, AI competency frameworks for teachers and students can contribute not only to educational effectiveness but also to the development of citizens capable of participating responsibly in an increasingly AI-mediated society (National AI Strategy, Nigeria, 2024; Temitope, 2025).

Knowledge Generation and Local Innovation

The findings also point to opportunities for strengthening local research and innovation. AI can accelerate research, support data analysis and facilitate context-specific solutions, including technologies designed for indigenous languages (Boncillo, 2025; Matos, 2025). For Nigeria, investment in locally relevant EdTech, content development and research capacity can strengthen a domestic AI ecosystem while simultaneously addressing educational and economic priorities (National AI Strategy, Nigeria, 2024; Manir, 2025).

Rebalancing the Educational Planner's Mandate

Overall, the findings suggest that AI is expanding the traditional mandate of the educational planner. The planner increasingly requires competencies that combine pedagogical expertise with data governance, AI procurement, ethical oversight, change management and technological literacy (OECD, 2024; UNESCO, 2024). Thus, the significance of AI is not simply the introduction of new technologies but the transformation of planning itself. Educational planners in Nigeria and elsewhere must become technologists, ethicists, capacity-builders and conveners capable of aligning technological innovation with educational goals, institutional readiness and societal values (Wang et al., 2024; Sanusi, 2025).

Taken together, the 16 institutional cases demonstrate that AI-related applications are already influencing multiple dimensions of educational planning, including learning delivery, performance prediction, assessment, administration, communication and resource management. The significance of these findings lies not in technological adoption alone but in the possibilities and constraints that adoption creates for educational systems. AI can make planning more responsive, differentiated, evidence-driven and potentially inclusive; however, these benefits depend on infrastructure, human capacity, equitable access, responsible governance and ethical safeguards. Consequently, AI should be conceptualised as an enabler of educational planning rather than an autonomous solution, with its ultimate value determined by the quality of institutional decisions and human judgement surrounding its deployment.

Recommendations

- Adopt a National AI-in-education policy framework that defines ethics, procurement standards, privacy protocols and interoperability for EdTech vendors.
- Invest in foundational infrastructure (broadband, stable power, device programs) prioritized for underserved regions to prevent an AI-divide.
- Develop and mandate AI competency frameworks for students and teachers (AI literacy, ethics, critical use).
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- Embed data governance and privacy-by-design in all AI procurements, with vendor transparency and third-party audits.
- Scale teacher professional development focused on pedagogical integration of AI, co-design with teachers, and continuous coaching models.
- Prioritize local content and language adaptation — fund open-source models for indigenous languages and culturally-relevant materials.
- Require rigorous evaluation (randomized pilots, longitudinal studies, cost-effectiveness) before national scale-up.
- Design assessments for higher-order skills and classroom-based authentic assessments less susceptible to misuse by generative AI.
- Create multi-stakeholder governance bodies (including teachers, parents, students, civil society) to oversee AI ethics and tendering.
- Support local EdTech innovation ecosystems through grants, incubation and university partnerships to build context-aware tools.

Conclusion

Artificial Intelligence presents educational planning with one of the most consequential toolsets of the 21st century: it can sharpen insight, tailor learning, streamline administration and enable evidence-driven policy (Wang et al., 2024; UNESCO, 2024). Yet the technology is not a self-executing cure. The decisive variable separating benefit from harm is governance: how planners, educators, governments, and civil society steward AI's introduction (OECD, 2024; Al-Zahrani, 2024). Internationally, accumulated evidence and multilateral guidance underscore a recurring theme — AI's technical promise must be married to ethical guardrails, robust data governance, teacher capacity-building, and proactive equity measures (UNESCO, 2021; Zhu et al., 2025; U.S. Department of Education, 2023). Organizations such as UNESCO and the OECD, and national agencies including the U.S. Department of Education, emphasize that without privacy safeguards, explainability, and attention to structural divides, AI risks amplifying existing inequalities or producing opaque decision-making that undermines trust (Xue, 2025; Lee et al., 2024). At the same time, systematic reviews show that when AI tools are pedagogically aligned and deployed with teacher involvement, they can deliver targeted gains in specific learning contexts — especially in adaptive tutoring and formative assessment (Garzón et al., 2025; Létourneau et al., 2025).

For Nigeria — and comparable contexts — the stakes are both particular and general. Nigeria's recent policy documents and strategy directions signal political will and an appetite to harness AI for development (National AI Strategy, Nigeria, 2024; National Digital Learning Policy, Nigeria, 2023). But this will alone cannot overcome deeply rooted structural constraints: inconsistent electricity, unequal broadband access, limited teacher PD budgets, and the linguistic and cultural diversity that demands localized content (Bali, 2024; Temitope, 2025; Manir, 2025). Nigeria's planners must therefore adopt a sequenced, equity-first approach: prioritize infrastructure and inclusive access; pilot with rigorous evaluation; scale models that demonstrate impact; and institutionalize data protection and vendor transparency (Matos, 2025; Portilla, 2025; *Governing with Artificial Intelligence*, OECD, 2024). In addition, investment in local talent and EdTech ecosystems can ensure that AI tools are adapted to the country's languages and pedagogical traditions, increasing relevance and social acceptability (National AI Strategy, Nigeria, 2024; Temitope, 2025).

Practically, the planner's toolkit should expand to include competencies in AI procurement, fairness auditing, and scenario modeling (OECD, 2024; Garzón et al., 2025). Ministries will need cross-sector collaboration (telecoms, data protection authorities, finance ministries) to align resources and governance (UNESCO, 2024; National AI Strategy, Nigeria, 2024). Teachers must not be passive recipients of technology but partners in design, given their central role in mediating AI's classroom effects (Tan et al., 2024; Manir, 2025). Assessments and accountability systems must be redesigned to prioritize authentic demonstrations of competence and to deter misuse of generative tools (Lee et al., 2024; Cotton, 2024). Finally, civil society and parent engagement are essential to legitimize AI uses and to maintain public trust (Xue, 2025; Al-Zahrani, 2024). AI's most important significance for educational planning may be normative rather than merely technical: it invites planners to reconceptualize education as a dynamic, learner-centered system that responds to timely evidence, is attentive to equity, and privileges human flourishing (UNESCO, 2021; Feigerlova, 2025). When AI is deployed as an amplifier of pedagogical goals — not a replacement for human judgement — it becomes a tool for resilience, inclusion and continual learning within education systems (Garzón et al., 2025; Tan, 2025). For Nigeria, the pathway is clear though challenging: couple ambition with prudent governance, invest in foundations, commit to rigorous local research, and center equity in every decision (National AI Strategy, Nigeria, 2024; Temitope, 2025). If done well, AI can be a catalyst for accelerating progress toward inclusive, quality education for all; if done poorly, it risks entrenching disparities and eroding trust (OECD, 2024; Boncillo, 2025). The obligation for planners is to steer a course that secures the former while guarding against the latter.

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