

Reimagining the Pedagogy of the Future: Navigating the Human-AI Hybrid Classroom Through Transformative Teacher Education in Nigeria

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Article History	Abstract
Original Research Article	<i>The emergence of artificial intelligence (AI) as a transformative force in education has fundamentally altered the landscape of teaching and learning, compelling educational systems worldwide to reconsider what it means to prepare effective teachers for the 21st century. In Nigeria, where teacher education faces longstanding structural, methodological, and resource challenges, the advent of the human-AI hybrid classroom represents both a formidable challenge and a historic opportunity. This paper argues that addressing this challenge requires not incremental adjustment but a genuinely transformative reconceptualisation of teacher education, in curriculum design, pedagogical orientation, institutional culture, and policy direction. Drawing on the Technological Pedagogical Content Knowledge (TPACK) framework, Mezirow's Transformative Learning Theory, and Vygotsky's Sociocultural Theory, and integrating evidence from global and Nigerian educational contexts, the paper examines the conceptual, structural, and practical dimensions of preparing Nigerian teachers for human-AI hybrid learning environments. It further proposes the REACH Framework, a five-dimensional model for reimagining Nigerian teacher preparation, and derives implications for institutional practice, professional governance, and national education policy. The paper concluded that the future of Nigerian education depends not on whether AI enters the classroom, but on whether teachers are adequately prepared to navigate, humanise, and lead learning in AI-augmented environments.</i> Keywords: Artificial Intelligence in Education, Human-AI Hybrid Classroom, Teacher Education, Transformative Pedagogy.
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Introduction

The global educational landscape is undergoing a transformation of historic proportions, driven in substantial measure by the accelerating integration of artificial intelligence (AI) into virtually every domain of human endeavour. Education, long considered the uniquely human enterprise of transmitting knowledge, forming values, and cultivating the capacities of successive generations, is not exempt from this transformation. From adaptive learning platforms and intelligent tutoring systems that personalise instruction in real time, to automated assessment tools, generative AI capable of producing scholarly-quality text, and predictive analytics that identify at-risk learners before teachers can, the integration of AI into teaching and learning environments is no longer a speculative horizon; it is a present and rapidly accelerating reality.

The World Economic Forum (2020) projects that by 2025, machines and algorithms will perform tasks previously exclusive to human cognition across virtually all professional domains, fundamentally altering the competencies demanded of 21st-century workers and, by extension, the knowledge, skills, and dispositions required of the teachers who prepare them. UNESCO (2019), through the landmark Beijing Consensus on Artificial Intelligence and Education, has called on member states to develop human-centred, inclusive, and ethically grounded approaches to AI integration, approaches that place teacher preparation at the centre of any credible national response. The Organisation for Economic Co-operation and Development (2019) has similarly identified AI as one of the defining social and economic challenges of the coming

decades, with education systems bearing particular responsibility for equipping populations to engage with AI critically, productively, and ethically.

In this context, the concept of the human-AI hybrid classroom has emerged as a new and increasingly influential paradigm for educational delivery, one in which human teachers and AI systems operate as complementary partners, each contributing capabilities the other lacks, in pursuit of richer and more equitable learning outcomes. Unlike earlier educational technology narratives that positioned digital tools as replacements for human educators, the human-AI hybrid model is premised on the recognition that the most powerful educational outcomes arise from the synergy of human pedagogical intelligence and AI computational capabilities (Luckin et al., 2016; Holmes et al., 2019). The challenge, therefore, is not whether to integrate AI into education; the tide of history has rendered that question moot, but how to prepare teachers to navigate this integration purposefully, critically, and in ways that preserve and amplify the distinctively human dimensions of teaching and learning.

For Nigeria, a nation with over 200 million people, the largest youth population on the African continent, and an educational system characterised by significant access, quality, and equity challenges, this challenge carries particular urgency. The Nigerian teacher education system, governed by the National Policy on Education (Federal Republic of Nigeria [FRN], 2013) and benchmarked by the National Universities Commission (NUC, 2019), has historically grappled with issues of inadequate resourcing, methodological conservatism, insufficient integration of contemporary educational technologies, and a persistent mismatch between teacher preparation and the realities of classroom practice. As AI technologies increasingly permeate global educational systems, Nigerian teacher education faces the compounding risk of producing graduates ill-equipped for the realities of 21st-century classrooms. Nwafor and Alikor (2026) likewise traced the weak implementation of mass education policies in Nigeria to poor funding, short-sighted planning and too few qualified teachers, which shows that any new reform of teacher education is likely to stall unless these older gaps are closed at the same time.

This paper is a response to this urgency. It argues that what Nigeria requires is not superficial technology training appended to existing teacher education programmes, but a genuinely transformative reimagining of how teachers are conceptualised, prepared, and supported. The paper is structured as follows: Section 2 presents the theoretical framework underpinning the analysis; Section 3 reviews global trends in AI in education; Section 4 examines the human-AI hybrid classroom concept; Section 5 analyses the

current state of teacher education in Nigeria; Section 6 addresses the transformative teacher education required for the AI era; Section 7 proposes the REACH Framework for reimagining teacher preparation in Nigeria; Section 8 discusses implications for policy and practice; and Section 9 presents the conclusion.

Theoretical Framework

This paper is grounded in three interconnected theoretical frameworks that together provide a comprehensive conceptual foundation for understanding the intersection of pedagogy, technology, and teacher transformation in the context of human-AI hybrid education.

Technological Pedagogical Content Knowledge (TPACK)

The TPACK framework, developed by Mishra and Koehler (2006) and elaborated in subsequent work by Koehler and Mishra (2009), represents one of the most widely adopted and empirically robust frameworks for understanding teacher knowledge in technology-rich educational environments. The framework builds upon Shulman's (1987) seminal conception of Pedagogical Content Knowledge (PCK), the distinctive body of knowledge that enables teachers to make subject matter accessible to diverse learners through contextually appropriate pedagogical strategies. Mishra and Koehler (2006) extended this conception by introducing a third knowledge domain, technological knowledge, arguing that effective technology integration in education requires not isolated mastery of any single domain but a dynamic, integrated understanding of how content knowledge, pedagogical knowledge, and technological knowledge intersect and interact.

TPACK posits seven knowledge types: Content Knowledge (CK), Pedagogical Knowledge (PK), Technological Knowledge (TK), Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK), each representing a qualitatively distinct form of teacher understanding. For the human-AI hybrid classroom, TPACK offers an especially relevant lens. Understanding AI tools (technological knowledge), knowing how to deploy them pedagogically (pedagogical knowledge), and situating their use within specific subject domains (content knowledge) requires the kind of integrated, contextualised teacher competence that neither technical training nor traditional pedagogical preparation alone can produce. Teacher education programmes in Nigeria must therefore be designed to develop TPACK holistically — cultivating teachers who do not merely use AI tools but who understand why, when, and how to deploy them in ways

that genuinely enhance subject-specific learning for specific learner populations.

Mezirow's Transformative Learning Theory

Jack Mezirow's Transformative Learning Theory (1991, 2000) provides the overarching philosophical orientation of this paper. Mezirow (1991) argues that the most profound form of adult learning involves not merely the acquisition of new information or procedural skills, but a fundamental revision of what he calls "frames of reference" — the habitual ways of thinking, feeling, and acting through which individuals interpret experience and make meaning. Such transformation, Mezirow argues, is typically precipitated by a "disorienting dilemma": an experience that reveals the inadequacy or limitations of existing frames of reference and compels critical reflection, rational discourse with others, and ultimately the construction of new, more inclusive and discriminating interpretive frameworks.

The encounter with artificial intelligence in education represents precisely such a disorienting dilemma for many teachers and teacher educators. AI challenges longstanding and deeply held assumptions about the teacher's role as the primary source of knowledge, about the nature of professional expertise in teaching, about the meaning and purpose of educational assessment, and about the very purpose of education in human society. Transformative teacher education, in this theoretical frame, is not about training teachers to use AI tools more efficiently. It is about supporting teachers through a sustained process of critical reflection, collaborative dialogue, and professional identity reconstitution — enabling them to engage with AI not as passive recipients of technological change but as empowered pedagogical agents who critically appropriate, humanise, and give ethical direction to AI's educational applications.

Vygotsky's Sociocultural Theory

Lev Vygotsky's (1978) sociocultural theory, with its foundational concepts of the Zone of Proximal Development (ZPD) and the mediating role of cultural tools in human cognitive development, provides a third theoretical anchor for this paper. Vygotsky (1978) argues that learning and development are fundamentally social and mediated processes: human cognitive capacities develop not through solitary discovery but through interaction with more capable others and through culturally constructed tools and symbol systems that extend and reshape what is cognitively possible. The concept of mediation is central: human thought and action are always mediated by cultural artefacts, language, writing, number systems, and, in the contemporary context, digital and AI technologies.

In the human-AI hybrid classroom, AI functions as a cultural tool in precisely the Vygotskian sense, a mediating artefact that can extend, scaffold, and in profound ways transform what is cognitively achievable for both learners and teachers. Intelligent tutoring systems scaffold learners through complex problem-solving within their ZPD; AI-generated analytics extend teachers' capacity to perceive and respond to individual learning needs; generative AI tools mediate writing development in ways that shift the focus of instruction from the mechanics of composition to the higher-order challenges of argument, evidence, and voice. Understanding AI as a mediating cultural tool, rather than as a replacement for human agency, reframes the teacher's role in the hybrid classroom: teachers become the culturally informed agents who design, deploy, and critically supervise AI-mediated learning experiences, ensuring that the tools available serve the social, developmental, and cultural contexts of their specific learner communities.

Artificial Intelligence in Education: Global Trends and Perspectives

Artificial intelligence in education (AIED) has evolved over four decades from a niche area of computer science research, characterised by rule-based systems and early intelligent tutoring programmes, into a globally consequential field with far-reaching implications for educational policy, institutional practice, and professional teaching. The systematic review by Zawacki-Richter et al. (2019), examining 2,656 research publications on AI in higher education published between 2007 and 2018, identified personalisation and adaptive learning as the dominant application domains, followed by assessment and evaluation, intelligent tutoring, and the automation of administrative functions. The authors note with significant concern, however, that learners and educators are largely absent as research subjects in the AIED literature, a finding that underscores the importance of centring teacher experience and professional preparation in AI integration discourse.

The landscape documented by Zawacki-Richter et al. (2019) has expanded dramatically in the years since, driven above all by the development of large language models and other generative AI technologies. Tools such as ChatGPT, Google Gemini, and their successors are now capable of producing human-quality text, engaging in extended educational dialogue, generating assessment questions, providing personalised feedback on student writing, explaining complex concepts in multiple ways, and performing a range of instructional support functions that were, until very recently, the exclusive province of human teachers. The pedagogical and ethical implications of these

capabilities for teacher preparation are profound and incompletely understood.

UNESCO (2019) has provided important global normative direction through the Beijing Consensus on Artificial Intelligence and Education, which calls on member states to develop AI approaches that are human-centred, inclusive of diverse cultural contexts, transparent, and governed by robust ethical frameworks. The subsequent UNESCO (2021) guidance for policy-makers identifies five key dimensions of AI competency for educators, understanding AI, using AI tools, designing AI-enhanced experiences, collaborating with AI, and governing AI ethically, providing a policy-relevant framework that informs the teacher education reform agenda advanced in this paper.

Holmes et al. (2019) identify four primary educational roles of AI: as a tool for personalising learning pathways through adaptive content delivery; as an intelligent tutor providing timely, tailored feedback on academic performance; as an administrative assistant capable of automating routine data-processing tasks that consume teacher time; and as a collaborative partner in knowledge creation and problem-solving. Roll and Wylie (2016), in their historical review of AIED, argue that the field has been shaped by recurring tension between what they term "revolution", transformative visions of AI as a radical improvement on traditional education — and "evolution", the pragmatic, iterative improvement of existing educational systems through targeted AI applications. Both orientations, they contend, have their place; the critical question is which educational goals and values should guide the selection of AI tools and applications in any given context.

Popenici and Kerr (2017) warn that uncritical AI adoption in higher education risks displacing the reflective, dialogic, and humanistic dimensions of learning that are among the most educationally irreplaceable values of university-level instruction. Their concern is not with AI per se but with the conditions under which AI is deployed — conditions that may prioritise efficiency and scalability over depth, criticality, and the cultivation of wisdom. Chen et al.'s (2020) comprehensive review of 800 AIED publications confirms that the most educationally significant AI applications are those that combine machine learning capabilities with sustained human teacher oversight, a finding that directly supports the human-AI hybrid classroom model and underscores the irreplaceable role of the teacher in AI-augmented educational environments.

Pedro et al. (2019) add important contextual nuance to the global AIED narrative by situating AI integration within the Sustainable Development Goals framework and emphasising the particular risks and opportunities that AI presents for educational systems in the Global South. They identify the risk of "AI colonialism", the uncritical

importation of AI tools and educational assumptions developed in high-income country contexts into the diverse educational realities of the developing world, as a significant concern that demands context-sensitive, locally grounded responses. For Nigeria, this caution is directly applicable: AI integration must be guided by Nigerian educational priorities, cultural contexts, and equity imperatives, not merely by the technological capabilities and commercial interests of global AI developers.

The Human-AI Hybrid Classroom: Concept and Characteristics

The human-AI hybrid classroom is a learning environment in which human teachers and AI systems operate as genuinely complementary partners, each contributing capabilities that the other lacks, and each compensating for the other's limitations, in pursuit of enhanced, more equitable, and more personalised learning outcomes. The concept represents a significant departure from both the "AI as teacher replacement" narrative that has dominated popular discourse and the uncritical "AI as mere tool" framing that has sometimes characterised institutional responses to educational technology. The hybrid model is premised on a more sophisticated understanding of complementarity: the computational power, speed, individualisation capacity, data-processing capability, and pattern-recognition sophistication of AI systems on one hand, and the contextual judgment, emotional attunement, ethical reasoning, relational depth, cultural sensitivity, and wisdom of experienced human teachers on the other (Luckin et al., 2016; Holmes et al., 2019).

Timms (2016) introduces the concept of educational "cobots", collaborative AI systems specifically designed to work alongside human educators rather than replace them, as a productive framework for understanding AI's role in hybrid classrooms. The cobot model does not supplant human pedagogical judgment; rather, it handles data-intensive, repetitive, or personalisation-intensive tasks that would overwhelm human capacity at scale, while freeing human teachers to engage more deeply in the distinctly human dimensions of their professional role: inspiring curiosity, building trusting relationships, cultivating character, adjudicating complex ethical situations, and modelling the habits of mind that constitute genuine intellectual development. Baker (2016) made a similar case when he argued that tutoring systems need not be highly intelligent in themselves, since their real value lies in giving teachers clear information on which human judgment can act, a view that places the intelligence of the hybrid classroom in the partnership rather than in the machine alone.

The human-AI hybrid classroom is characterised by several defining features that have direct implications for teacher

preparation. First, it is deeply adaptive: AI systems track individual learner progress through continuous formative assessment, adjusting content difficulty, pacing, and pedagogical approach in response to each learner's demonstrated knowledge, skill level, and learning trajectory. Second, it is data-rich in ways that expand teacher perception: human teachers receive analytics dashboards aggregating information about learner engagement, performance patterns, time-on-task, conceptual difficulties, and emotional states, information that would be impossible to generate manually at the individual level and that enables evidence-informed instructional decisions of a quality and granularity previously unavailable. Third, it is explicitly relational at the human level: recognising that AI systems cannot replicate the emotional, motivational, and sociocultural dimensions of the teacher-learner relationship, the hybrid model deliberately reserves these domains for human teacher engagement, repositioning the teacher as the primary architect of educational relationships even as AI handles logistical and informational functions. Sam-Kalagbor (2026a) found that learning styles, peer relationships and time management were all positively related to students' educational development in higher institutions in Rivers State, which suggests that the personal learning patterns that AI systems track are the very factors that shape how far learners grow, and that teachers must know how to read and act on them.

Fourth and crucially for teacher preparation is that human-AI hybrid classroom is ethically supervised: human teachers retain ultimate responsibility for the ethical governance of AI deployment within their learning communities. This includes evaluating AI outputs critically rather than accepting them uncritically, monitoring AI systems for evidence of bias, anachronism, or cultural inappropriateness, protecting student data from misuse, making values-informed judgments about which AI applications serve their learners' educational interests, and maintaining clear accountability for learning outcomes that no algorithm can assume. Pedró et al. (2019) emphasise that the success of the human-AI hybrid classroom is contingent not primarily on the sophistication of the AI deployed but on the quality of teacher preparation. Teachers who lack conceptual understanding of AI's principles, who have not developed critical AI literacy, or who approach AI with either uncritical enthusiasm or reflexive resistance are poorly positioned to navigate the hybrid classroom effectively, a finding that places teacher education squarely at the centre of any credible AI integration agenda. This position agreed with Taylor et al. (2025), who assessed the awareness and adoption of artificial intelligence tools among adult educators in Rivers State-owned universities and treated awareness and adoption as separate matters,

showing that knowing about the tools did not by itself lead to their use in daily professional work.

Teacher Education in Nigeria: Current State and Challenges

Nigeria's teacher education system occupies a critical position in the nation's educational architecture, producing annually the teachers upon whom the quality of primary, secondary, and tertiary education across a nation of over 200 million people substantially depends. The National Policy on Education (FRN, 2013) articulates a comprehensive regulatory framework for teacher preparation, establishing the Nigerian Certificate in Education (NCE) as the minimum qualification for entry into primary and junior secondary school teaching, and the bachelor's degree in education as the foundation for higher-level professional engagement. The NUC (2019) Benchmark Minimum Academic Standards provide curriculum frameworks for education degree programmes across Nigerian universities, while the National Commission for Colleges of Education (NCCE) exercises corresponding oversight of NCE programmes.

Despite this regulatory architecture, Nigerian teacher education faces persistent and extensively documented challenges that significantly compromise its capacity to produce teachers adequate to contemporary educational demands. The curriculum challenge is perhaps the most fundamental: teacher education curricula across Nigerian institutions have struggled to keep pace with the accelerating transformation of educational knowledge, practice, and context. The integration of contemporary competency areas, including educational technology, inclusive education, and now artificial intelligence literacy, into mainstream teacher preparation programmes has proceeded slowly and unevenly, often dependent on the individual initiative of forward-looking lecturers rather than systematic institutional or regulatory reform. The result is teacher graduates whose professional preparation is substantially oriented to a past educational reality rather than the present and future contexts in which they will work.

The pedagogical culture of Nigerian teacher education institutions poses a related challenge. Research consistently documents the dominance of transmission-oriented, lecture-based instructional approaches in Nigerian Colleges of Education and Education faculties, approaches that model precisely the pedagogical practices that teacher education must transcend if it is to prepare graduates capable of facilitating learner-centred, inquiry-driven, and technology-mediated instruction (Ertmer & Ottenbreit-Leftwich, 2010). The challenge of teacher technology change is not purely technical; Ertmer and Ottenbreit-Leftwich (2010) identify what they term "second-order

barriers", deeply held beliefs about the nature of teaching, learning, and the teacher's role, as more resistant to change than the first-order barriers of access and time. These belief barriers are particularly salient in institutional cultures where transmission pedagogy is deeply normalised. Ekrika and Alikor (2024) examined the extent to which teachers in Rivers State applied the ASSURE model in lesson development, a model that makes the planned selection and use of media and technology part of every lesson, and such planning habits are exactly what transmission-oriented preparation fails to build in student teachers.

Resource deficiencies compound these structural challenges. Many Nigerian teacher education institutions lack adequate digital infrastructure, reliable internet connectivity, sufficient computing devices, functional digital laboratories, and access to contemporary educational software platforms that would enable student teachers to develop technological competencies through authentic practice. The shortage of doctorally qualified academic staff in many Education faculties limits research engagement, curriculum innovation, and the quality of academic supervision available to student teachers. Practicum experiences — the structured school-based components of teacher preparation that international research consistently identifies as among the most powerful determinants of teacher competence and professional identity — are frequently compressed, inadequately supervised, and disconnected from the conceptual learning occurring in university-based coursework.

The governance architecture of Nigerian teacher education adds further complexity. Teacher preparation is distributed across multiple institutional types — Universities of Education, Conventional Universities, Colleges of Education, and in some states Polytechnics — supervised by different regulatory bodies with varying standards and quality assurance capacities. The Teachers Registration Council of Nigeria (TRCN), while providing an important professional registration function, has faced resource and capacity constraints that limit its effectiveness in maintaining professional standards responsive to emerging challenges. Against this backdrop, the emergence of human-AI hybrid classrooms as an educational reality constitutes a compound challenge: Nigerian teacher education is being asked to equip graduates for an AI-integrated educational future while grappling with unresolved legacy challenges in curriculum, pedagogy, resourcing, and governance. Oteyi and Dede (2025) described this kind of gap as a digital disconnect, in which official statements about AI-powered and other digital tools run ahead of what administrators are able to put in place, and they argued that closing it calls for deliberate

investment in the digital leadership of those who manage educational institutions.

Transformative Teacher Education for the AI Era

Addressing the demands of the human-AI hybrid classroom requires a fundamentally different orientation to teacher preparation, one characterised by what Darling-Hammond (2006) describes as "power": coherent, practice-based, intellectually rigorous preparation that connects theoretical understanding to authentic teaching challenges, and that treats student teachers as developing professionals with agency rather than passive recipients of transmitted knowledge. The transformation required is not cosmetic, not the addition of an elective ICT module to an otherwise unchanged curriculum, or the purchase of laboratory computers for a College of Education without corresponding faculty development and curriculum redesign. The transformation required is structural, philosophical, and cultural: a reconceptualisation of what teacher education is for, who it serves, and how it should be organised in an AI-augmented educational world.

AI Literacy as a Core Teacher Competency

The most foundational requirement for teacher preparation in the AI era is the systematic development of robust AI literacy, a competency domain that UNESCO (2021) defines across four dimensions: understanding AI (conceptual knowledge of AI principles, mechanisms, and limitations), using AI tools (practical capability to deploy AI applications purposefully in teaching and learning contexts), designing with AI (the capacity to create and adapt AI-enhanced learning experiences aligned to specific learning objectives and learner needs), and governing AI (the capacity to evaluate AI systems critically and exercise ethical oversight of their deployment). UNESCO (2021) further emphasises that AI competency for educators is not a narrow technical skill set but a broad professional capacity that intersects with subject knowledge, pedagogical expertise, ethical judgment, and cultural awareness, a conceptualisation fully consistent with the TPACK framework's emphasis on integrated, contextualised teacher knowledge.

For Nigerian teacher education, embedding AI literacy as a core competency requires both dedicated coursework, providing the conceptual foundations of AI, its educational applications, and its ethical implications, and systematic embedding across subject-specific method courses, ensuring that student teachers encounter AI literacy not as an isolated module in an unfamiliar technical domain but as a dimension of their developing subject-specific pedagogical identity. A student teacher preparing to teach secondary school mathematics, for example, must not only understand adaptive learning platforms in the abstract but

must develop the TPACK to deploy them specifically in the context of Nigerian secondary mathematics, with awareness of the curriculum expectations, learner misconceptions, and resource contexts that characterise that specific teaching environment. Ikechukwu et al. (2026) examined teachers' digital competence in relation to effective classroom instructional delivery in senior secondary schools in Port Harcourt Metropolis, and their work adds local weight to the argument that the technological side of teacher knowledge cannot be left to chance or to the personal effort of individual teachers.

Reimagining the Practicum Experience

Initial teacher education programmes must urgently redesign practicum and teaching practice experiences to incorporate human-AI hybrid classroom realities. The current structure of practicum in many Nigerian institutions, characterised by placements in schools where technology integration is minimal, supervision focused on classroom management and content delivery rather than technology-mediated pedagogy, and limited connection between school-based experience and university-based conceptual learning, is inadequate preparation for AI-integrated teaching contexts. Selwyn (2019) observes that dominant narratives about AI in education are produced primarily by researchers, policymakers, and technology developers who are largely remote from the daily realities of classroom practice, a disconnect that teacher education is uniquely positioned to bridge, if practicum is designed to ground technology encounters in authentic, supervised teaching practice.

Practicum redesign for the AI era should incorporate: structured observation of and participation in classrooms where AI tools are purposefully deployed; collaborative lesson planning with mentor teachers that specifically addresses how AI-generated data should inform instructional decisions; critical reflection exercises examining the pedagogical implications and ethical dimensions of specific AI-generated learner assessments; and guided ethical deliberation about AI deployment decisions in the context of specific learner communities. Pane et al. (2017) document that personalised, practice-based learning approaches- those that situate skill development in authentic, reflective professional contexts produce the most robust and transferable competencies. The principle applies directly to teacher preparation: AI competency is best developed not through decontextualised technical training but through supervised, critically reflective engagement with AI tools in the context of genuine teaching responsibilities. Nwuke and Yellowe (2025) reported that artificial intelligence could raise the efficiency and effectiveness of school supervision in public secondary schools in Rivers State, which suggests that the

supervision of student teachers during practicum can itself be strengthened by the same tools they are being prepared to use.

Critical and Ethical Dimensions of AI Pedagogy

The most distinctive and non-negotiable element of transformative teacher education for the AI era is the cultivation of critical, ethically grounded engagement with AI, what UNESCO (2021) terms the "governing AI" dimension of teacher AI competency. The documented risks of uncritical AI adoption in education are significant: algorithmic bias that reflects and amplifies existing social inequalities; data privacy violations affecting vulnerable learner populations; the erosion of teacher professional judgment and agency through over-reliance on automated recommendations; and the reduction of complex human learning to the measurable outputs that AI systems can process, at the expense of the dimensions of education that are most difficult to quantify but most important to human development. Sam-Kalagbor (2026b) found that principals and vice-principals in public senior secondary schools in Port Harcourt Metropolis rated the role of artificial intelligence high in school record management but low in administrative decision-making and instructional supervision, which shows that AI is entering schools faster in routine tasks than in the areas where professional judgment matters most.

Voogt and Roblin (2012), in their comparative analysis of 21st-century competence frameworks across major international organisations, identify critical thinking, ethical reasoning, and responsible citizenship as among the most consistently valued and educationally irreplaceable competencies across diverse cultural and national contexts. These competencies are especially vital in relation to AI, given the speed at which AI capabilities are developing, the opacity of many AI decision-making processes, and the substantial power asymmetries between AI developers, institutional adopters, and the learners whose educational experiences are shaped by AI deployment decisions. Teacher education programmes must therefore cultivate in student teachers the philosophical grounding, technical understanding, and professional confidence to resist the reduction of teaching to a techno-managerial activity, and to insist, consistently, articulately, and with institutional support, on the primacy of human values in AI-mediated educational environments.

The REACH Framework: Reimagining Teacher Education in Nigeria

Based on the theoretical analysis, global evidence, and Nigerian contextual considerations presented in this paper, the author proposes the REACH Framework for Reimagining Teacher Education for Human-AI Hybrid

Classrooms in Nigeria. The acronym REACH captures five mutually reinforcing dimensions of the transformation required dimensions that are simultaneously conceptual, structural, institutional, and political in their implications.

The REACH Framework

R — Reconceptualisation of Teacher Role: Teacher education programmes must be redesigned around a reconceptualised understanding of the teacher's professional identity and function in AI-augmented environments. Rather than positioning teachers primarily as content deliverers or classroom managers, programmes must prepare teachers as learning architects, human relationship specialists, critical AI supervisors, ethical agents, and cultural mediators of AI tools in learner-specific contexts. This reconceptualisation must permeate the philosophy, content, pedagogy, and assessment of teacher preparation across all stages and subject specialisations.

E — Embedding AI Literacy Across the Curriculum: AI literacy must be embedded systematically throughout teacher education curricula — not confined to a standalone ICT or educational technology module but woven through subject-specific method courses, educational psychology, curriculum theory, assessment studies, and educational leadership. This requires curriculum review at the institutional level, substantive faculty development to build AI literacy among teacher educators themselves, and active partnership with technology developers and AI-deploying schools to ensure currency and relevance.

A — Authentic Learning Experiences: Teacher preparation for human-AI hybrid classrooms must be grounded in authentic, supervised engagement with real hybrid teaching contexts. This demands redesigned practicum experiences that place student teachers in AI-integrated schools, collaborative mentor-student lesson planning that specifically incorporates AI tools and analytics, design challenges requiring student teachers to develop AI-enhanced learning resources, and structured reflection on the pedagogical and ethical dimensions of specific AI deployment decisions encountered in practice.

C — Critical and Ethical Formation: Critical and ethical formation must be treated as a core — not peripheral, component of teacher preparation for the AI era. This includes structured AI ethics courses, case-based ethical reasoning exercises drawing on real educational AI dilemmas, engagement with the relevant provisions of Nigerian data protection law and international AI governance frameworks, and the sustained cultivation of a professional disposition that treats AI with informed, evidence-based scepticism and insists unfailingly on the primacy of learner welfare.

H — Holistic Policy and Institutional Support: Individual teacher preparation reform is insufficient without the institutional and policy infrastructure to support its implementation and sustain its effects over time. The NUC must revise Benchmark Minimum Academic Standards to explicitly require AI literacy competencies in education degree programmes. The Federal Ministry of Education must develop a National AI in Education Strategy. Colleges of Education and university education faculties must invest in faculty development, AI-enabled laboratory infrastructure, and industry-academic partnerships that connect teacher preparation to real-world AI deployment contexts and expertise.

The REACH Framework is distinguished from existing technology integration frameworks by its explicit commitment to transformation, not merely the addition of new tools to existing practice, but the reconstitution of teacher professional identity, institutional culture, and policy architecture in response to a genuinely new educational reality. It draws on the transformative learning tradition (Mezirow, 1991, 2000) in its insistence that the critical challenge is not technical upskilling but perspective transformation; on TPACK (Mishra & Koehler, 2006; Koehler & Mishra, 2009) in its commitment to integrated, contextualised knowledge development; and on Vygotskian sociocultural theory (Vygotsky, 1978) in its framing of AI as a cultural mediating tool whose educational value is determined by the quality of human pedagogical intelligence brought to its deployment.

Implications for Policy and Practice

The analysis and framework presented in this paper carry several significant and specific implications for educational policy and institutional practice in Nigeria, distributed across the multiple stakeholder levels that together shape the quality and direction of teacher education.

For teacher education institutions, Colleges of Education and university education faculties, the imperative is comprehensive curriculum transformation: a systematic, evidence-based review and redesign of teacher preparation programmes to embed AI literacy competencies, reimagine practicum and field experience structures, cultivate critical and ethical AI engagement, and reconceptualise the teacher professional identity being developed. This transformation cannot be sustained by individual enthusiasts within isolated departments; it requires institutional leadership commitment, dedicated resourcing, cross-departmental collaboration, and faculty-wide professional development designed to build AI competence among teacher educators before, or at minimum alongside, its integration into student teacher preparation.

For the National Universities Commission and the National Commission for Colleges of Education, the imperative is regulatory: the existing Benchmark Minimum Academic Standards for education degree programmes and the NCE Minimum Standards documents must be comprehensively reviewed and updated to include explicit, assessable competency requirements for human-AI hybrid classroom readiness. Without regulatory reinforcement, curriculum innovation in individual institutions will remain patchy, unsustained by quality assurance mechanisms, and vulnerable to leadership change. The NUC's capacity to drive curriculum reform through its accreditation processes should be directed explicitly toward AI integration as a quality indicator in education programme review.

For the Teachers Registration Council of Nigeria, the implication concerns continuing professional development on a national scale. The majority of practising Nigerian teachers received their initial preparation before AI was a practical educational reality; they require structured, sustained professional development to develop the competencies, AI literacy, critical evaluation of AI tools, human-AI collaborative lesson design, ethical AI governance that the human-AI hybrid classroom demands. The TRCN's mandatory professional development framework should identify AI literacy and hybrid pedagogy as priority competency areas, and the Council should work with teacher education institutions, technology partners, and international organisations to develop quality-assured professional development programmes accessible to teachers across Nigeria's diverse geographic and infrastructural contexts. Nwuke and Nwanguma (2024) found capacity building to be a tool for improving staff job performance in public universities in Rivers State, and the same reasoning applies to practising teachers, whose readiness for the hybrid classroom will depend on sustained and well-planned training rather than one-off workshops. Darling-Hammond et al. (2017) showed that professional development works best when it is focused on content, involves active learning, supports collaboration, offers coaching and expert support, and is sustained over time, and these are the qualities that a national programme for AI readiness should be built around.

For the Federal Ministry of Education and the Office of the Senior Special Adviser to the President on Education, the priority is a coherent National AI in Education Policy, a policy document that coordinates the multiple dimensions of Nigeria's AI education challenge in a unified strategic framework addressing infrastructure development, teacher preparation reform, curriculum and assessment adaptation, data governance and student privacy protection, equity provisions ensuring that AI does not deepen existing educational inequalities, and monitoring and evaluation

mechanisms to assess impact over time. UNESCO (2021) and the OECD (2019) have produced policy guidance frameworks that the Nigerian government can adapt and contextualise; the Beijing Consensus (UNESCO, 2019) provides normative international guidance.

Conclusion

The human-AI hybrid classroom is not a distant prospect reserved for technologically advanced educational systems in high-income countries. It is an emerging and accelerating reality that is reshaping the conditions of teaching and learning across the world, including in Nigeria, and that poses challenges and opportunities for which Nigerian teacher education is currently inadequately prepared. The question before Nigeria's educational policymakers, teacher educators, and professional bodies is not whether AI will enter Nigerian classrooms; the technological and economic pressures driving that integration are already operative and intensifying, but whether Nigerian teachers will be prepared to meet AI with the conceptual understanding, critical literacy, pedagogical creativity, and ethical grounding that effective human-AI educational partnership requires.

This paper has argued, through theoretical analysis and review of global and Nigerian evidence, that meeting this challenge requires transformative, not incremental, reform of teacher education in Nigeria. Drawing on Mezirow's transformative learning theory, the TPACK framework, and Vygotsky's sociocultural theory, and proposing the REACH Framework as a contextually grounded instrument for that transformation, the paper has advanced a comprehensive account of what reimagining teacher education for the human-AI hybrid classroom requires: a reconceptualisation of teacher professional identity; the systematic embedding of AI literacy across teacher preparation curricula; the redesign of practicum experiences to ground technology competency in authentic pedagogical practice; the cultivation of critical and ethical dispositions toward AI as a non-negotiable dimension of professional preparation; and the development of policy and institutional infrastructure sufficient to sustain reform at scale and over time.

The stakes of this transformation, for Nigerian education, are very high. A teaching force inadequately prepared for the human-AI hybrid classroom risks being progressively marginalised by AI tools it cannot critically engage, reduced to monitoring algorithmic outputs it cannot professionally evaluate, and producing graduates who lack the creative, critical, and adaptively intelligent human capabilities that a digital economy demands and that no AI can supply. A teaching force that is critically, ethically, and pedagogically prepared for human-AI collaboration can, by contrast, harness the extraordinary potential of AI to

personalise learning at scale, extend the reach of quality education to underserved communities, free teacher time for the relational and inspirational dimensions of teaching, and generate the evidence-based insights needed to continuously improve learning outcomes across an educational system of Nigeria's complexity and scale.

References

1. Baker, R. S. (2016). Stupid tutoring systems, intelligent humans. *International Journal of Artificial Intelligence in Education*, 26(2), 600–614. <https://doi.org/10.1007/s40593-016-0105-0>
2. Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access*, 8, 75264–75278. <https://doi.org/10.1109/ACCESS.2020.2988510>
3. Darling-Hammond, L. (2006). *Powerful teacher education: Lessons from exemplary programs*. Jossey-Bass.
4. Darling-Hammond, L., Hylar, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute. <https://doi.org/10.54300/122.311>
5. Ekrika, A., & Alikor, O. (2024). Assessment of the extent of application of ASSURE model in lesson development among teachers in Rivers State, Nigeria. *East African Scholars Journal of Education, Humanities and Literature*, 7(7), 217–223.
6. Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, 42(3), 255–284. <https://doi.org/10.1080/15391523.2010.10782551>
7. Federal Republic of Nigeria. (2013). *National policy on education* (6th ed.). NERDC Press.
8. Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.
9. Ikechukwu, B. P., Wordu, H., & Mbaba, A. E. (2026). Teachers' digital competence and effective classroom instructional delivery in senior secondary schools in Port Harcourt Metropolis, Rivers State. *UKR Journal of Arts, Humanities and Social Sciences*, 2(8), 6–18. <https://doi.org/10.5281/zenodo.21771624>
10. Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge (TPACK)? *Contemporary Issues in Technology and Teacher Education*, 9(1), 60–70.
11. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson.
12. Mezirow, J. (1991). *Transformative dimensions of adult learning*. Jossey-Bass.
13. Mezirow, J. (Ed.). (2000). *Learning as transformation: Critical perspectives on a theory in progress*. Jossey-Bass.
14. Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–1054. <https://doi.org/10.1111/j.1467-9620.2006.00684.x>
15. National Universities Commission. (2019). *Benchmark minimum academic standards for undergraduate programmes in Nigerian universities: Education*. NUC.
16. Nwafor, N. H. A., & Alikor, O. (2026). “No Child Left Behind”: Implementation challenges of related educational policies in Nigeria. *UKR Journal of Arts, Humanities and Social Sciences*, 2(6), 229–236. <https://doi.org/10.5281/zenodo.20923289>
17. Nwuke, T. J., & Nwanguma, T. K. (2024). Capacity building as a tool for administrative staff improved job performance in public universities in Rivers State. *Journal of Social and Management Sciences*, 3(2), 211–225.
18. Nwuke, T. J., & Yellowe, A. N. (2025). Utilization of artificial intelligence in school supervision for effective administration in public secondary schools in Rivers State, Nigeria. *International Journal of Educational Management, Rivers State University*, 1(1), 318–334.
19. Organisation for Economic Co-operation and Development. (2019). *Artificial intelligence in society*. OECD Publishing. <https://doi.org/10.1787/eedfee77-en>
20. Oteyi, J. V., & Dede, D. (2025). Digital disconnect in education: The administrative challenge of aligning rhetoric and reality in the implementation of AI-powered and non-AI digital tools. *International Journal of Educational Management, Rivers State University*, 1(1), 196–208.
21. Pane, J. F., Steiner, E. D., Baird, M. D., Hamilton, L. S., & Pane, J. D. (2017). *Informing progress:*

Insights on personalized learning implementation and effects. RAND Corporation.
<https://doi.org/10.7249/RR2042>

22. Pedró, F., Subosa, M., Rivas, A., & Valverde, P. (2019). *Artificial intelligence in education: Challenges and opportunities for sustainable development.* UNESCO.
<https://unesdoc.unesco.org/ark:/48223/pf0000366994>
23. Popenici, S. A. D., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. *Research and Practice in Technology Enhanced Learning*, 12(1), 22. <https://doi.org/10.1186/s41039-017-0062-8>
24. Roll, I., & Wylie, R. (2016). Evolution and revolution in artificial intelligence in education. *International Journal of Artificial Intelligence in Education*, 26(2), 582–599. <https://doi.org/10.1007/s40593-016-0110-3>
25. Sam-Kalagbor, V. O. (2026a). Academic resilience and education development in higher education institutions. *IKR Journal of Education and Literature*, 2(5), 1–9. <https://doi.org/10.5281/zenodo.22734222>
26. Sam-Kalagbor, V. O. (2026b). Roles of artificial intelligence on educational management for sustainable development in public senior secondary schools in Port Harcourt Metropolis. *UKR Journal of Education and Literature*, 2(5), 27–37. <https://doi.org/10.5281/zenodo.22671436>
27. Selwyn, N. (2019). *Should robots replace teachers? AI and the future of education.* Polity Press.
28. Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, 57(1), 1–22. <https://doi.org/10.17763/haer.57.1.j463w79r56455411>
29. Taylor, D. I., Jack, B. D., & Wami, K. C. (2025). Assessment of awareness and adoption of artificial intelligence tools for enhanced job performance of adult educators in Rivers State-owned universities. *International Journal of Educational Management, Rivers State University*, 1(1), 113–127.
30. Timms, M. J. (2016). Letting artificial intelligence in education out of the box: Educational cobots and smart classrooms. *International Journal of Artificial Intelligence in Education*, 26(2), 701–712. <https://doi.org/10.1007/s40593-016-0095-y>
31. UNESCO. (2019). *Beijing consensus on artificial intelligence and education.* UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000368303>
32. UNESCO. (2021). *Artificial intelligence and education: Guidance for policy-makers.* UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000376709>
33. Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks for 21st century competences: Implications for national curriculum policies. *Journal of Curriculum Studies*, 44(3), 299–321. <https://doi.org/10.1080/00220272.2012.668938>
34. Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes* (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds.). Harvard University Press.
35. World Economic Forum. (2020). *The future of jobs report 2020.* WEF. <https://www.weforum.org/reports/the-future-of-jobs-report-2020>
36. Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education — where are the educators? *International Journal of Educational Technology in Higher Education*, 16(1), 39. <https://doi.org/10.1186/s41239-019-0171-0>