

ARTIFICIAL INTELLIGENCE IN EDUCATION IN PAKISTAN: OPPORTUNITIES, CONSTRAINTS, AND A POLICY-TO-PRACTICE PATHWAY

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Abstract

Artificial intelligence is rapidly reshaping education through adaptive learning, generative tutoring, automated feedback, learning analytics, accessibility tools, institutional planning, and teacher-support systems. For Pakistan, AI in education is not only a technological issue but also a governance, equity, pedagogy, language, infrastructure, and capacity-building challenge. This paper examines the role of artificial intelligence in Pakistan's education sector by analyzing its opportunities, constraints, and practical policy pathway. The study uses qualitative document analysis and thematic review of recent scholarly literature, international reports, and Pakistani policy documents, including UNESCO guidance on generative AI, UNESCO's AI competency framework for teachers, the World Bank's AI-in-education work, Pakistan Education Statistics 2023–24, UNICEF Pakistan education data, Pakistan's National Artificial Intelligence Policy 2025, the Digital Pakistan Policy, the Digital Nation Pakistan Act 2025, and the Higher Education Commission's draft framework on ethical generative AI use in higher education. The findings show that AI can support Pakistan in five major areas: personalized learning, teacher workload reduction, assessment reform, inclusion for marginalized learners, and evidence-based governance. However, the same technologies may deepen inequalities where internet access, electricity, devices, teacher training, data protection, local-language content, and institutional accountability remain weak. The paper proposes a new Pakistan AI Education Translation Framework, built around six stages: access, safety, teacher readiness, curriculum redesign, assessment integrity, and evidence-based scaling. The central argument is that Pakistan should not adopt AI as a shortcut solution to structural educational problems; rather, AI should be embedded in a human-centred, equity-first, teacher-supported, locally contextualized, and legally accountable education reform pathway. The paper concludes that AI can strengthen education in Pakistan only when policy ambition is converted into classroom-level capacity, provincial implementation, and measurable learning improvement.

Keywords: *Artificial intelligence in education, Pakistan, generative AI, education policy, teacher readiness, digital divide, AI ethics, learning analytics, policy-to-practice pathway.*

1. Introduction

Artificial intelligence has become one of the most important forces shaping contemporary education. AI systems can generate text, explain concepts, translate content, recommend learning paths, assess student responses, analyse institutional data, support students with disabilities, and assist teachers in lesson planning and feedback. Since the public release of generative AI tools such as ChatGPT, the educational debate has shifted from whether AI should enter classrooms to how it should be governed, taught, used, limited, and evaluated. UNESCO's 2023 guidance on generative AI in education argues that countries need immediate safeguards, long-term regulation, and human-centred capacity building so that generative AI supports rather than weakens education.

For Pakistan, the question is urgent. Pakistan faces long-standing educational challenges: out-of-school children, uneven learning outcomes, weak teacher support, rural-urban inequality, gender gaps, low digital access in many households, fragmented governance, and limited assessment reform. UNICEF states that Pakistan has an estimated 25.1 million out-of-school children aged 5–16, making it one of the countries with the largest out-of-school populations in the world. Pakistan Education Statistics 2023–24, published by the Pakistan Institute of Education in 2025, is now one of the most recent official statistical sources for national education planning. Foundational learning data from ASER Pakistan also show that Pakistan’s learning crisis is not only about school access but also about literacy, numeracy and basic competency gaps among enrolled children (ASER Pakistan, 2024).

AI therefore enters Pakistan’s education system at a time when the country needs both access expansion and learning-quality reform. The role of AI in Pakistan’s education sector should be understood through a balanced lens. On the opportunity side, AI can support low-cost tutoring, teacher professional development, Urdu and regional-language learning materials, early-warning systems for dropout, inclusive education for children with disabilities, and better use of education-management data. The World Bank’s 2024 work on AI in education highlights personalised tutoring, teacher support, and data-informed management as major areas where AI can improve education if institutions invest in infrastructure, professional development, and guardrails.

On the constraint side, AI can also widen inequality if it benefits only elite schools, English-medium institutions, urban universities, and students with private internet access. UNICEF’s work on digital transformation in public education in Pakistan notes that only about 33 percent of households have internet access, which directly affects students’ ability to use digital learning solutions, especially girls.

Pakistan has recently moved toward national AI policy planning. The National Artificial Intelligence Policy 2025 proposes awareness, readiness, training, scholarships, AI research, public-sector upskilling, and responsible use as major policy directions. The policy specifically calls for AI-focused programs in schools, colleges, and universities, expansion of DigiSkills.pk, AI courses for marginalized communities, annual training of 200,000 individuals, 10,000 trainers by 2027, and 3,000 annual postgraduate and doctoral scholarships in AI and allied technologies.

This shows that Pakistan’s AI agenda is no longer purely theoretical. However, the major challenge is translating national ambition into provincial education systems, teacher education institutions, classrooms, assessment boards, universities, and school leadership structures.

Pakistan’s AI-in-education debate must also be located within wider national digital transformation efforts. The Digital Pakistan Policy placed education among the key sectors for digital development and innovation (Government of Pakistan, Ministry of Information Technology and Telecommunication [MoITT], 2018). More recently, the Digital Nation Pakistan Act 2025 strengthened the legal and institutional basis for digital governance and public-sector transformation (Digital Nation Pakistan Act, 2025). These developments show that AI in education is not an isolated reform but part of Pakistan’s broader digital-state agenda.

This paper have three research questions. First, what opportunities does AI create for improving education in Pakistan? Second, what constraints may prevent equitable and ethical AI adoption? Third, what policy-to-practice pathway can help Pakistan move from AI policy documents to classroom-level educational improvement? The paper argues that AI should not be used as a

technological substitute for teachers, schools, curriculum reform, or public investment. Rather, AI should be used as a carefully governed educational support system that strengthens human teaching, improves learning equity, and creates evidence-based decision-making.

The central contribution of this paper is the Pakistan AI Education Translation Framework. This framework is a new policy-to-practice model designed for Pakistan's conditions. It proposes that AI adoption should move through six connected stages: access readiness, safety and governance, teacher readiness, curriculum and language localisation, assessment redesign, and evidence-based scaling. The framework is grounded in international AI-education principles but adapted to Pakistan's realities of provincial governance, uneven infrastructure, language diversity, public-private gaps, and weak implementation capacity.

2. Review of Literature

2.1 Artificial intelligence in education: concept and scope

Artificial intelligence in education refers to the use of machine-based systems that perform tasks associated with human intelligence, such as prediction, classification, natural-language processing, feedback generation, pattern recognition, and decision support. In education, AI appears in intelligent tutoring systems, adaptive learning platforms, automated writing support, chatbots, assessment tools, plagiarism detection, learning analytics dashboards, assistive technologies, and administrative decision systems. Recent systematic literature reviews show that AI in education is increasingly used to personalise learning, improve feedback, support teaching design, and strengthen educational data analysis.

Generative AI has expanded the debate because it can produce essays, lesson plans, explanations, summaries, code, quizzes, rubrics, translations, and research drafts. Giannakos and colleagues argue that generative AI can support learning design, self-regulated learning, feedback, automated content generation, and teaching efficiency, but it also creates risks of overdependence, misinformation, academic dishonesty, and reduced human interaction.

Therefore, AI in education must be treated as a socio-technical reform rather than a neutral digital tool.

A key point in the literature is that AI should strengthen, not replace, teachers. UNESCO's AI competency framework for teachers identifies five competency dimensions: human-centred mindset, ethics of AI, AI foundations and applications, AI pedagogy, and AI for professional learning. AI in education is increasingly understood as a broad field that includes intelligent tutoring systems, automated feedback, learning analytics, adaptive assessment, generative tools and decision-support systems (Holmes, Bialik, & Fadel, 2019; Crompton & Burke, 2023). Recent reviews show that AI applications in education can support personalised learning, learner engagement and institutional decision-making, but they also raise concerns about ethics, equity, transparency and overreliance on automated systems (Ali, Murray, Momin, Dwivedi, & Malik, 2024; Wang et al., 2024).

This is highly relevant for Pakistan because teacher readiness is often the missing bridge between technology policy and classroom practice. Without teacher capacity, AI tools may become either unused, misused, or restricted to superficial content generation.

2.2 Opportunities of AI in education

The first major opportunity is personalized learning. AI systems can adapt content to students' performance, pace, learning gaps, and preferred modes of explanation. Adaptive learning can be useful in Pakistan where classrooms are often large and multi-level, particularly in public schools

and low-fee private schools. AI tutors can provide practice in mathematics, science, English, Urdu, and regional languages; they can also give immediate feedback that teachers may not have time to provide individually. Systematic reviews of adaptive AI learning systems show potential for real-time personalization through supervised learning, unsupervised learning, reinforcement learning, and multimodal analytics.

The second opportunity is teacher support. AI can help teachers prepare lesson plans, design formative assessments, generate differentiated worksheets, create examples for mixed-ability classrooms, translate content, and identify common student errors. A 2025 systematic review on AI in teaching and teacher professional development found that research increasingly recognises teacher demand for AI integration but also identifies a gap between available professional development and actual classroom needs. Generative AI has created new possibilities for lesson planning, student feedback, content generation and academic support, but these opportunities require careful pedagogical design rather than uncritical adoption (Giannakos et al., 2025). Garzón's systematic review similarly shows that AI tools can improve educational interaction and learner support when they are aligned with sound instructional design and teacher guidance (Garzón, 2025). Teacher professional development is one of the most important conditions for meaningful AI adoption. Tan et al. (2025) found that AI-related teacher training is expanding, but many teachers still lack practical preparation for classroom integration, ethical use and assessment redesign. This finding is important for Pakistan because technology reforms often fail when teachers are treated as passive users rather than professional decision-makers.

In Pakistan, where many teachers receive limited continuous professional development, AI-supported coaching could become useful if integrated into provincial teacher-training institutions and local-language platforms.

The third opportunity is assessment reform. Traditional examination systems in Pakistan often encourage memorisation, short-term preparation, and coaching-centre dependency. AI can support formative assessment, item generation, rubric-based feedback, diagnostic testing, and early detection of learning gaps. However, generative AI also challenges conventional assignments because students can produce polished text without demonstrating genuine understanding. International higher-education research shows that universities are revising assessments by requiring AI disclosure, oral defence, process-based evaluation, in-class writing, authentic tasks, and assessment designs that test reasoning rather than only final answers. This is directly relevant to Pakistan's boards, universities, and teacher-education programs.

The fourth opportunity is inclusion. AI tools can support learners with disabilities through speech-to-text, text-to-speech, captioning, visual recognition, simplified explanations, and personalized practice. They can also help girls, rural learners, working students, and out-of-school adolescents through flexible learning pathways. Pakistan's National AI Policy 2025 includes references to marginalized communities, women, persons with disabilities, DigiSkills expansion, and gender participation in AI research and digital companies. This creates an opening for inclusive AI in education, but only if public policy deliberately prioritises underserved groups. Universities across the world are revising academic policies because generative AI challenges conventional assignments, take-home essays and written assessment practices (Beale, 2025).

The fifth opportunity is education governance. AI can help ministries and departments analyse enrolment, dropout risk, teacher deployment, school infrastructure, attendance, examination

patterns, and resource allocation. Pakistan already has education-management information systems, but AI could make data more actionable through dashboards, predictive models, and planning simulations. The Digital Pakistan Policy 2018 aimed to build a digital ecosystem and encouraged technology use in education, health, agriculture, and other socio-economic sectors. International agencies also emphasise that AI education policy should be human-centred, rights-based and teacher-supported. UNESCO's guidance recommends regulation, age-appropriate use, privacy protection and institutional safeguards for generative AI in education and research (Miao & Holmes, 2023). Similarly, UNESCO's AI competency framework argues that teachers need competencies in AI ethics, AI pedagogy, human agency, professional learning and responsible classroom use (UNESCO, 2024). The Digital Nation Pakistan Act 2025 further signals the state's intention to strengthen digital society, digital economy, digital infrastructure, and digital governance.

2.3 Constraints and risks

The most serious constraint is the digital divide. AI-based education assumes electricity, devices, connectivity, digital skills, and language access. These conditions are unevenly distributed in Pakistan. UNICEF's public education digital transformation work notes that internet access is available in only about one-third of households, with gendered and geographic barriers affecting use. If AI tools are adopted without equity planning, elite urban schools may gain more advantage while rural public schools fall further behind.

The second constraint is teacher readiness. AI tools may look simple, but responsible educational use requires teachers to understand prompts, bias, hallucination, student privacy, plagiarism, assessment redesign, and subject-specific limitations. UNESCO notes that teachers need competencies not only in AI applications but also in ethics, pedagogy, human agency, and professional learning. For Pakistan, this means that AI training cannot be restricted to computer-science departments. It must become part of pre-service and in-service teacher education across disciplines.

The third constraint is academic integrity. Generative AI can produce essays, assignments, coding tasks, summaries, and research drafts. This may weaken student writing, originality, reading habits, and critical thinking if universities respond only through detection tools. HEC's draft framework on generative AI in higher education stresses transparency, informed consent, bias mitigation, data privacy, accessibility, explainability, ethical use, and academic integrity. In Pakistan, this concern is reflected in the Higher Education Commission's draft framework, which highlights transparency, ethical use, plagiarism, privacy, accessibility and explainability in the use of generative AI tools in higher education (Higher Education Commission of Pakistan, 2025). This is a major issue for the all universities available in the Pakistan because thesis writing, coursework, plagiarism checking, and supervision systems were already under stress before generative AI.

The fourth constraint is data privacy and child protection. AI tools often collect student data, learning behaviour, conversations, assessment records, and personal information. Pakistan's Personal Data Protection Bill 2023 remains central to the privacy debate because it proposes rules for collection, processing, use, disclosure, and transfer of personal data, including special concern for children. However, Pakistan still lacks a fully enacted and mature data-protection regime comparable to more developed regulatory systems; therefore, AI in schools requires strong institutional safeguards before large-scale deployment.

The fifth constraint is local-language and cultural relevance. Many AI tools work best in English and may provide lower-quality output in Urdu, Sindhi, Pashto, Balochi, Punjabi, Saraiki, and other local languages. This matters because Pakistan's education system is multilingual and socially stratified by language. If AI learning tools privilege English-medium learners, they will reproduce existing inequality. Pakistan's National AI Policy 2025 recognizes the importance of disseminating AI awareness content in national and regional languages. Pakistan's National Artificial Intelligence Policy 2025 provides a national direction for AI awareness, research, public-sector capacity, scholarships, trainers and inclusive digital participation (Government of Pakistan, MoITT, 2025). However, successful education-sector adoption also depends on data protection and privacy safeguards, especially because AI tools may process sensitive information about children and learners (Government of Pakistan, MoITT, 2023). Education policy must extend this principle to learning content, teacher training, assessment, and parental awareness.

2.4 Proposed framework: Pakistan AI Education Translation Framework

This paper proposes the **Pakistan AI Education Translation Framework** as a new model for moving from policy to practice. The framework is built on the idea that AI adoption should not begin with purchasing platforms. It should begin with readiness, protection, teacher capacity, curriculum alignment, assessment reform, and evidence.

Stage	Core question	Pakistan-specific action
1. Access readiness	Who can actually use AI?	Map school connectivity, electricity, devices, gender gaps, disability access, and language access before adoption.
2. Safety and governance	How will learners be protected?	Establish rules for privacy, consent, child data, bias, procurement, transparency, and human oversight.
3. Teacher readiness	Can teachers use AI pedagogically?	Train teachers in AI literacy, prompt design, ethics, subject use, feedback, and classroom management.
4. Curriculum and localisation	Does AI support Pakistani learning goals?	Develop Urdu and regional-language AI content aligned with national and provincial curricula.
5. Assessment integrity	Does AI improve learning or enable cheating?	Redesign assignments, examinations, rubrics, oral assessment, portfolios, and AI-use declarations.
6. Evidence-based scaling	What works, for whom, and at what cost?	Pilot AI tools, evaluate learning outcomes, compare equity effects, and scale only proven models.

This framework contributes a new idea: AI translation capacity. Pakistan's problem is not simply the absence of AI policy. The more serious problem is the weak translation of policy into practice. AI translation capacity means the ability of ministries, universities, schools, teacher-training bodies, assessment boards, and communities to convert AI policy into safe, equitable, and measurable learning improvement.

3. Research Methodology

The study used qualitative document analysis because policy documents, official reports and scholarly reviews provide suitable evidence for examining emerging technology reforms where large-scale local implementation is still developing (Krippendorff, 2018; Schreier, 2012). The documents were analysed thematically by identifying recurring patterns related to opportunities, constraints, ethics, teacher readiness, assessment, digital inclusion and policy implementation.

The data sources include three categories. The first category consists of international policy and research sources, including UNESCO's guidance on generative AI in education, UNESCO's AI competency framework for teachers, World Bank publications on AI in education, and recent systematic reviews of AI in education. UNESCO's generative AI guidance is used because it provides global principles on regulation, age appropriateness, teacher capacity, privacy, human oversight, and ethical use.

The World Bank's AI-in-education work is used because it links AI opportunities with implementation issues such as infrastructure, professional development, and institutional strategy.

The second category consists of Pakistan-specific education and digital-policy sources. These include Pakistan Education Statistics 2023–24, UNICEF Pakistan education data, ASER Pakistan findings, Pakistan's National AI Policy 2025, the Digital Pakistan Policy 2018, the Digital Nation Pakistan Act 2025, the Personal Data Protection Bill 2023, and HEC's draft framework on generative AI in higher education. The National AI Policy 2025 is especially important because it sets national targets for awareness, AI training, trainers, scholarships, research projects, and public-sector capacity.

The third category consists of scholarly literature on AI in education, teacher professional development, generative AI, adaptive learning, assessment, ethics, and academic integrity. Recent studies indicate that AI can improve learning support and teaching efficiency, but they also warn about overreliance, bias, false information, academic dishonesty, and unequal access.

The analysis followed three steps. First, the documents were read to identify recurring themes: opportunity, constraint, governance, teacher readiness, assessment, equity, and implementation. Second, the themes were compared with Pakistan's educational conditions, particularly out-of-school children, digital access, teacher capacity, and higher-education policy. Third, the findings were synthesized into the Pakistan AI Education Translation Framework. This approach allows the paper to connect global AI debate with Pakistan's policy and classroom realities.

4. Data Collection and Analysis

4.1 Sources of data

The data collection process relied on secondary documentary evidence. International sources were used to identify global trends in AI-based learning, teacher support and educational governance (World Bank, 2024, 2025). Pakistan-specific sources were used to understand national readiness, including official statistics, digital policy, AI policy and education-sector challenges (Pakistan Institute of Education, 2025; UNICEF Pakistan, 2024; Government of Pakistan, MoITT, 2025).

Data source	Type	Relevance to this study
UNESCO Guidance for Generative AI in Education and	International policy report	Provides ethical and regulatory guidance for generative AI in

Research, 2023		education.
UNESCO AI Competency Framework for Teachers, 2024	International competency framework	Defines teacher competencies needed for AI-era education.
World Bank AI Revolution in Education, 2024	International education technology report	Identifies AI opportunities in tutoring, teacher support, and management.
Pakistan National AI Policy 2025	National policy	Sets Pakistan's AI awareness, training, scholarship, research, and governance goals.
Pakistan Education Statistics 2023–24	Official education statistics	Provides national education-planning context.
UNICEF Pakistan education data	International development data	Highlights out-of-school children and equity challenges.
Digital Pakistan Policy 2018	National digital policy	Establishes earlier digital transformation goals.
Digital Nation Pakistan Act 2025	National legislation	Creates broader digital governance context.
HEC draft framework on GenAI in HEIs	Higher-education policy framework	Addresses ethical AI use, plagiarism, privacy, accessibility, and explainability.

The data show that Pakistan's policy environment is becoming more favourable to AI adoption, but educational implementation remains difficult. The National AI Policy 2025 includes ambitious targets such as training one million IT graduates in AI and allied technologies by 2027, developing 10,000 trainers, increasing AI scholarships, and supporting AI research initiatives.

However, UNICEF's education data show that Pakistan continues to face a large out-of-school population, meaning that AI policy must be linked to foundational access and inclusion rather than only higher-skill innovation.

4.2 Opportunities identified from the data

The first opportunity is AI-supported foundational learning. Pakistan's learning crisis requires tools that can help children practice reading, numeracy, comprehension, and problem-solving. ASER Pakistan is widely recognized for measuring foundational literacy and numeracy across children aged 5–16. ASER Pakistan's findings are especially relevant because they show that many children who are enrolled in school still struggle with basic literacy and numeracy, meaning that AI tools must be evaluated according to their ability to improve foundational learning rather than merely introduce new technology (ASER Pakistan, 2024). AI tutors could support foundational learning if they are available offline or low-bandwidth, aligned with local curriculum, and translated into Urdu and regional languages.

The second opportunity is teacher workload reduction. Teachers in Pakistan often handle large classes, administrative duties, exam preparation, and limited teaching resources. AI can help generate lesson plans, worksheets, quizzes, differentiated materials, and feedback templates. International reviews show that teachers are already using AI for lesson planning and content

creation, but professional development remains insufficient. Therefore, Pakistan should treat AI as part of teacher-support policy, not merely student technology.

The third opportunity is **inclusive education**. AI can support children with disabilities, students in remote areas, girls with mobility constraints, and learners who need flexible schedules. Pakistan's National AI Policy 2025 explicitly refers to persons with disabilities, marginalized communities, remote areas, and women's participation in AI. This creates a policy opening for AI-enabled inclusive education, but it must be funded through public-sector priorities rather than left to private markets.

The fourth opportunity is **higher-education transformation**. Universities can use AI in research support, data analysis, literature review assistance, coding, simulation, academic advising, and student support. The World Bank's higher-education AI report argues that AI can improve student support, faculty research, and institutional management, though adoption is often fragmented where infrastructure, faculty upskilling, and innovation ecosystems are weak.

This is directly relevant for Pakistan's universities, where AI policies must connect with research ethics, supervision, assessment, and graduate employability. AI adoption in higher education should also be linked with employability, research productivity and academic integrity, as international studies show that universities are among the earliest but most uneven adopters of generative AI tools (Crompton & Burke, 2023; Beale, 2025; World Bank, 2025).

The fifth opportunity is **evidence-based governance**. AI can help education department's analyses dropout risks, school facilities, teacher shortages, student attendance, budget gaps, and examination trends. The Digital Nation Pakistan Act 2025 provides a broader legal context for digital governance and transformation. If AI is connected with education data systems, it can help planners move from reactive administration to predictive and preventive decision-making.

4.3 Constraints identified from the data

The first constraint is **unequal digital access**. AI-enabled learning may require stable internet, smartphones, tablets, laptops, electricity, and digital literacy. UNICEF notes that only 33 percent of households in Pakistan have internet access, which means many students, especially girls, face barriers to digital learning. Therefore, AI adoption without connectivity planning may worsen educational inequality.

The second constraint is **weak data protection and privacy enforcement**. AI education systems may collect sensitive information about children's learning, behaviour, identity, disability, language, location, and performance. Pakistan's Personal Data Protection Bill 2023 proposes regulation of personal data collection, processing, use, disclosure, and transfer, but education institutions need practical rules even before large-scale AI deployment. Schools and universities should not upload student data into AI tools without consent, governance, and institutional safeguards.

The third constraint is **academic integrity**. Generative AI can produce assignments, essays, coding tasks, research summaries, and paraphrased content. HEC's draft framework recognises that generative AI raises issues of plagiarism, explainability, accessibility, privacy, transparency, and ethical use in higher education. Universities in Pakistan will need AI-use declarations, redesigned assignments, oral defences, supervised writing, process portfolios, and clear penalties for misuse.

The fourth constraint is **teacher anxiety and uneven capacity**. Teachers may fear that AI will reduce their authority, expose their digital weaknesses, or increase monitoring. UNESCO's

teacher competency framework stresses that teachers need a human-centred mindset, ethical understanding, AI foundations, AI pedagogy, and professional learning. In Pakistan, this means AI training should be supportive rather than punitive. Teachers should be trained as professional users, evaluators, and co-designers of AI tools.

The fifth constraint is **policy fragmentation**. Education in Pakistan is governed through federal and provincial responsibilities, while AI policy, higher education, digital infrastructure, data protection, curriculum, and teacher training are distributed across different bodies. Pakistan's AI policy, Digital Pakistan Policy, Digital Nation framework, HEC guidance, and provincial education plans must be aligned. The National AI Policy 2025 includes several implementation targets, but the challenge is coordination across ministries, HEC, NAVTTC, provincial governments, teacher-training institutions, schools, and universities.

5. Discussion

The findings show that AI in Pakistan's education sector is both promising and risky. It is promising because it can help address teacher workload, personalised learning, inclusion, assessment reform, and planning. It is risky because Pakistan's education system already suffers from inequality, governance gaps, and uneven access. If AI is introduced mainly through private EdTech companies, English-medium platforms, and elite universities, it may deepen the very inequalities it claims to solve. The literature suggests that AI adoption in education succeeds only when it is connected to pedagogy, teacher agency and institutional readiness (Holmes et al., 2019; Tan et al., 2025). Therefore, Pakistan should avoid treating AI as a quick technological solution. Instead, AI should be integrated through curriculum reform, teacher training, assessment redesign, digital inclusion and strong governance (Ali et al., 2024; Giannakos et al., 2025).

The first major discussion point is that Pakistan needs an **equity-first AI strategy**. AI should be piloted first in public-sector contexts where learning needs are highest, not only in elite institutions where adoption is easiest. Public-sector AI pilots should focus on foundational literacy, numeracy, teacher coaching, girls' education, inclusive education, and dropout prevention. UNICEF's data on out-of-school children makes clear that Pakistan's education crisis is fundamentally an equity crisis. AI policy must therefore be judged by whether it improves learning for poor, rural, female, disabled, and public-school learners.

The second discussion point is that Pakistan should adopt a **teacher-first model** of AI in education. AI should be introduced through teacher education, not around teachers. Teachers should learn how to question AI output, detect hallucinations, design prompts, adapt AI-generated materials, protect student data, and redesign assessments. UNESCO's AI teacher framework provides a strong basis for this approach because it includes ethics, pedagogy, professional learning, and human agency. Pakistan should adapt this framework for pre-service teacher education, B.Ed. programs, provincial teacher-training academies, and university faculty development.

The third discussion point is that AI requires **assessment transformation**. If Pakistani schools and universities continue to rely heavily on take-home essays, memory-based exams, and formulaic assignments, generative AI will create academic dishonesty and superficial learning. HEC's draft framework is therefore important because it recognizes that AI policy is connected to academic integrity, plagiarism, transparency, privacy, and explainability. The practical

solution is not banning AI entirely. Instead, institutions should use assessment designs that require reasoning, drafts, oral explanation, local data, project work, reflection, and teacher-student interaction.

The fourth discussion point is that Pakistan needs **local-language AI infrastructure**. AI education tools must work in Urdu and provincial languages, not only English. Without local-language support, AI will favour students already advantaged by English-medium schooling. The National AI Policy 2025 recognizes the need to disseminate AI awareness through national and regional languages. This should be expanded into curriculum-aligned AI tutors, teacher guides, reading tools, and parental awareness campaigns in Urdu, Sindhi, Punjabi, Pashto, Balochi, Saraiki, and other languages.

The fifth discussion point is that AI implementation must be **evidence-based**. Pakistan should avoid large-scale procurement of AI platforms without pilots, independent evaluation, cost-effectiveness analysis, privacy review, and learning-outcome evidence. The World Bank warns that AI adoption can remain fragmented where infrastructure gaps and faculty upskilling are not addressed.

Pakistan should therefore begin with small pilots in different provinces, compare results across rural and urban schools, evaluate teacher acceptance, measure student learning, and scale only what works. Pakistan's policy environment is becoming more supportive of AI, but implementation remains the central challenge. The Digital Pakistan Policy created an early digital transformation vision (Government of Pakistan, MoITT, 2018), the Digital Nation Pakistan Act 2025 strengthened the legal direction for digital governance (Digital Nation Pakistan Act, 2025), and the National AI Policy 2025 introduced specific AI-related capacity-building goals (Government of Pakistan, MoITT, 2025). However, these policies will affect education only if they are translated into provincial implementation plans, school connectivity, teacher preparation and classroom-level practice.

The sixth discussion point is that AI governance must be **legally accountable**. Children's data, teacher data, and institutional data should not be treated as commercial raw material. Pakistan's Personal Data Protection Bill 2023 provides an important basis for regulating personal data, consent, disclosure, and processing.

Before AI is widely used in schools, education departments should create rules for data minimisation, parental consent, vendor accountability, audit logs, bias testing, and human review of automated decisions. Privacy and child protection must remain central to AI implementation. Since AI systems may process student records, learning behaviours and personal data, Pakistan's data-protection framework should be linked directly with education-sector AI procurement and classroom use (Government of Pakistan, MoITT, 2023). This is consistent with UNESCO's warning that generative AI must be governed through privacy protection, transparency, age-appropriate use and human oversight (Miao & Holmes, 2023; UNESCO, 2024).

Based on this discussion, the policy-to-practice pathway for Pakistan can be summarized as follows:

Policy area	Current need	Practical pathway
Access	Digital divide limits AI use.	Provide school connectivity, shared devices, offline AI tools, and girls' access plans.
Teachers	Teachers lack AI preparation.	Integrate AI literacy into B.Ed., M.Ed., CPD, and university faculty training.

Curriculum	AI is not yet systematically embedded.	Add AI literacy, ethics, critical thinking, and local-language AI activities.
Assessment	Generative AI disrupts assignments.	Use oral defence, portfolios, supervised writing, AI-use declarations, and authentic tasks.
Data governance	Student data may be exposed.	Require consent, privacy review, procurement standards, and child-data safeguards.
Inclusion	Marginalised learners may be left out.	Prioritise public schools, rural areas, girls, disability inclusion, and regional languages.
Evaluation	AI tools may be adopted without evidence.	Pilot, evaluate, publish results, revise, and scale gradually.

The central argument is that Pakistan should move from AI enthusiasm to AI implementation discipline. AI can be helpful, but only if its use is guided by equity, pedagogy, law, evidence, and teacher professionalism.

6. Conclusion

Artificial intelligence has the potential to reshape education in Pakistan, but it will not automatically solve Pakistan's educational problems. AI can support personalised learning, teacher preparation, assessment reform, inclusive education, academic advising, research support, and data-informed governance. However, these opportunities are inseparable from constraints such as digital inequality, weak teacher readiness, academic integrity risks, privacy concerns, language barriers, policy fragmentation, and uneven institutional capacity.

This paper proposed the Pakistan AI Education Translation Framework as a new contribution to the debate. The framework argues that Pakistan must move through six stages: access readiness, safety and governance, teacher readiness, curriculum and localization, assessment integrity, and evidence-based scaling. This framework is designed to prevent a common policy failure: announcing ambitious technology goals without building classroom-level implementation capacity. The evidence reviewed in this paper shows that AI can support Pakistan's education system only when it is linked with access, learning quality, teacher capacity and ethical governance. International literature confirms that AI has educational potential, but also warns against unregulated, unequal and poorly supervised implementation (Ali et al., 2024; Garzón, 2025; Wang et al., 2024). Pakistan's official policy direction is promising, but the real measure of success will be whether AI improves learning outcomes for public-school students, rural learners, girls, students with disabilities and low-income communities (ASER Pakistan, 2024; UNICEF Pakistan, 2024; Pakistan Institute of Education, 2025).

The study concludes that Pakistan needs a human-centred and equity-first AI education strategy. National AI policy should be connected with provincial education departments, teacher-training institutions, HEC, NAVTTC, curriculum bodies, examination boards, school leaders, and communities. AI should be used to support teachers, not replace them. It should improve learning, not encourage shortcuts. It should expand access, not deepen class and gender divides. It should protect student data, not expose it. It should strengthen local languages, not reproduce English-only privilege.

In practical terms, Pakistan should begin with targeted pilots in public schools and universities, train teachers before deploying tools, create clear AI-use rules, develop local-language content, redesign assessments, and evaluate learning outcomes. The country's National AI Policy 2025 provides a useful starting point, but the real test will be implementation. AI in education will

succeed in Pakistan only when policy is translated into classrooms, teacher practice, student learning, and accountable governance.

Limitations of the Research Study

The research study has limitations. It does not include primary survey data from teachers or students. It also does not claim that AI tools have already improved learning outcomes in Pakistan at scale. Instead, it provides a policy-oriented research synthesis. Future studies should test AI interventions through classroom pilots, teacher interviews, student learning assessments, and province-wise implementation studies.

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