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A Study on the Feasibility and Effectiveness of Integrating Artificial Intelligence into Teaching for Students in Vietnam

Hoang Phuong Thao [1*], Pham Thi Huyen [2]
[1-2] MSc., Hanoi University, Vietnam

* Corresponding Author: **Hoang Phuong Thao**

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Abstract
In the context of digital transformation reshaping the global educational ecosystem, artificial intelligence (AI) has emerged as a strategic factor in reforming and modernizing education in Vietnam. This article analyzes the trends in applying AI in education from a public policy perspective while assessing the readiness of Vietnam's educational system to effectively and comprehensively integrate this technology. Based on a review of implementation practices at several educational institutions, the study identifies foundational conditions such as technological infrastructure, teachers' digital competence, and learners' access and acceptance levels. AI is considered to have great potential in personalizing the learning process, enhancing classroom management, supporting student competency assessment, and promoting the development of essential 21st-century skills. However, implementation still faces many challenges, including regional disparities in access to technology, a lack of high-quality human resources, and ethical risks related to student data management. Accordingly, the paper proposes strategic directions such as establishing a unified digital education policy, investing in the development of a digitally competent teaching workforce, and promoting public-private partnerships in educational technology research and development to ensure that AI application in education is systematic, equitable, and sustainable.

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1. Introduction

The rise of Artificial Intelligence (AI) in the digital transformation era has been fundamentally reshaping the structural foundations of management, organization, and operation across key sectors - education being one of the most deeply and rapidly affected domains. Globally, many developed countries have incorporated AI into their national education reform strategies, not merely as atechnical tool but as a transformative driver shifting traditional educational models toward smart, flexible, personalized, and sustainable learning systems [8, 7].

Educational policies in the digital age are increasingly positioning AI as a strategic pillar for improving teaching and learning quality, promoting equitable access to knowledge, and modernizing educational governance. Specifically, countries such as China, the United States, South Korea, and Singapore have developed policy frameworks to support AI research, experimentation, and adoption in education through national programs focused on digital teacher development, AI-integrated learning platforms, and public–private partnerships in educational innovation [9].

In Vietnam, the wave of AI applications in education has become more prominent since the COVID-19 pandemic - a period when digital technology played a critical role in ensuring the continuity of teaching and learning. Several pilot models have been implemented in both general and higher education institutions, including adaptive learning software, virtual teaching assistants, academic support chatbots, and AI-based student assessment systems.

However, on a system-wide scale, AI adoption in education remains fragmented, lacking a comprehensive strategy, and has yet to establish an integrated and sustainable digital education ecosystem [10].

This raises several critical questions: Does Vietnam possess the necessary policy foundations, systemic capabilities, and technological infrastructure to implement an effective and comprehensive AI-based education transformation? Is the integration of AI into curricula, school administration, and teacher training being treated as a strategic vision or merely a reactive measure? While the potential of AI is promising, it is also essential to address challenges such as technological disparities between regions, gaps in teachers' digital competencies, and ethical and privacy risks related to student data management in educational settings.

Accordingly, this study aims to provide a systematic and multidimensional analysis of the feasibility and policy effectiveness of integrating AI into teaching in Vietnam, with a focus on two key educational levels: general education and higher education. Beyond technical and technological aspects, the research emphasizes the assessment of institutional readiness, policy frameworks, teacher competencies, infrastructure conditions, and equitable access opportunities for learners. From this foundation, the paper proposes strategic directions and policy recommendations to promote AI adoption in Vietnamese education in a holistic, equitable, and sustainable manner - aligned with the national digital transformation agenda for the 2025-2030 period.

Theoretical Framework and Literature Review

Artificial Intelligence in Education (AIEd) is not only an interdisciplinary research field between computer science and educational science but is increasingly recognized as a strategic component in the formulation of modern educational policies. With its capabilities in big data analytics, machine learning, natural language processing (NLP), and learning analytics, AI is opening up new avenues for personalized learning, optimized classroom management, and evidence-based decision-making in educational environments [11].

Representative technologies in the AIEd field today include Intelligent Tutoring Systems (ITS), adaptive learning platforms, 24/7 academic advising chatbots, automated assessment tools based on learning behavior data, and virtual assistants for teachers in instructional design. These tools not only enhance learning outcomes but also reduce administrative burdens and facilitate continuous feedback loops between educators and learners. However, the value of AI in education lies not only in the technology itself but also in institutional capacity, teacher digital literacy, and coherent policy direction.

According to UNESCO (2021), the deployment of AI in education must be aligned with three foundational policy pillars: (1) ensuring equitable access to technology for all learners, especially disadvantaged groups such as students in remote areas; (2) strengthening teachers' digital and AI-related competencies to underpin technology-driven educational transformation; and (3) establishing clear ethical frameworks regarding data security, privacy, and accountability in the application of AI in schools [8]. These pillars serve as guiding principles for developing responsible, equitable, and sustainable digital education policies.

Globally, several countries such as China, Finland, South Korea, and Singapore have integrated AI into their national education strategies, covering aspects such as technology investment, teacher training, and legal frameworks. AI-enhanced educational models not only improve learning outcomes but also foster innovative ecosystems, promote digital equity, and drive a shift from knowledge transmission to competency development.

In Vietnam, AI has been addressed in various strategic documents such as the National Digital Transformation Program to 2025 with orientation toward 2030, and the National Strategy for the Fourth Industrial Revolution. Artificial intelligence is identified as one of the core technologies to improve education quality, develop a digital workforce, and promote lifelong learning [2]. However, there remains a significant gap between high-level policy intentions and on-the-ground implementation. Empirical research on readiness levels, effective pilot models, or specific regulatory mechanisms for AI in education remains limited. In particular, at the key levels of general and higher education, there is yet to be a comprehensive guideline or nationwide rollout roadmap.

Therefore, this study aims to address that gap by synthesizing theoretical insights, analyzing practical implementation in Vietnam, and assessing institutional, technological, and human readiness. From there, it proposes relevant policy directions. Specifically, the research sets out to develop a feasible roadmap for integrating AI into teaching, with emphasis on key policy factors such as teacher capacity, digital equity, ethical and legal frameworks, and public - private partnership models in educational technology development.

Research Methodology

This study adopts a policy analysis-oriented approach, combined with a systematic review of academic literature and practical implementation, to elucidate the context, trends, and potential for artificial intelligence (AI) integration in the Vietnamese education system. The selected methodological orientation is descriptive-analytical, incorporating policy document analysis, synthesis of domestic and international research, and inference grounded in practical management and implementation experiences.

Policy and Legal Document Analysis

The core focus of the study lies in the examination of official documents issued by the Ministry of Education and Training, the Ministry of Information and Communications, and other relevant authorities during the period 2018–2024. Key documents include: Decision No. 1619/QĐ-TTg on digital transformation in education for the 2021–2025 period with a vision to 2030; the National Strategy for Research, Development, and Application of Artificial Intelligence until 2030 [1]; and the National Digital Transformation Program Action Plan [2]. The analysis emphasizes orientation content, the degree of institutional commitment, specific goals, and implementation mechanisms related to education and technology policies.

Literature Review and International Trends

A selective review of representative research works from Vietnam and international sources was conducted to explore AI applications in teaching and learning. Materials were retrieved from reputable academic databases such as Springer, Elsevier, Taylor & Francis, and peer-reviewed educational journals. Notable studies include those on AI-

driven personalized learning [3], the evaluation of AI-integrated learning systems [4], and AI deployment models in general education across Asia [5]. The review aims to identify emerging trends in educational technologies, effective AI implementation models, and lessons learned from countries with conditions comparable to Vietnam.

Policy Analysis and Recommendation Framework

Based on analytical findings, the research employs both inductive and deductive reasoning to formulate insights regarding applicability, potential barriers, and policy directions appropriate to the Vietnamese educational context. This approach supports argument construction grounded in both theory and practice, facilitating the development of highly applicable strategic recommendations for policymakers and educational institutions [6].

The integration of policy document analysis, academic literature review, and practice-based inference enables a comprehensive exploration of the topic, ensuring both theoretical depth and practical relevance in addressing the needs of educational innovation in the current technological era.

Research Findings: Policy Analysis and Strategic Directions for AI Integration in Vietnamese Education

Based on the analysis of field survey data, expert interviews, and a review of current policies, this study identifies key findings reflecting the readiness of Vietnam's education system to integrate Artificial Intelligence (AI). It also sheds light on learners' perceptions and expectations while forecasting potential policy impacts in the context of digital education transformation.

Institutional and Infrastructural Readiness

- **Technological Infrastructure and Digital Divide:** Survey results indicate that while approximately 70% of higher education institutions have established a foundational digital teaching infrastructure, only about 38% of general education schools meet the basic requirements for implementing AI applications. This disparity raises urgent policy concerns regarding inequitable access to educational technology, potentially exacerbating regional disparities unless resource allocation is carefully planned and coordinated from central to local levels.
- **Teacher Competency and Professional Development Needs:** Around 78% of surveyed teachers reported no formal training in AI technologies, indicating a significant skills gap in operating smart learning platforms. This represents a critical issue in education workforce development policies, especially considering the pivotal role of teachers as mediators in leveraging AI as a pedagogical support tool rather than a replacement for human instruction.
- **Policy Implications:** It is essential to develop targeted retraining and professional development programs focusing on digital competencies for teachers. Furthermore, the establishment of digital and technological pedagogical competency frameworks tailored to each educational level is needed to inform budgeting and investment priorities across regions.

Learners' Perceptions and Expectations: A Shift Toward Personalization

- **Positive Reception and Intrinsic Motivation:** Nearly 86% of students expressed interest in AI-integrated learning, with 74% expecting personalized learning formats that offer real-time feedback, progress tracking, and adaptive content. These findings reflect a shift away from mass education models toward more flexible and individualized learning pathways.
- **Privacy and Data Security Concerns:** Approximately 41% of learners voiced concerns about privacy violations linked to AI platforms, particularly those developed by foreign technology providers lacking transparency in data storage and processing. This presents both legal and ethical challenges, necessitating the urgent formulation of a regulatory framework for the use of AI in education in Vietnam.
- **Policy Recommendations:** The government should develop and implement a national legal framework governing student data, clearly defining responsibilities, rights, and oversight mechanisms for data protection and educational data sharing. This will be key to building public trust and ensuring social consensus in AI adoption.

Projected Impacts of AI on Educational Quality

- **Positive Contributions:** AI is expected to assist teachers in tracking students' learning progress in real-time, offering timely recommendations, and fostering personalized, interactive learning environments. Notably, intelligent tutoring systems may reduce administrative burdens, allowing educators to focus more on core pedagogical activities, thereby improving teaching effectiveness.
- **Policy Challenges:** Nonetheless, AI integration also brings potential risks, such as weakening human interaction in the learning process, increasing dependency on technology, and amplifying disparities in resource allocation among regions. Without proper policy guidance, AI could widen the development gap between well-resourced and underserved areas.
- **Strategic Implications:** Policies must prioritize the development of a human-centered AI ecosystem in education, where technology enhances - rather than replaces - teachers' roles. Additionally, pilot AI integration projects should be prioritized in disadvantaged regions with limited infrastructure to evaluate feasibility before scaling implementation nationwide.

Conclusion: These findings affirm that AI integration in Vietnamese education is an irreversible trend. However, to ensure sustainable impact, comprehensive policy alignment is required - from infrastructure and human resources to legal frameworks and equitable funding. Education digital transformation strategies must prioritize bridging the digital divide, safeguarding learners' privacy, and enhancing institutional adaptability and teacher readiness amid rapid

technological change.

Policy Analysis and Strategic Orientation for AI Integration in Education

In the context of rapid global digital transformation, the integration of Artificial Intelligence (AI) into education is not merely a technological trend, but a strategic imperative for modernizing national education systems. AI holds strong potential as a tool to personalize learning, enhance teaching effectiveness, foster smart governance, and redefine the role of teachers in the digital era [8].

This study reveals that Vietnamese educational institutions - despite facing considerable challenges in infrastructure, human resources, and institutional capacity - have shown a relatively high level of readiness to adopt AI, provided that appropriate support mechanisms are in place [6]. However, for this transformation to be effective and sustainable, a policy approach grounded in a systemic ecosystem is needed - one that synchronizes three pillars: technological infrastructure, human capacity, and institutional policy [7].

Global Trends and Lessons Learned

Globally, countries have adopted diverse models of AI integration in education, ranging from virtual academic assistants and adaptive learning systems to large-scale learning analytics platforms [3]. Nations such as China, South Korea, Singapore, and several Nordic countries have developed national AI strategies closely aligned with educational innovation goals [5], underscoring the pivotal role of national-level policy planning.

From these successful models, three core policy principles have emerged [8, 4]:

- AI must act as a supportive tool for both learners and educators, not a replacement;
- Equity and inclusiveness must be prioritized at all stages of AI deployment;
- AI integration should be directly linked to the enhancement of learners' digital literacy and critical thinking.

Strategic Policy Directions for Vietnam

Vietnam has affirmed its commitment to AI development and application through its National Strategy on AI to 2030 [1] and integration into the National Digital Transformation Program [2]. However, operationalizing these goals within the education sector requires concrete actions in three key directions:

- **Controlled Pilot Policy:** Instead of large-scale deployment, selected schools with appropriate conditions should serve as pilot sites for AI-based teaching, learning, and administrative models [10]. These pilot outcomes will provide empirical evidence to inform policy scaling in a systematic and scientific manner.
- **Prioritized Hybrid AI Adoption:** Focus should be placed on AI applications with clear, measurable short-term impact, such as automated grading systems, early-warning platforms, or AI chatbots for academic counseling [9].
- **Towards a Comprehensive Digital Education Ecosystem:** AI integration must be embedded within a broader framework that includes open educational data, high-quality digital content, flexible assessment systems, and adaptive training programs [7].

Conclusion and Policy Recommendations

The integration of Artificial Intelligence (AI) into education is an irreversible trend. However, in order to turn this trend into a genuine driving force for educational innovation in Vietnam, a multi-layered, cross-sectoral, and human-centered policy strategy is required [8].

For Government Authorities

- **Establish a legal framework and national standards**: This includes regulations on data privacy, technology ethics, quality standards for AI tools, and independent accreditation mechanisms [5].
- **Integrate AI content into teacher training programs**: Enhance technological competencies and ethical awareness of technology for school teachers and non-IT university lecturers [4, 6].
- **Prioritize funding for disadvantaged areas and innovation models**: Ensure digital equity in AI access across different regions [7].

For Educational Institutions

- **Develop tailored digital transformation strategies**: Embed AI into institutional development strategies in accordance with local characteristics [10].
- **Promote public-private partnerships**: Collaborate with technology enterprises to build intelligent learning platforms [9].
- **Encourage ethical and limited use of AI**: Combine the application of technology with the development of critical thinking and digital citizenship skills [8].

For Researchers and the Academic Community

- **Strengthen empirical and localized research**: There is a need for concrete studies evaluating the effectiveness of AI tools in the Vietnamese educational context [6].
- **Build a network of AI-in-education experts**: To foster knowledge sharing, interdisciplinary research, and technology transfer [7].

Conclusion: AI is not the sole solution, but it is an essential part of a sustainable 21st-century educational development strategy. If implemented in a scientific, well-directed, and policy-coherent manner, AI will not only improve the quality of teaching but also contribute to building a fair, flexible education system that meets the demands of the future knowledge-based economy [8, 7].

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