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THE APPLICATION OF ARTIFICIAL INTELLIGENCE IN ENHANCING LEARNING EFFICIENCY AMONG VIETNAMESE UNIVERSITY STUDENTS

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Abstract

In recent years, the integration of Artificial Intelligence (AI) in education has emerged as a transformative trend that reshapes traditional learning models. This study aims to examine the application of AI tools such as ChatGPT, adaptive learning platforms, and intelligent tutoring systems in improving the learning efficiency of Vietnamese university students. Using a mixed-method approach that combines quantitative surveys and qualitative interviews, the research evaluates how AI influences students' motivation, academic performance, and self-directed learning. The findings reveal that the adoption of AI-based tools significantly enhances learning engagement, provides personalized learning experiences, and supports students in managing time and academic workload more effectively. However, challenges related to data privacy, digital literacy, and overdependence on technology remain critical concerns. The study concludes with recommendations for universities and policymakers to develop guidelines for the ethical and effective integration of AI in higher education in Vietnam.

Keywords: *Artificial intelligence (AI); learning efficiency; higher education; digital learning*

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1. Introduction

In the era of the Fourth Industrial Revolution, Artificial Intelligence (AI) has emerged as a transformative force reshaping various sectors, including higher education. AI refers to computer systems capable of performing tasks that normally require human intelligence, such as learning, reasoning, problem-solving, and natural language processing (Russell & Norvig, 2021). In the educational context, AI technologies such as adaptive learning platforms, intelligent tutoring systems, and virtual assistants have been increasingly adopted to enhance teaching and learning quality. These tools enable instructors to deliver more personalized instruction, automate assessment processes, and provide learners with real-time feedback that supports self-directed learning (Richter et al., 2019).

Traditional teaching models that rely primarily on one-way knowledge transmission are becoming less effective in addressing students' diverse learning needs. AI-driven learning environments, on the other hand, promote learner-centered approaches by analyzing students' behaviors and learning patterns to customize content and optimize learning efficiency. Holmes et al. (2021) argued that AI technologies can help create inclusive learning ecosystems that adapt to individual differences, foster engagement, and improve academic outcomes. Moreover, as digital learning tools become increasingly accessible, AI offers opportunities for universities to bridge learning gaps and enhance students' digital competencies.

Globally, the application of AI in education has demonstrated significant potential in enhancing learning performance and engagement. Chen et al. (2020) found that AI-supported systems can reduce cognitive load and improve students' motivation to learn. Large Language Models (LLMs) such as ChatGPT have further expanded the scope of AI in education by supporting students in writing, critical thinking, and language learning (Kasneci et al., 2023). These systems enable learners to access information efficiently and receive personalized explanations that traditional classroom settings may not provide. However, scholars also caution that overreliance on AI tools can hinder independent thinking and critical problem-solving skills if not guided by appropriate pedagogical frameworks (Luckin et al., 2016).

Despite the promising benefits, the integration of AI in education raises several ethical and practical concerns. Issues related to data privacy, algorithmic transparency, and unequal access to digital infrastructure are among the most pressing challenges (Williamson & Eynon, 2020). Furthermore, the effective use of AI in learning depends heavily on users' digital literacy and institutional readiness. Universities must therefore balance technological innovation with ethical considerations to ensure that AI adoption aligns with educational values and student development goals.

In Vietnam, the adoption of AI in higher education is still in its early stages but has gained momentum in recent years, particularly after the COVID-19 pandemic. The shift toward online and blended learning has encouraged universities to explore AI-based learning management systems, automated grading tools, and intelligent chatbots to enhance teaching efficiency (Nguyen & Do, 2022). However, empirical studies examining how AI applications affect students' learning efficiency in the Vietnamese context remain limited. Vietnamese students often face challenges such as limited access to digital resources, varying levels of technological proficiency, and a lack of institutional guidelines on the ethical use of AI in learning (Phan, 2023). These contextual factors create a need for in-depth research to understand both the opportunities and obstacles associated with AI-enhanced education in Vietnam.

Given these considerations, this study seeks to explore the role of Artificial Intelligence in enhancing learning efficiency among Vietnamese university students. Specifically, the research aims to assess the extent of AI adoption, examine its impact on students' academic performance and learning motivation, and identify the challenges associated with AI integration in higher education. By addressing these objectives, the study contributes to the growing literature on educational technology by providing empirical evidence from a developing country perspective. Moreover, it offers practical insights for educators, policymakers, and technology developers to design ethical and effective AI-based learning environments that promote sustainable educational innovation in Vietnam.

2. Literature review

Artificial Intelligence (AI) is increasingly recognized as a transformative technology that reshapes the global educational landscape. AI refers to the capability of computer systems to simulate human intelligence processes, including learning, reasoning, perception, and decision-making (Russell & Norvig, 2021). In higher education, AI is widely applied to automate instructional processes, enhance student assessment, provide personalized learning pathways, and improve institutional decision-making through data analytics (Zawacki-Richter et al., 2019). These applications are not only redefining how knowledge is delivered but also how students interact with learning environments.

According to Holmes, Bialik, and Fadel (2021), the integration of AI in education enables adaptive and data-driven instruction, allowing educators to tailor teaching strategies to individual learners' needs. AI-driven systems, such as intelligent tutoring systems, learning analytics platforms, and recommendation engines, continuously collect data on learners' performance, engagement, and behavioral patterns to generate personalized feedback and adaptive learning experiences. Such personalization has been found to enhance learning engagement, improve retention, and support the development of self-regulated learning (Chen et al., 2020). Furthermore, AI can automate repetitive administrative tasks such as grading and attendance tracking thereby enabling educators to focus on higher-order pedagogical tasks such as mentoring and cognitive scaffolding (Luckin et al., 2016). However, the growing adoption of AI also raises pedagogical and ethical questions. While AI systems can analyze and predict student performance with high precision, they lack the emotional intelligence and contextual understanding that are central to effective teaching. Williamson and Eynon (2020) caution that reliance on AI-driven decision-making may introduce algorithmic bias, reduce human agency, and perpetuate inequalities if educational data are not used responsibly. Thus, while AI offers unprecedented opportunities for innovation, its successful integration requires critical evaluation of its pedagogical value, ethical implications, and contextual suitability.

Learning efficiency is a key construct in educational psychology, referring to the extent to which learners achieve desired academic outcomes while minimizing cognitive load, time, and effort (Chen et al., 2020). The concept is closely related to self-regulated learning, motivation, and metacognition factors that determine how

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effectively learners plan, monitor, and evaluate their learning processes. In this regard, AI can serve as an enabling technology that optimizes learning efficiency through automation, adaptation, and intelligent support (Yang, Wang, & Shen, 2022). Empirical research has consistently demonstrated the positive impact of AI-assisted tools on learning performance and efficiency. For example, adaptive learning platforms employ machine learning algorithms to analyze individual progress and deliver customized instructional content. These systems provide students with real-time feedback, helping them identify weaknesses and adjust learning strategies accordingly (Zawacki-Richter et al., 2019). Chen et al. (2020) found that AI-based learning analytics systems reduce redundant learning efforts by identifying knowledge gaps early, thereby enabling more efficient study behaviors. Additionally, intelligent tutoring systems simulate one-on-one human instruction, offering students continuous guidance and personalized exercises, which can lead to significant improvements in both learning outcomes and efficiency (Luckin et al., 2016). Nevertheless, scholars have also emphasized that technological interventions must be accompanied by appropriate pedagogical design to ensure genuine improvements in learning quality. Holmes et al. (2021) argued that while AI can improve efficiency, excessive automation risks narrowing the learning experience by focusing primarily on measurable outcomes rather than holistic educational development. Therefore, the relationship between AI and learning efficiency should be viewed as dynamic and context-dependent, where technology acts as a supportive instrument rather than a replacement for human learning processes.

Student engagement the degree of attention, curiosity, and emotional involvement that students bring to the learning process is one of the most critical determinants of academic success (Kasneci et al., 2023). AI technologies, particularly those powered by natural language processing and large language models (LLMs), have emerged as tools that can enhance engagement through interactive and personalized learning experiences. For instance, systems such as ChatGPT or conversational agents can assist students with academic writing, brainstorming, and problem-solving, thereby increasing learning motivation and cognitive engagement. Kasneci et al. (2023) reported that students who used AI-assisted tools showed greater confidence in articulating ideas, improved writing coherence, and higher levels of engagement in academic tasks. Moreover, AI chatbots and virtual tutors can provide instant assistance, enabling continuous learning beyond classroom boundaries. This aligns with constructivist learning theories, which emphasize learner autonomy and active knowledge construction. However, despite these advantages, scholars have raised concerns about overreliance on AI tools for cognitive tasks. Williamson and Eynon (2020) cautioned that dependence on AI-generated content could undermine students' critical thinking and creativity, leading to surface-level learning rather than deep understanding. Therefore, the pedagogical value of AI must be framed within clear ethical guidelines and accompanied by training that fosters digital literacy and responsible use.

Vietnam has witnessed rapid digital transformation in education, particularly following the COVID-19 pandemic, which accelerated the adoption of online and blended learning models (Nguyen & Do, 2022). The Vietnamese government has identified AI as a key driver of national innovation, promoting its integration in multiple sectors, including higher education. Universities across the country have begun adopting AI-based tools for administrative management, e-learning systems, plagiarism detection, and automated grading. Despite this progress, AI implementation in Vietnamese higher education remains fragmented and uneven, with significant differences in technological readiness among institutions (Phan, 2023). Phan (2023) observed that while Vietnamese students demonstrate growing interest in AI-assisted learning, their actual utilization of these tools is limited by factors such as digital literacy gaps, lack of English proficiency, and inadequate institutional support. Additionally, many instructors remain uncertain about how to integrate AI tools into pedagogy effectively, often perceiving them as supplementary rather than transformative technologies. Nguyen and Do (2022) emphasized that the success of AI adoption depends on aligning technological innovation with pedagogical reform and staff development. From a research perspective, empirical studies focusing on AI's pedagogical impact in Vietnam are still scarce. Existing literature primarily addresses digital transformation and online learning rather than the specific mechanisms through which AI enhances learning efficiency. This gap highlights the need for systematic investigations into how Vietnamese students engage with AI technologies, the extent to which these tools influence their learning outcomes, and the challenges associated with ethical use and accessibility. By addressing these questions, future research can provide valuable insights into how AI can be effectively leveraged to improve learning efficiency and educational quality in the Vietnamese higher education system.

Overall, the literature indicates that AI has significant potential to enhance learning efficiency by providing adaptive, data-driven, and personalized educational experiences. However, the effectiveness of AI integration depends on contextual factors such as digital literacy, institutional readiness, and ethical awareness. While substantial research has been conducted in developed countries, empirical evidence from developing contexts, particularly Vietnam, remains limited. Therefore, this study aims to bridge this gap by investigating the application of AI in enhancing learning efficiency among Vietnamese university students. By analyzing the relationship between AI adoption, student motivation, engagement, and learning outcomes, the research seeks to contribute to both theory and practice. The findings are expected to inform educators and policymakers on how to design responsible and effective AI-driven learning environments that align with Vietnam's ongoing digital transformation.

3. Current situation of artificial intelligence in Vietnamese higher education

In recent years, Vietnam has witnessed a strong wave of digital transformation across various sectors, including higher education. This transformation has been largely driven by the national strategy titled *"National Digital Transformation Program Toward 2030"* (Vietnamese Government, 2020), which identifies Artificial Intelligence (AI) as a strategic technology for improving productivity, innovation, and human resource quality. Within this context, universities are encouraged to integrate AI and digital tools into teaching, learning, and research activities to improve educational efficiency and competitiveness in the global knowledge economy (Ministry of Education and Training [MOET], 2022).

The COVID-19 pandemic accelerated the digitalization of education in Vietnam, forcing universities to adopt online learning platforms and educational technologies at an unprecedented pace.

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According to Nguyen and Do (2022), the crisis acted as a catalyst for technological innovation, leading to widespread experimentation with AI-based applications such as automated grading, plagiarism detection (Turnitin, Grammarly AI), and virtual classrooms. Several universities, including Vietnam National University, Hanoi University of Science and Technology, and FPT University, have pioneered the use of AI in digital learning management systems and student support services. These initiatives illustrate the growing institutional interest in leveraging AI for improving teaching quality and operational efficiency.

Despite these advancements, the overall adoption of AI in Vietnamese higher education remains limited and uneven. A national survey by the MOET (2023) revealed that only about 35% of universities had implemented AI-related initiatives in teaching and administration, and less than 20% had established research or training programs specializing in AI. The main challenges identified include limited financial resources, inadequate digital infrastructure, and a shortage of skilled educators capable of integrating AI tools into pedagogy (Phan, 2023). Additionally, many universities rely heavily on foreign-developed technologies, raising concerns about data privacy, local adaptability, and long-term sustainability.

From the learners' perspective, Vietnamese university students are increasingly aware of AI technologies and have begun to incorporate AI tools into their learning processes, especially after the emergence of generative AI systems like ChatGPT in late 2022. A study by Tran (2023) reported that over 70% of surveyed students had used AI-powered applications for academic purposes, such as language translation, essay writing, and coding assistance. However, the study also found that most students use these tools passively focusing on convenience rather than active knowledge construction. This reflects a broader issue of **low** digital literacy and limited understanding of ethical AI use among students, which can potentially lead to academic integrity problems (Pham & Le, 2023).

Institutionally, Vietnamese universities are still developing clear frameworks and guidelines for AI integration. While some private universities have invested heavily in AI research centers and partnerships with technology companies, many public universities lack the infrastructure and human resources necessary to adopt AI at scale (Nguyen & Do, 2022). Furthermore, the absence of standardized policies concerning data governance, ethics, and pedagogical design has hindered consistent implementation across institutions. These challenges highlight the need for coordinated national strategies that address both technological readiness and educational objectives.

Nevertheless, the potential of AI in improving learning efficiency is widely acknowledged. Studies have shown that AI can provide Vietnamese students with more interactive and adaptive learning experiences, promote self-directed learning, and support the development of critical thinking skills (Phan, 2023; Nguyen & Do, 2022). The ongoing expansion of AI-related initiatives, combined with the rapid growth of Vietnam's digital economy, suggests a favorable environment for future research and implementation. However, to ensure effective and responsible use of AI, higher education institutions must prioritize digital literacy training, ethical guidelines, and evidence-based pedagogical frameworks tailored to the Vietnamese context.

4. Conclusion

Artificial Intelligence (AI) has become a transformative force reshaping higher education globally, offering opportunities to enhance learning efficiency through personalization, automation, and data-driven decision-making. This study examined the application of AI in improving learning efficiency among Vietnamese university students, situating the discussion within the broader framework of digital transformation in education. The findings from the literature and contextual review highlight that AI technologies—such as intelligent tutoring systems, learning analytics, and large language models—have demonstrated significant potential in improving academic performance, fostering motivation, and supporting self-regulated learning (Chen et al., 2020; Kasneci et al., 2023; Luckin et al., 2016). However, these benefits are not automatically achieved; they depend heavily on institutional readiness, digital literacy, ethical awareness, and pedagogical innovation.

In the Vietnamese context, the application of AI in higher education has gained increasing momentum, particularly following the government's *National Digital Transformation Program Toward 2030* (Vietnamese Government, 2020). Universities such as FPT, Vietnam National University, and Phenikaa have pioneered AI-based systems in teaching and administration, signaling a positive trend toward modernization. Yet, the overall implementation remains fragmented and uneven. Many institutions still lack the necessary technological infrastructure, financial resources, and human capacity to integrate AI effectively (Phan, 2023; Nguyen & Do, 2022). Moreover, the absence of standardized frameworks for ethical AI use and data protection raises potential risks related to privacy and academic integrity. Although Vietnamese students increasingly use AI tools such as ChatGPT and Grammarly for study assistance, their engagement tends to be superficial and driven by convenience rather than deep cognitive learning (Tran, 2023). These findings suggest that while AI adoption is expanding, it remains at an early stage characterized by experimentation rather than strategic pedagogical integration.

To ensure that AI contributes meaningfully to educational improvement, several policy implications can be drawn. First, the Ministry of Education and Training (MOET) should establish a national framework for AI integration in education that includes ethical guidelines, data governance standards, and pedagogical principles. This framework would help ensure consistency and accountability across institutions while fostering innovation in a safe and ethical manner. Second, universities must invest in digital infrastructure and capacity building. Without reliable internet access, modern devices, and trained educators, the potential of AI to improve learning outcomes cannot be fully realized. Faculty development programs focusing on AI literacy, data analysis, and educational design should be prioritized to enable teachers to utilize AI tools effectively in classroom instruction.

Third, AI literacy should be embedded in university curricula across disciplines. Students must understand not only how to use AI tools but also how to engage with them critically and ethically. Courses on data ethics, algorithmic transparency, and responsible AI usage should be introduced to equip students with the competencies required for the digital economy. Fourth, collaboration between academia and industry should be strengthened to promote innovation and contextual adaptation. Partnerships with technology companies and international institutions can facilitate knowledge exchange, co-development of

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AI learning platforms, and real-world applications that fit the Vietnamese educational context. Finally, higher education institutions should encourage more empirical research on AI in education, focusing on measuring its pedagogical impact, cost-effectiveness, and long-term sustainability. Evidence-based research will provide policymakers with valuable insights to refine strategies for nationwide AI integration.

In conclusion, the integration of AI into Vietnam's higher education system represents both an opportunity and a challenge. When appropriately implemented, AI can empower students to learn more efficiently, foster self-directed learning, and prepare them for the demands of the knowledge-based economy. However, without strategic policy support, adequate infrastructure, and ethical safeguards, the potential of AI could be undermined by misuse, inequality, and dependence on technology. Therefore, it is essential for policymakers, educators, and institutions to collaborate in building an inclusive, ethical, and sustainable AI-driven educational ecosystem. By aligning technological innovation with pedagogical goals and national development strategies, Vietnam can ensure that AI becomes a catalyst for educational excellence and social progress rather than a source of division or academic superficiality.

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