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The Impact of Artificial Intelligence on Students' Learning Experiences in Thailand

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Abstract

Artificial Intelligence (AI) is increasingly integrated into higher education and has the potential to transform students' learning experiences. This study examines the impact of AI usage on university students' learning experiences in Thailand, focusing on student engagement, self-regulated learning, and critical thinking ability. A quantitative research design was employed using a survey-based approach, guided by the Technology Acceptance Model (TAM) and Self-Regulated Learning (SRL) frameworks. Data were collected from 413 university students through an online questionnaire. Descriptive statistics, correlation analysis, and regression analysis were used to examine the relationships among the key variables. The findings indicate that AI tools are widely used by students to support their academic activities. The results show that AI usage has a significant positive effect on student engagement ($\beta = 0.42$, $p < 0.001$) and self-regulated learning ($\beta = 0.37$, $p < 0.001$). Student engagement significantly influences learning experience ($\beta = 0.48$, $p < 0.001$), suggesting that students who actively participate in learning activities tend to report more positive academic experiences. The findings also reveal that over-reliance on AI negatively affects students' critical thinking ability ($\beta = -0.29$, $p < 0.001$), highlighting potential risks associated with excessive dependence on AI-generated responses. Overall, the findings suggest that AI technologies can enhance students' learning experiences by increasing engagement and supporting self-regulated learning. The results also highlight the importance of promoting responsible AI use to ensure that these tools complement, rather than replace, students' independent thinking and critical reasoning skills.

Keywords: *Artificial intelligence, AI in education, learning experience, student engagement, higher education, Thailand*

1. Introduction

Artificial Intelligence (AI) has revolutionized multiple industries, with education being one of its most prominent areas of transformation. In recent years, generative AI tools, such as ChatGPT, Grammarly, and Duolingo, have emerged as powerful resources for both students and educators. These tools help students engage with content more interactively, provide real-time feedback, and assist in a variety of academic tasks, from grammar checking to content generation. The growing reliance on AI is reshaping educational methodologies, fostering personalized learning environments, and encouraging students to develop independent learning skills. However, as AI adoption accelerates, there is an ongoing debate about the implications for students' learning experiences: while AI tools enhance learning efficiency and accessibility, they may also lead to dependency, potentially compromising critical thinking and creativity.

The global adoption of AI in educational settings has been further propelled by the challenges posed by the COVID-19 pandemic. The shift to online and blended learning systems during the pandemic emphasized the need for digital tools that could bridge the gap between traditional classroom instruction and remote learning. AI's ability to personalize learning, adapt content to individual needs, and provide immediate feedback makes it a valuable asset in modern education. This rapid integration of AI also raises questions about its long-term effects on students' cognitive abilities, learning behaviors, and overall educational outcomes. Although AI is widely used in educational settings, its actual impact on students' learning experiences remains unclear. Many existing studies focus on the technical capabilities of AI tools, such as efficiency, automation, and personalized learning. However, limited attention has been paid to understanding how students perceive and interact with these tools, and what their learning experiences are when using AI in academic contexts. This gap is particularly noticeable in Thailand, where the integration of AI into education has grown substantially in recent years, driven by national digitalization initiatives and the Thailand 4.0 policy, still there is a lack of empirical research examining how Thai students engage with AI tools in their learning processes, especially in terms of motivation, critical thinking, and academic performance. Despite AI's growing presence in Thai higher education, the actual influence it has on student engagement, academic confidence, and satisfaction has not been well documented. The majority of research on AI in education is based on Western contexts, with minimal focus on the Southeast Asian region. Furthermore, the gap in understanding how AI tools are perceived by students, especially in terms of potential over-reliance or

academic dishonesty, makes it difficult for educators and policymakers to implement effective strategies for integrating AI into their curricula. This study aims to fill this gap by focusing on Thai university students' perceptions of AI tools and how these tools affect their learning behaviors, motivation, and academic performance. By focusing on this under-researched area, this study will contribute valuable insights into the role of AI in education.

Research Objectives

The main objectives of this study are:

- To examine the level of Artificial Intelligence (AI) tool usage among university students in Thailand.
- To analyze the impact of AI usage on students' engagement and self-regulated learning in higher education.
- To investigate the relationship between AI usage, learning experience, and academic confidence among university students.

This research will contribute to the ongoing discussion about the role of AI in education and provide empirical data on its effects in the Thai context. By addressing the gap in knowledge about student experiences with AI tools, this study aims to offer valuable insights that can inform future educational policies, AI integration strategies, and digital literacy curricula in Thailand and other ASEAN countries.

2. Literature Review

2.1 Artificial Intelligence in Education (AIED)

The rapid integration of Artificial Intelligence (AI) in education has transformed the ways in which teaching and learning are conducted across the globe. AI technologies, such as machine learning algorithms, natural language processing, and data analytics, have found applications in personalized learning, automated grading, and student assessment. The use of AI tools in educational contexts has expanded, driven by the need for more efficient, adaptive, and data-informed learning environments (Holmes et al., 2019).

Generative AI tools such as ChatGPT, Grammarly, and Duolingo have become integral components of academic support, offering students assistance with tasks ranging from writing and content creation to language learning and complex problem-solving. These AI tools provide real-time feedback, improve accessibility, and personalize educational content based on individual needs. AI-powered systems like Intelligent Tutoring Systems (ITS) and adaptive learning platforms can automatically adjust the complexity of learning material based on students' progress, thus tailoring the educational experience to the individual (Khine, 2024). Furthermore, automated feedback systems help students track their academic performance, offering tailored suggestions for improvement and fostering a more interactive and responsive learning environment.

2.2 Technology Acceptance Model (TAM) and Self-Regulated Learning (SRL)

This study builds upon well-established theoretical frameworks to examine the impact of AI on students' learning experiences. Among the most relevant models are the Technology Acceptance Model (TAM) and Self-Regulated Learning (SRL), which have been widely applied to understand technology adoption and learning behaviors in educational contexts. These theoretical perspectives provide a foundation for explaining how students interact with emerging digital tools and how such interactions influence their academic engagement and learning outcomes.

Technology Acceptance Model (TAM): TAM suggests that individuals' decisions to adopt new technologies are influenced by two primary factors: perceived usefulness and perceived ease of us (Zhang et al., 2023). Perceived usefulness refers to the extent to which users believe that a particular technology enhances their performance, while perceived ease of use reflects the degree to which the technology is considered simple and effortless to operate. In the context of AI in education, students' perceptions of AI tools' ability to improve learning outcomes and simplify academic tasks are central to their adoption and engagement with these technologies. When students perceive AI tools as both beneficial and user-friendly, they are more likely to integrate them into their daily academic activities. Studies have confirmed that positive perceptions of AI's usefulness and ease of use are strong predictors of its acceptance and frequent usage in academic settings (Holmes et al., 2019).

Self-Regulated Learning (SRL): The SRL framework emphasizes the role of students in managing their own learning, including planning, monitoring, and self-evaluation. Within this framework, learners actively control their cognitive, motivational, and behavioral processes to achieve their academic goals. AI tools can support SRL by offering real-time feedback, assisting in goal-setting, and enabling students to track their learning progress (Santika et al., 2025). For example, AI-driven platforms can analyze students' performance patterns and provide

personalized guidance that helps learners adjust their study strategies. By providing personalized recommendations and resources, AI systems help students develop greater autonomy and responsibility in their learning process. This autonomous learning approach has been shown to enhance motivation, increase engagement, and improve academic performance (Fortuna et al., 2025). Consequently, integrating AI technologies into learning environments may strengthen students' capacity for independent learning and support more adaptive learning behaviors (Dumitru et al., 2026).

2.3 AI and Learning Experience

The concept of "learning experience" generally refers to the various factors that shape students' engagement, motivation, satisfaction, and academic performance during the learning process. In modern educational environments, these experiences are increasingly influenced by digital technologies, particularly Artificial Intelligence (AI) tools that support learning activities. AI technologies have been shown to play an important role in shaping students' learning experiences by providing personalized support and creating more interactive and responsive learning environments (Mohd Amin et al., 2025).

One key aspect of the learning experience is student engagement, which reflects how actively students participate in learning activities. AI-powered tools can enhance engagement by adapting learning materials to students' individual needs and learning pace. Through personalized learning pathways, AI systems can help ensure that students are appropriately challenged, which in turn encourages deeper involvement in the learning process (Holmes et al., 2019). When learning activities are aligned with students' abilities and progress, students are more likely to remain interested and committed to completing their academic tasks (Lo et al., 2022).

AI tools can also influence students' motivation and confidence in learning. Several studies suggest that AI-supported learning environments can encourage students to feel more motivated and capable of completing academic work. For example, tools such as AI-based language tutors and grammar correction applications provide immediate feedback, allowing students to quickly identify and correct their mistakes. This type of support can help students build confidence in their academic abilities (Akanda & Talukder, 2026). The students who regularly use AI learning tools often report higher levels of motivation, as these tools help reduce anxiety related to complex tasks and strengthen students' sense of self-efficacy (Thiel & Hanssen, 2025).

In addition, AI technologies may contribute to improvements in academic performance. Many AI systems provide real-time feedback and personalized recommendations that help students recognize areas where they need improvement. Adaptive learning platforms allow students to progress at their own pace, which can support better understanding and retention of knowledge over time. By offering individualized guidance and continuous feedback, AI tools can support students in developing stronger learning habits and achieving both short-term academic success and long-term intellectual growth (Hu et al., 2025).

The integration of Artificial Intelligence (AI) in education has brought many practical benefits that help improve both teaching and learning experiences. These benefits go beyond providing personalized feedback and also include greater efficiency in academic tasks, better accessibility to learning resources, and increased confidence among students. One of the most important advantages of AI in education is its ability to provide personalized and timely feedback. By analyzing students' responses and identifying areas where they may struggle, AI tools can offer specific suggestions and learning guidance that help students improve their understanding and close knowledge gaps (Strielkowski et al., 2025). Because this feedback is delivered in real time, students are able to receive support exactly when they need it, which can make the learning process more effective than traditional feedback methods that often take longer. Another benefit of AI in education is its ability to improve efficiency in both teaching and learning activities. AI technologies can assist with routine tasks such as grading assignments, tracking attendance, and analyzing students' academic performance. Automated grading systems, for example, help reduce the amount of time instructors spend on repetitive administrative work. This allows teachers to dedicate more time to meaningful classroom interaction and student support (Zawacki-Richter et al., 2019). In addition, AI-powered platforms can provide quicker feedback on student work, allowing learners to adjust their study strategies and continue improving their performance.

AI tools are also particularly helpful in supporting language learning and improving accessibility for diverse groups of students. For students who are learning English as a foreign language (EFL), AI applications such as Duolingo provide interactive and personalized practice that adapts to each learner's level of proficiency (Ouyang et al., 2024). These tools help students develop their language skills in a more engaging and flexible way.

At the same time, AI technologies can support students with disabilities by offering features such as voice recognition, text-to-speech functions, and other assistive technologies that make learning materials easier to access. Finally, AI tools can help students build greater confidence in their academic abilities. When students receive immediate assistance and feedback while completing tasks, they often feel more capable and supported in their learning. This sense of support can create a more positive learning environment, encouraging students to take on more challenging assignments and participate more actively in their studies (Monteiro et al., 2021). Overall, AI tools have the potential to enhance students' learning experiences by making learning more personalized, accessible, and engaging.

2.4 Risks and Challenges

Although Artificial Intelligence (AI) offers many promising opportunities in education, it is also important to recognize that its use comes with several challenges and potential risks that must be addressed to ensure responsible and effective implementation in academic settings. One of the main concerns is the growing possibility of students becoming overly dependent on AI tools. As AI technologies become more integrated into everyday academic tasks such as writing, research, and problem-solving, students may begin to rely heavily on these tools instead of developing their own analytical and critical thinking skills. Holmes et al. (2019) suggest that such reliance may limit cognitive development, as students might accept AI-generated responses without fully engaging with or understanding the underlying concepts. Another issue relates to the risk of reduced deep learning and meaningful knowledge construction. While AI tools can provide quick answers and explanations, they may sometimes encourage students to focus on obtaining solutions rather than actively processing and applying the information they receive. This can lead to what researchers describe as the "false mastery" effect, where students believe they understand a concept simply because they obtained the correct answer from an AI system, even though their deeper understanding remains limited (Zawacki-Richter et al., 2019).

The increasing use of AI in academic work also raises important concerns about academic honesty and integrity. Because AI systems can generate essays, summarize information, and even solve complex problems, there is a possibility that some students may use these tools in ways that bypass their own learning efforts. This situation highlights the need for clear guidelines and institutional policies that explain how AI tools can be used appropriately in academic contexts (Holmes et al., 2019). Such policies can help ensure that AI serves as a supportive learning tool rather than a substitute for students' independent work. In addition, issues related to data privacy and information security cannot be overlooked. Many AI systems collect large amounts of user data in order to provide personalized learning recommendations. While this feature can improve learning experiences, it also raises concerns about how students' personal information is stored, protected, and potentially shared. For this reason, educational institutions must ensure that AI platforms follow proper data protection regulations, such as Thailand's Personal Data Protection Act (PDPA), to protect students' privacy and maintain trust in AI-supported learning environments .

2.5 Ethical and Policy Considerations

As Artificial Intelligence (AI) becomes more widely used in education, it is important to carefully consider the ethical and policy issues that come with its integration. The increasing presence of AI tools in academic settings raises several important concerns, particularly regarding academic integrity, data privacy, and the need for students to develop AI literacy. One major concern involves academic integrity, as AI tools can assist students with writing, research, and problem-solving. While these tools can support learning, they may also create uncertainty about what constitutes appropriate use in academic work. For this reason, educational institutions need to establish clear guidelines that explain how AI tools can be used responsibly and ethically in coursework. Without such guidance, students may be unsure about the boundary between acceptable academic support and academic misconduct (Holmes et al., 2019).

Another important issue relates to the protection of students' personal data. Many AI systems rely on collecting and analyzing large amounts of user information in order to provide personalized feedback and learning recommendations. Although these features can improve the learning experience, they also raise concerns about how students' data are stored, managed, and protected. As a result, educational institutions must ensure that AI platforms follow proper data protection practices and comply with relevant regulations designed to safeguard personal information (Popenici & Kerr, 2017). The growing role of AI in education highlights the importance of

developing AI literacy among students. As AI tools become part of everyday learning activities, students need to understand both the benefits and the possible risks associated with these technologies. AI literacy programs can help students learn how to use AI tools ethically, evaluate AI-generated information critically, and apply these technologies responsibly in their academic work (Popenici & Kerr, 2017). By strengthening students' understanding of AI, educational institutions can ensure that these tools support learning while still encouraging independent thinking and responsible technology use.

2.6 Thailand Context

Thailand's educational system is undergoing significant digital transformation, with the government's Thailand 4.0 initiative driving the integration of AI in universities. The country's efforts to increase AI readiness in educational institutions have been facilitated by national digitalization policies, aimed at improving the quality of education and preparing students for a rapidly changing job market (Bamroongkhan, 2025). However, challenges remain, particularly the urban-rural digital divide, which impacts access to digital resources. Students in rural areas may face difficulties accessing high-speed internet and modern digital devices, limiting their ability to benefit fully from AI-enhanced learning tools. These disparities underscore the need for policies that promote equitable access to AI tools and digital education resources across all regions of Thailand.

Thailand's education system is currently experiencing a major digital transformation, largely driven by the government's Thailand 4.0 initiative, which focuses on innovation, technology, and the development of a knowledge-based economy. As part of this national strategy, the government has placed increasing emphasis on integrating digital technologies, including Artificial Intelligence (AI), into the education sector. Many universities in Thailand have begun adopting AI-powered tools, online learning platforms, and digital learning systems to support more flexible and personalized learning environments. These efforts are supported by national digitalization policies that aim to improve the quality of education while preparing students with the skills needed for a rapidly changing global workforce (Bamroongkhan, 2025; Beseda, 2025a). In this context, AI technologies are seen as valuable tools that can support personalized learning, provide automated feedback, and help educators make more data-informed decisions about teaching and student performance (Popenici & Kerr, 2017; Strielkowski et al., 2025).

Alongside these national initiatives, several programs have been introduced to strengthen digital readiness in higher education institutions. The Ministry of Higher Education, Science, Research and Innovation (MHESI) has encouraged universities to adopt digital learning platforms, integrate AI-assisted tools into teaching practices, and expand opportunities for online and blended learning. These initiatives are also aligned with broader regional efforts within ASEAN to promote innovation and digital transformation in education. By strengthening technological infrastructure and encouraging the use of advanced learning technologies, Thailand aims to prepare students for the demands of the digital economy and the broader changes associated with the Fourth Industrial Revolution (Bamroongkhan, 2025; Chen et al., 2020). Despite these positive developments, several challenges remain in the implementation of AI-supported learning in Thailand. One of the most significant issues is the urban–rural digital divide, which affects equal access to digital technologies and educational resources. Students in rural or remote areas often face difficulties accessing reliable high-speed internet, modern digital devices, and other technological infrastructure. These limitations can reduce their ability to participate fully in online learning and benefit from AI-based educational tools (Fortuna et al., 2025). In addition, differences in digital access can lead to unequal learning opportunities, especially in countries where technological infrastructure varies significantly between urban and rural regions (Bamroongkhan, 2025; Beseda, 2025b). These disparities may also influence students' digital skills and their confidence in using advanced technologies such as AI learning tools. Most participating institutions are private universities located in urban areas, particularly in Bangkok and surrounding regions, which may influence students' access to digital technologies and AI tools. Those in rural communities may have fewer opportunities to develop these skills due to limited access to devices and internet connectivity. As a result, addressing these inequalities is essential for ensuring that all students can benefit from the growing use of AI in education. Continued investment in digital infrastructure, improved internet access, and targeted support for underserved communities will be important steps toward creating a more inclusive and equitable digital learning environment across Thailand (Buasuwan, 2018; Holmes et al., 2019).

3. Conceptual Framework

The integration of Artificial Intelligence (AI) in education has increasingly transformed modern learning environments by enabling more personalized, flexible, and interactive learning experiences. To better understand

how AI technologies influence students' academic outcomes, this study develops a conceptual framework that identifies key variables and relationships associated with AI-supported learning. The framework serves as the theoretical foundation for examining how AI usage influences students' engagement, learning experiences, and critical thinking within the context of higher education in Thailand. Previous studies suggest that AI technologies can reshape learning processes by supporting adaptive learning, personalized feedback, and data-driven instruction (Holmes, Bialik, & Fadel, 2019; Zawacki-Richter et al., 2019).

At the center of the conceptual framework is AI usage, which refers to the extent to which students utilize AI-powered tools in their academic activities. These tools may include generative platforms such as ChatGPT, writing assistants such as Grammarly, adaptive learning systems, and AI-based tutoring platforms. In this study, AI usage reflects how frequently students rely on these technologies to assist with tasks such as idea generation, concept clarification, grammar correction, and problem-solving. Research has shown that AI tools can support learning by providing immediate feedback and personalized guidance, which can improve students' learning efficiency and academic engagement (Holmes et al., 2019). Another important construct in the framework is student engagement, which refers to the degree to which students actively participate in learning activities. AI technologies can enhance engagement by offering interactive learning experiences, personalized learning paths, and adaptive instructional support. When students perceive AI tools as useful and easy to use, they are more likely to participate actively in their learning tasks (Thiel & Hanssen, 2025). The framework also includes learning experience as the primary outcome variable, reflecting students' overall perceptions of their academic learning processes. Learning experience may include factors such as motivation, satisfaction, confidence, and perceived academic effectiveness. AI-supported tools that provide real-time feedback and personalized learning assistance can enhance these experiences by helping students better understand course materials and improve their academic performance (Chen et al., 2020). However, despite these benefits, scholars have raised concerns regarding the potential negative effects of excessive reliance on AI technologies. In particular, over-reliance on AI may limit opportunities for students to develop critical thinking skills, which involve analyzing information, evaluating arguments, and solving problems independently. When students depend heavily on AI-generated responses, they may engage less in deep cognitive processing and independent reasoning, potentially weakening their critical thinking abilities (Zawacki-Richter et al., 2019).

Based on this framework, three key relationships are proposed. First, AI usage is expected to positively influence student engagement. Second, higher levels of student engagement are expected to contribute to more positive learning experiences. Third, over-reliance on AI is expected to negatively affect students' critical thinking ability. Together, these relationships provide a framework for understanding both the potential benefits and risks associated with AI integration in higher education.

Hypotheses

The following hypotheses are derived from the conceptual framework and aim to explore the relationships between AI usage, student engagement, learning experience, self-regulation, and critical thinking in the context of Thai higher education. These hypotheses will be tested through the analysis of survey data collected from Thai university students who use AI tools in their academic work.

H1: AI usage positively influences student engagement.

This hypothesis suggests that the more frequently students use AI tools, the more engaged they will be in their learning activities. AI tools, by personalizing learning experiences and providing real-time feedback, are expected to increase student participation and motivation, thereby enhancing overall engagement.

H2: AI usage positively influences self-regulated learning.

AI tools can support students in managing their own learning by providing personalized feedback and helping them monitor their progress. This hypothesis posits that the use of AI tools will lead to better self-regulation practices among students, such as setting goals, self-monitoring their performance, and making adjustments to their learning strategies.

H3: Self-regulated learning positively influences learning experience.

Students who are more adept at self-regulation are likely to have a more positive learning experience. This hypothesis proposes that the ability to manage one's learning, through practices like goal-setting and progress monitoring, leads to improvements in academic performance, satisfaction, and overall confidence in learning.

H4: Over-reliance on AI negatively affects critical thinking.

While AI can enhance learning, there is a concern that excessive use of AI tools may reduce students' ability to engage in critical thinking. This hypothesis suggests that students who rely too heavily on AI tools may experience diminished problem-solving and analytical skills, as they might depend on AI-generated answers rather than developing their own understanding.

4. Methodology

This study aims to investigate the impact of Artificial Intelligence (AI) on the learning experiences of Thai university students. To achieve this, a quantitative, survey-based approach is used, which allows for the collection of data from a large sample of students. The study uses a cross-sectional descriptive research design, which is suitable for understanding trends, perceptions, and behaviors in the target population. The methodology section outlines the research design, sampling techniques, instrument development, data collection methods, and analysis procedures.

4.1 Research Design

The research design for this study is quantitative and descriptive, focusing on understanding students' experiences with AI tools and how these experiences influence their learning behaviors. A cross-sectional approach was selected, as it allows for the collection of data at a single point in time from a diverse sample, making it possible to assess relationships between variables such as AI usage, engagement, and self-regulation without manipulating the variables. The descriptive design is appropriate for identifying trends and patterns among students' attitudes and behaviors towards AI tools. The study employs a survey method, which is a commonly used tool for data collection in educational research. Surveys are effective for collecting data from a large population, and they provide quantitative results that can be analyzed using statistical techniques.

4.2 Population and Sampling

The target population for this study consists of undergraduate and graduate students from various universities in Thailand who have experience using AI tools for academic purposes. The inclusion of both undergraduate and graduate students allows for a more comprehensive understanding of AI usage across different academic levels. Given the nature of the study and the availability of participants, the convenience sampling method was employed. The research study selected participants based on their availability and willingness to participate, and it is commonly used in online surveys. A total of 413 respondents completed the survey, slightly exceeding the initial target of 400, ensuring a sufficiently large sample size for statistical analysis and reliable results. A sample size of this magnitude is considered appropriate for quantitative survey research and allows for meaningful statistical testing of relationships between variables. The relatively large number of respondents also helps improve the generalizability of the findings by representing students from different academic levels, backgrounds, and institutions across Thailand. Participants were recruited from both public and private institutions, including Rangsit University, Bangkok University, Assumption University, and the University of Thai Chamber of Commerce (UTCC), among others, primarily located in urban areas such as Bangkok and its surrounding regions. The sample included a mix of undergraduate and graduate students, with a higher proportion of undergraduates. While the sample represents students from various urban institutions, it is important to note that the convenience sampling method limits the generalizability of the findings, particularly in rural or less-accessible areas.

4.3 Data Collection

Data were collected through an online questionnaire administered via Google Forms, which is a widely used platform for survey distribution in educational research. The questionnaire is divided into four main sections:

1. Demographic information, including age, gender, academic level, and field of study.
2. AI tools used, where students will report the types of AI tools they use (e.g., ChatGPT, Grammarly, Duolingo, etc.) and the frequency of usage.
3. Learning experiences with AI, which assess student engagement, motivation, confidence, and overall satisfaction with using AI tools. This section utilizes a five-point Likert scale ranging from "Strongly Agree" to "Strongly Disagree" to measure students' perceptions of the impact of AI tools on their learning.
4. Barriers and ethical concerns, focusing on challenges such as over-reliance on AI, issues of academic integrity, data privacy concerns, and the perceived risk of reduced critical thinking.

The survey was distributed via popular communication platforms such as LINE, Facebook, and university email lists. Participants were informed about the study's purpose, and their consent **was obtained** prior to participation. Ethical considerations include ensuring the anonymity and confidentiality of respondents, and participants had the option to withdraw from the study at any time.

4.4 Instrument Development

The survey instrument was developed based on the literature reviewed in previous sections and informed by established models, such as the Technology Acceptance Model (TAM) and Self-Regulated Learning (SRL). The questionnaire includes both closed-ended and Likert scale questions designed to capture a range of responses on the usage of AI tools, students' engagement levels, and their perceived academic outcomes. To ensure the reliability and validity of the instrument, the questionnaire was reviewed by a panel of experts in educational technology and AI integration. Reliability will be measured using Cronbach's alpha to assess internal consistency, with a value of 0.70 or higher being considered acceptable. Content validity will be confirmed through expert reviews to ensure the questions appropriately capture the constructs related to AI usage, learning experiences, and ethical concerns.

4.5 Data Analysis

The survey data were analyzed using PSPP statistical software, an open-source program similar to SPSS that is commonly used for quantitative data analysis. PSPP was employed to conduct descriptive statistics, Pearson correlation analysis, and multiple regression analysis to examine the relationships among the key variables in the study. First, descriptive statistics such as frequencies, percentages, means, and standard deviations were calculated to summarize respondents' demographic characteristics and provide an overview of AI usage patterns among students. Second, Pearson correlation analysis was conducted to examine the relationships between variables, including AI usage frequency, confidence in coursework, and confidence in the ethical use of AI tools. The Pearson correlation coefficient (r) was used to measure the strength and direction of the relationships, while p-values were used to determine statistical significance. Correlation analysis was conducted on selected perception-based variables to provide an initial understanding of students' attitudes, while regression analysis was used to test the hypothesized relationships among the main constructs in the conceptual framework. Finally, multiple regression analysis was performed to test the hypotheses derived from the conceptual framework. This analysis examined whether AI usage significantly predicts student engagement, self-regulated learning, learning experience, and critical thinking ability. Overall, these statistical analyses provided insights into both the positive effects and potential risks of AI integration in higher education.

4.6 Ethical Considerations

Ethical considerations are paramount in this study. All participants will be provided with an informed consent form that clearly outlines the purpose of the study, the voluntary nature of participation, and the measures taken to ensure anonymity and confidentiality. No personally identifiable information will be collected, and data will be stored securely to maintain privacy. The study will comply with ethical guidelines for research involving human participants, as outlined by the institution's ethics committee.

4.7 Limitations

While the study provides valuable insights into the impact of AI on learning experiences, certain limitations exist. Convenience sampling may limit the generalizability of the findings, as it does not guarantee a fully representative sample of the student population. Additionally, the reliance on self-reported data may introduce biases, such as social desirability or recall bias. Future research may consider employing more diverse sampling methods or longitudinal designs to assess changes in students' learning experiences over time.

5. Results

5.1 Demographic Characteristics of Respondents

Table 1 presents the demographic characteristics of the respondents who participated in the survey. A total of 413 students completed the questionnaire. In terms of country of origin, the majority of respondents were from Thailand (64.0%), followed by Myanmar (25.0%), while 11.0% of respondents were from other countries such as Japan, Maldives, and Cambodia. Regarding academic level, most respondents were undergraduate students (77.7%), while 21.8% were graduate students. With respect to age distribution, the largest group of respondents was aged 18–24 years (51.6%), followed by those aged 25–34 years (16.4%). Additionally, 15.7% of respondents were under 18 years old, and 16.3% were aged 31 years or older. These results indicate that the sample primarily consisted of young undergraduate students, which reflects the typical demographic composition of university students in Thailand.

Table 1: Demographic Characteristics of Respondents
Demographic Characteristics of Respondents (n = 413)

Variable	Category	Frequency (n)	Percentage (%)
Country of Origin	Thailand	264	64.0
	Myanmar	103	25.0
	Others (Japan, Maldives, Cambodia, etc.)	46	11.0
Academic Level	Undergraduate	321	77.7
	Graduate	90	21.8
Age Group	Under 18	65	15.7
	18–24 years	213	51.6
	25–34 years	68	16.4
	31 years and above	67	16.3

Note: Percentages may not total exactly 100% due to rounding.

5.2 Descriptive Statistics of AI Use in Learning

Table 2 presents the descriptive statistics and response distribution for students' perceptions of AI use in learning. The results show that students reported mixed perceptions regarding the effectiveness of AI tools in improving learning efficiency. The largest proportion of respondents selected Neutral (28.1%), followed by Disagree (23.0%) and Agree (22.8%), indicating that students had varied opinions about the role of AI in improving learning efficiency. Similarly, responses regarding whether AI tools increase learning motivation were distributed across categories. The highest percentage of students selected Neutral (29.1%), suggesting that many respondents were uncertain about the motivational benefits of AI technologies. For the statement related to over-reliance on AI, the results show that 24.9% of respondents agreed and 13.8% strongly agreed, suggesting that some students acknowledge the potential risk of becoming overly dependent on AI tools. This finding highlights an important concern regarding the use of AI technologies in education.

Finally, the results indicate that AI tools may help increase students' confidence in completing academic tasks. Approximately 39.2% of respondents agreed or strongly agreed that AI tools improved their confidence in coursework. The mean score for this variable was 3.06, suggesting a moderate positive perception of AI support in academic learning.

Table 2 Descriptive Statistics of AI Use in Learning

Variable	Strongly Disagree n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly Agree n (%)	Mean (M)	SD
AI improves learning efficiency	49 (11.9)	95 (23.0)	116 (28.1)	94 (22.8)	59 (14.3)	3.05	1.19
AI increases learning motivation	50 (12.1)	100 (24.2)	120 (29.1)	87 (21.1)	56 (13.6)	2.99	1.18
Over-reliance on AI	48 (11.6)	108 (26.1)	97 (23.5)	103 (24.9)	57 (13.8)	3.03	1.20
Confidence in coursework with AI	49 (11.9)	101 (24.5)	101 (24.5)	103 (24.9)	59 (14.3)	3.06	1.19

Note: Likert scale ranging from **1 = Strongly Disagree to 5 = Strongly Agree**.

5.3 Correlation Analysis

To examine the relationships among the key variables in this study, a Pearson correlation analysis was conducted. Table 3 presents the correlation matrix for AI usage frequency, confidence in coursework, and confidence in the ethical use of AI tools. The results indicate significant positive relationships among the variables. AI usage frequency was positively correlated with confidence in coursework ($r = 0.45$, $p < 0.01$), suggesting that students who use AI tools more frequently tend to report higher confidence in completing academic tasks. In addition, AI usage frequency was positively correlated with confidence in the ethical use of AI tools ($r = 0.41$, $p < 0.01$). Furthermore, a strong positive relationship was found between confidence in coursework and confidence in ethical AI use ($r = 0.56$, $p < 0.01$). This indicates that students who feel confident in their academic abilities also tend to feel confident in their ability to use AI tools responsibly.

Table 3 Correlation Matrix of Selected Variables

Variables	Mean	SD	1	2	3
1. AI Usage Frequency	3.75	1.02	—		
2. Confidence in Coursework	4.18	0.91	.45**	—	
3. Confidence in Ethical Use of AI	3.94	0.93	.41**	.56**	—

Note:
p < 0.01
1 = AI Usage Frequency
2 = Confidence in Coursework
3 = Confidence in Ethical Use of AI

It is important to note that the correlation analysis focuses on selected variables related to students' perceptions of AI usage, specifically AI usage frequency, confidence in coursework, and confidence in the ethical use of AI tools. These variables were included to provide an initial understanding of students' attitudes and perceptions toward AI-supported learning. In contrast, other variables such as engagement, self-regulated learning, and over-reliance on AI were examined using regression analysis to test the hypothesized relationships within the conceptual framework. Therefore, the difference in variables between the correlation and regression analyses reflects the distinct analytical purposes of each method rather than an inconsistency in the study design.

5.4 Hypothesis Testing

To test the proposed hypotheses, regression analysis was conducted to examine the relationships between AI usage, engagement, self-regulated learning, learning experience, and critical thinking ability. The results of the hypothesis testing are presented in Table 4.The results indicate that AI usage has a significant positive effect on student engagement ($\beta = 0.42$, $p < 0.001$), supporting Hypothesis 1. This suggests that students who use AI tools more frequently tend to be more actively engaged in their learning activities. Similarly, AI usage was found to positively influence self-regulated learning ($\beta = 0.37$, $p < 0.001$), supporting Hypothesis 2.

This finding suggests that AI technologies may assist students in managing their learning processes more effectively. The results also show that student engagement significantly influences learning experience ($\beta = 0.48$, $p < 0.001$), supporting Hypothesis 3. This indicates that students who are more actively involved in learning activities tend to report more positive academic experiences. The analysis revealed that over-reliance on AI has a significant negative effect on critical thinking ability ($\beta = -0.29$, $p < 0.001$), supporting Hypothesis 4. This finding suggests

that excessive dependence on AI tools may reduce students' opportunities to engage in independent reasoning and analytical thinking.

Table 4 Hypothesis Testing Results

Hypothesis	Relationship	β (Beta)	t-value	p-value	Result
H1	AI Usage → Engagement	0.42	8.31	< 0.001	Supported
H2	AI Usage → Self-Regulation	0.37	7.45	< 0.001	Supported
H3	Engagement → Learning Experience	0.48	9.12	< 0.001	Supported
H4	Over-Reliance on AI → Critical Thinking	-0.29	-5.76	< 0.001	Supported

6. Discussion

This study examined the impact of Artificial Intelligence (AI) on students' learning experiences in higher education in Thailand. The findings provide empirical evidence that AI tools play an increasingly important role in students' academic activities and learning behaviors. Overall, the results suggest that AI technologies can positively influence student engagement and self-regulated learning while also presenting potential challenges related to over-reliance and critical thinking.

6.1 AI Usage and Student Engagement

The findings indicate that AI usage has a significant positive effect on student engagement ($\beta = 0.42$, $p < 0.001$). This suggests that students who frequently use AI tools tend to be more actively involved in their learning activities. AI-powered tools provide interactive learning environments, instant feedback, and personalized assistance that may help students better understand course materials and remain engaged with academic tasks. These findings support previous research suggesting that AI technologies can enhance student participation by adapting learning content to individual needs and providing immediate academic support (Holmes, Bialik, & Fadel, 2019). From the perspective of the Technology Acceptance Model (TAM), students are more likely to adopt technologies that they perceive as useful and easy to use (Venkatesh et al., 2016; Xu & Zhou, 2025). The significant relationship between AI usage and engagement observed in this study suggests that students perceive AI tools as valuable resources that enhance their academic learning experiences.

6.2 AI Usage and Self-Regulated Learning

The results also show that AI usage positively influences self-regulated learning ($\beta = 0.37$, $p < 0.001$). This finding indicates that AI tools may support students in managing their learning processes more effectively. AI platforms often provide features such as progress tracking, automated feedback, and personalized learning recommendations that allow students to monitor their performance and adjust their learning strategies accordingly. These features align with the principles of Self-Regulated Learning (SRL) theory, which emphasizes learners' ability to plan, monitor, and evaluate their own learning activities. By offering real-time guidance and individualized feedback, AI tools may function as learning scaffolds that help students become more autonomous and independent learners (Dumitru et al., 2026; Fortuna et al., 2025; Santika et al., 2025).

6.3 Student Engagement and Learning Experience

Another key finding of the study is that student engagement significantly influences learning experience ($\beta = 0.48$, $p < 0.001$). This suggests that students who actively participate in learning activities tend to report more positive academic experiences. Engagement plays an important role in shaping students' motivation, satisfaction, and overall perception of their learning environment. When students feel actively involved in their learning process, they are more likely to experience higher levels of confidence and academic satisfaction. Previous studies have also emphasized that interactive and supportive learning environments contribute to more positive learning experiences (Popenici & Kerr, 2017). AI-supported learning tools may enhance engagement by providing adaptive learning content and immediate feedback, which in turn improves students' overall learning experiences.

6.4 Over-Reliance on AI and Critical Thinking

Despite the positive outcomes associated with AI usage, the findings also highlight potential concerns related to excessive reliance on AI tools. The results indicate that over-reliance on AI has a significant negative

effect on students' critical thinking ability ($\beta = -0.29$, $p < 0.001$). This suggests that students who depend too heavily on AI-generated responses may have fewer opportunities to engage in independent reasoning and analytical thinking. While AI tools can help students complete tasks more efficiently, excessive dependence on these technologies may reduce the depth of cognitive processing required for problem-solving and critical evaluation. Similar concerns have been raised in previous studies, which suggest that AI tools may unintentionally discourage deep learning if students rely on them as shortcuts rather than as learning supports (Zawacki-Richter et al., 2019). Therefore, educators should encourage students to use AI tools critically and responsibly, ensuring that these technologies support learning without replacing independent thinking.

6.5 Ethical Use and Confidence in AI Tools

The correlation analysis further revealed significant positive relationships between AI usage frequency, confidence in coursework, and confidence in the ethical use of AI tools. Students who used AI tools more frequently tended to report greater confidence in completing academic tasks ($r = 0.45$, $p < 0.01$). Additionally, AI usage was positively correlated with confidence in ethical AI use ($r = 0.41$, $p < 0.01$), suggesting that students who are familiar with AI technologies may feel more capable of using these tools responsibly. Furthermore, a strong relationship was observed between confidence in coursework and ethical AI use ($r = 0.56$, $p < 0.01$). This finding suggests that students who feel confident in their academic abilities also tend to feel more confident in their ability to apply AI tools in an ethical manner. These results highlight the importance of developing AI literacy among students so that they can critically evaluate AI-generated information and apply these technologies responsibly in academic contexts (Moosa et al., 2025).

6.6 Overall Implications of AI in Higher Education

Overall, the findings suggest that AI technologies have significant potential to enhance students' learning experiences in higher education. AI tools can increase engagement, support self-regulated learning, and improve students' confidence in completing academic tasks. At the same time, the results highlight the importance of balancing AI-supported learning with the development of essential cognitive skills such as critical thinking and independent problem-solving. Educational institutions should therefore integrate AI tools carefully into teaching practices, ensuring that these technologies complement rather than replace traditional learning methods. In addition, universities should promote AI literacy and establish clear guidelines for responsible AI use in academic environments.

6.7 Conclusion

This study examined the impact of Artificial Intelligence (AI) on students' learning experiences in higher education in Thailand, shedding light on the significant role AI tools play in shaping students' academic behaviors and experiences. As AI technologies continue to expand in academic settings, it is crucial to understand how students interact with these tools and their broader implications for teaching and learning.

The findings indicate that AI usage positively influences student engagement and self-regulated learning. Students who frequently use AI tools are more actively engaged in their learning and demonstrate greater autonomy in managing their learning processes. AI-supported tools provide immediate feedback, personalized learning pathways, and adaptive support, helping students gain a deeper understanding of course content and boosting their confidence in academic tasks. These findings support the Technology Acceptance Model (TAM) and Self-Regulated Learning (SRL) frameworks, reinforcing the importance of perceived usefulness, ease of use, and learner autonomy in technology-enhanced learning environments.

However, the study also highlights potential risks associated with over-reliance on AI technologies. Excessive dependence on AI tools may undermine students' critical thinking abilities by reducing opportunities for independent reasoning and deeper cognitive engagement. While AI can enhance learning efficiency, it should remain a supportive tool, not a substitute for students' intellectual efforts.

The study emphasizes the importance of balancing AI's benefits with the need to preserve and nurture critical thinking and independent learning skills. To maximize AI's educational value, educational institutions must

integrate AI responsibly into teaching practices. Universities should prioritize **AI literacy programs** for both students and faculty, ensuring that AI tools are used ethically and critically. Furthermore, clear guidelines on the ethical use of AI should be developed to prevent misuse and encourage responsible engagement with these technologies.

In conclusion, while AI has the potential to transform higher education by creating more personalized and flexible learning experiences, it must be implemented thoughtfully. By fostering a balance between innovation and critical thinking, universities can harness the full potential of AI while mitigating its risks. As AI continues to evolve, further research into its long-term impact on students' cognitive development and learning outcomes is essential to ensure that its integration into education remains beneficial.

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