

The Role of AI-Assisted Learning Tools in Personalized Learning and Adaptive Education

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Abstract: This study examines the role of AI-assisted learning tools in fostering personalised learning and adaptive education in higher education. With the increasing adoption of AI-powered applications such as ChatGPT, Grammarly, and intelligent tutoring systems, students benefit from tailored academic support, real-time feedback, and individualised learning pathways. Using a quantitative research design, this study collected data through an online survey distributed to university students across various disciplines. The findings indicate that AI-assisted learning tools significantly enhance student engagement and academic performance while supporting independent learning. However, challenges such as over-reliance on AI, ethical concerns regarding academic integrity, and data privacy issues remain critical considerations. Statistical analyses, including correlation and regression models, demonstrate a positive relationship between AI usage frequency and students' perceived learning effectiveness. The study concludes with recommendations for optimising AI integration in education, emphasising a balanced approach that combines AI with traditional pedagogical methods to enhance student learning outcomes while mitigating potential risks.

Keywords: *AI-assisted learning, personalised education, adaptive learning, student engagement, ethical considerations*

1. Introduction

Artificial intelligence (AI) integration in higher education is transforming traditional teaching and learning practices by enabling personalised learning experiences, adaptive instruction, and improved academic support. Tools such as ChatGPT, Grammarly, and Google Bard offer real-time feedback, grammar correction, and content summarisation, making them popular among students for academic writing, comprehension, and research (Sumartono et al., 2025; Jereb & Urh, 2024). These AI-powered tools cater to various learning needs and styles, enhancing inclusivity and academic engagement (Xiao et al., 2025). However, the rise of AI in education also brings ethical and pedagogical challenges, including concerns about academic integrity, data privacy, and potential algorithmic bias (Maphalala & Ajani, 2025).

In the Malaysian context, AI adoption in higher education is gaining traction, supported by initiatives from the Ministry of Higher Education and institutional-level digital transformation strategies. Malaysian universities have begun incorporating AI tools into teaching and learning practices, with a focus on digital literacy and innovation. Despite this progress, challenges persist regarding students' readiness, ethical awareness, and the balance between AI usage and independent critical thinking.

AI tools have the potential to enhance independent learning by offering students real-time feedback, personalised pathways, and opportunities for self-directed study (Taşkın, 2025; Zailani Iman et al., 2024). However, concerns have emerged about over-reliance on AI-generated content, which may reduce students' ability to think critically and diminish their academic confidence (Rodríguez Bermeo et al., 2025; Delello et al., 2025). The question arises whether these tools genuinely foster improved learning outcomes or merely facilitate task completion without deeper understanding.

Therefore, this study seeks to investigate how frequently AI tools are used by university students, for what purposes, and how students perceive their effectiveness in improving academic performance and fostering personalised and independent learning. Specifically, it explores these dimensions among Accounting and Business students who often rely on AI technologies for writing, financial analysis, and research. Understanding their perceptions and usage patterns will help identify the benefits and limitations of AI integration in Malaysian higher education.

The study addresses the following research questions:

- What is the frequency and purpose of AI-assisted learning tool usage among students?
- How do students perceive the effectiveness of AI tools in enhancing academic performance?
- How do AI tools contribute to personalised learning and independent study habits?

Literature Review

Artificial Intelligence in Higher Education

Artificial Intelligence (AI) is redefining the landscape of higher education by automating feedback, personalising learning, and enabling real-time academic support through tools like ChatGPT, Grammarly, and Google Bard (Luan & Tsai, 2021). In Malaysia, the Ministry of Higher Education has been promoting AI-based teaching tools under its Education Blueprint (2015–2025) to enhance digital competency among students and lecturers. AI implementation is increasingly evident in local universities through smart learning platforms and adaptive online content (Maphalala & Ajani, 2025).

However, ethical concerns such as academic integrity, data privacy, and dependency on automation are rising among Malaysian educators and students alike (Jereb & Urh, 2024; Kehinde-Awoyele & Adeowu, 2024). These developments necessitate further research on how students engage with AI, especially in developing countries where digital readiness varies widely (Kazimova et al., 2025).

Frequency of AI Tool Usage Among Students

The usage of AI-assisted tools varies across disciplines and regions. Studies show that more than 70% of university students globally rely on AI for writing support, content searches, and summarisation (Choi et al., 2025; Jain et al., 2025). In Malaysia, similar trends have been reported in business and technical faculties, where AI applications are used extensively for presentation scripting, language editing, and data simulation (Rodríguez Bermeo et al., 2025; Sami et al., 2025).

Frequent AI users tend to engage more in critical thinking and active learning processes, though this is contingent upon their AI literacy level (Delello et al., 2025). However, concerns around algorithmic bias and reduced self-reliance have led some institutions to call for stricter digital ethics training (Uppal & Hajian, 2024). These studies support

H1: *There is a significant positive relationship between the frequency of usage of AI-assisted learning tools and students' academic engagement.*

Primary Purposes of AI-Assisted Learning Tools

AI tools such as Grammarly and QuillBot are widely used to improve grammar, coherence, and structure in academic writing, especially among non-native English speakers (Panit, 2025). In Malaysia, a study by Fahira et al. (2024) found that over 65% of undergraduates use AI to generate essay outlines and summaries. Adaptive tools like AI-based search engines help streamline academic reading, which enhances comprehension efficiency (Hutapea et al., 2024).

However, dependency on AI for idea generation has also raised alarms, particularly when students substitute AI-generated answers for original thought (Cheng, 2024). While AI supports scaffolding for weaker students, it can also mask underlying learning deficiencies if overused (Salameh, 2024). These studies support

H2: *Students' perceptions of AI-assisted learning tools significantly improve their academic performance.*

AI and Personalised Learning

AI's ability to adapt content based on learner profiles creates highly personalised pathways. In Malaysia, UiTM and other public universities have piloted adaptive learning modules using LMS-integrated AI that offer quizzes, feedback, and learning suggestions tailored to individual progress (Zailani Iman et al., 2024). These tools are in line with Self-Determination Theory, which posits that autonomy, competence, and relatedness enhance intrinsic motivation (Deci & Ryan, 1985).

Despite the benefits, limitations such as low content diversity and algorithmic rigidity may reduce the richness of personalised learning, especially for interdisciplinary subjects (Li, 2025; Qushwa & Onia, 2024). These studies support

H3: *AI-assisted learning tools significantly enhance personalised learning experiences.*

AI and Independent Learning

AI-assisted tools foster independent learning by providing on-demand resources, feedback, and self-paced content (Zhao, 2025). In Malaysia, this aligns with post-pandemic learning shifts where students increasingly manage their academic progress through digital platforms (Sikka & Goel, 2024). Tools like ChatGPT and Socratic offer instant problem-solving guidance, reducing students' reliance on lecturer explanations (Senanayake et al., 2024).

Yet, a study by Rodríguez Bermeo et al. (2025) found that heavy reliance on AI weakens students' confidence in manual problem-solving and reduces deep knowledge retention. A balanced integration of AI is therefore recommended to ensure students develop both independence and critical reasoning (Fried & Alshibli, 2024). These studies support

H4: *AI-assisted learning tools contribute to increased student independence in learning.*

Student Perceptions of AI Tool Effectiveness

Student attitudes toward AI greatly affect adoption rates. When students perceive tools like Grammarly or ChatGPT as accurate and reliable, they are more likely to use them frequently and report improved academic outcomes (Gheřie et al., 2025). However, concerns around plagiarism, false information, and lack of originality remain barriers to trust (Otermans et al., 2025).

In Malaysia, the perception of AI varies based on academic discipline and digital exposure. Business students tend to report more positive experiences due to the practical application of AI in data analysis and communication tasks, while students in the humanities often express concern about the loss of creativity (Kehinde-Awoyele & Adeowu, 2024; Handayani et al., 2024). These studies support

H5: *Students' perceptions of AI tools influence their willingness to adopt AI-assisted learning and its effectiveness in improving academic performance.*

3. Methodology

Research Design

The study executed its research through surveys to measure outcomes related to undergraduate Accounting and Business Studies students. Using this approach, the researchers can achieve statistical generalization and discover connections between student learning results and their patterns of AI tool usage. The survey measured undergraduate student responses regarding their utilization frequency of AI tools alongside the effectiveness rating and academic participation and self-learning capacity. The research instrument consisted of a structured questionnaire that adopted tested instruments from AI-assisted learning literature, such as those found in Delello et al. (2025) and Zhao (2025). The questionnaire employed Likert scales between 1 (Strongly Disagree) and 5 (Strongly Agree) for item measurement. A group of twenty students participated in a pilot test to evaluate the clarity and reliability, together with content validity, of the instrument. Finally, the questionnaire was approved by two educational technology experts, along with receiving feedback from academic specialists in educational technology, before its final version was established.

Population and Sampling

The target population for this study consisted of undergraduate students enrolled in Accounting and Business-related programmes at a public university in Malaysia. Based on institutional records, the estimated student population across these programmes was approximately 2,100. To ensure diverse representation, a stratified random sampling technique was used based on year of study (First to Final year) and prior experience with AI tools (Frequent, Occasional, Rare users). Accounting and Business students were selected due to the frequent integration of AI tools in their coursework, particularly in writing, analysis, and digital literacy tasks, making them relevant for this study's objectives.

A total of 383 valid responses were obtained, fulfilling the sample adequacy requirements for a 95% confidence level and a 5% margin of error.

Data Collection Procedures

Primary data were collected via a Google Forms survey distributed through university digital platforms, course groups, and academic forums. The survey was voluntary and anonymous to encourage honest responses. Key areas of inquiry included demographics, frequency and purposes of AI tool usage, perceived effectiveness, and ethical concerns related to AI in education.

Data Analysis Techniques

The dataset was analysed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics (mean, frequency, standard deviation) were used to profile the participants and their responses. For hypothesis testing:

- Pearson correlation was used to examine relationships between the frequency of AI usage and academic engagement,
- Regression analysis tested the effect of AI perceptions on academic performance,
- Independent sample t-tests compared perceptions based on usage intensity,
- Chi-square tests evaluated the association between AI usage frequency and perceived independent learning.

This methodological framework enabled a comprehensive analysis and valid interpretation of the impact of AI-assisted tools on learning behaviour and outcomes.

4. Findings

The document's analysis includes frequency distributions, correlations, regression analysis, t-tests, and cross-tabulations related to AI-assisted learning tools and their impact on personalised learning and adaptive education.

Demographic Profile

The demographic analysis indicates a homogeneous respondent group, with 79.6% of participants falling within category 1 for age and only 0.3% in category 4, reflecting a skewed age distribution. Educationally, an overwhelming 97.4% belong to Category 1, indicating a uniform academic background, consistent with prior demographic research highlighting the importance of educational data in understanding learning behaviours (Nguyen-Kearns et al., 2024).

All these participants belong to category 2, which refers to their field of study, which is the study's focus on accounting and business students. Gender distribution lists a very high percentage (76%) for category 2 and 24% for category 1. Similarly, almost half of the distribution is in year 2 (35.5%) and year 3 (34.7%), accurately matching familiar studies (Bolatbekkyzy, 2023; Cole, 2022; Shareef, 2022).

Table 1: Demographic Profile

			Frequency	Per cent	Valid Percent	Cumulative Percent
Age	Valid	1.00	305	79.6	79.6	79.6
		2.00	77	20.1	20.1	99.7
		4.00	1	.3	.3	100.0
		Total	383	100.0	100.0	
Education	Valid	1.00	373	97.4	97.4	97.4
		2.00	10	2.6	2.6	100.0
		Total	383	100.0	100.0	
Field Study	Valid	2.00	383	100.0	100.0	100.0

Gender	Valid	1.00	92	24.0	24.0	24.0
		2.00	291	76.0	76.0	100.0
		Total	383	100.0	100.0	
Year of Study	Valid	1.00	59	15.4	15.4	15.4
		2.00	136	35.5	35.5	50.9
		3.00	133	34.7	34.7	85.6
		4.00	55	14.4	14.4	100.0
		Total	383	100.0	100.0	

Correlation Analysis (H1)

AI Usage Frequency and Critical Thinking Enhancement

A significant positive correlation was found between the frequency of AI usage and students' perceived enhancement of critical thinking (Pearson = 0.215, $p < 0.01$). This suggests that students who engage more frequently with AI tools perceive a more significant improvement in their analytical and problem-solving abilities.

However, research presents mixed findings on this issue. While some studies report that AI-supported multimodal learning environments enhance critical thinking (Wu et al., 2025), others argue that AI reliance can lead to cognitive offloading, particularly among younger users (Gerlich, 2025). Panit (2025) suggests that AI fosters cognitive flexibility, but excessive dependence may result in superficial understanding.

Table 2: Correlation Analysis

		Usage Frequency	Enhance Critical Thinking
Usage Frequency	Pearson Correlation	1	.215**
	Sig. (2-tailed)		.000
	N	383	383
Enhance Critical Thinking	Pearson Correlation	.215**	1
	Sig. (2-tailed)	.000	
	N	383	383

** . Correlation is significant at the 0.01 level (2-tailed).

Regression Analysis (H2)

Impact of AI Helpfulness on Academic Performance

The regression analysis suggests that AI helpfulness accounts for 8.6% of the variance in students' academic performance ($R^2 = 0.086$, $p = 0.000$). The standardised coefficient ($\beta = 0.294$, $p < 0.001$) confirms a positive relationship between AI perception and academic success.

These findings align with research highlighting AI's role in personalised learning and material absorption (Hendrawan et al., 2024; Lu et al., 2024). However, concerns about over-reliance persist, suggesting that AI should be supplementary rather than a replacement for traditional learning methods (Wang, 2024; Handayani et al., 2024).

Table 3: Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.294 ^a	.086	.084	1.04131

a. Predictors: (Constant), Usefulness of AI

Table 4: ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.081	1	39.081	36.042	.000 ^b
	Residual	413.128	381	1.084		
	Total	452.209	382			

a. Dependent Variable: How use of AI affect academic performance

b. Predictors: (Constant), How helpful AI

Table 5: Coefficients^a

Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.117	.296		7.143	.000
	Usefulness of AI	.429	.071	.294	6.003	.000

a. Dependent Variable: How the use of AI affected academic performance

Independent Sample T-Test (H3)

AI Usage and Independent Learning

The t-test results indicate a statistically significant difference in independent learning perceptions based on AI usage frequency ($t = -2.305$, $p = 0.024$). Students who frequently use AI (mean = 3.87) reported greater independent learning abilities compared to low-frequency users (mean = 2.75). This supports findings that AI personalises learning experiences, fostering self-directed study habits (Choi et al., 2025; Tlili et al., 2025). However, concerns about academic integrity and potential AI over-reliance require further examination (Talukder & Ahsan, 2025).

Table 6: Group Statistics

Usage Frequency	N	Mean	Std. Deviation	Std. Error Mean
1.00	4	2.7500	.50000	.25000
5.00	61	3.8689	.95700	.12253

Table 7: Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	1.724	.194	-2.305	63	.024	-1.11885	.48531	-2.08867	-.14903
Equal variances not assumed			-4.019	4.601	.012	-1.11885	.27841	-1.85360	-.38410

Cross-Tabulation (H4)

AI Usage Frequency vs. Perceived Independence

A Chi-square test ($\chi^2 = 65.518$, $p = 0.000$) confirms a significant association between AI usage frequency and students' perceptions of AI fostering independent learning. These findings align with Otermans et al. (2025),

who reported a positive correlation between AI attitudes and personalised learning benefits. However, Handayani et al. (2024) caution that AI may foster dependency, potentially reducing critical thinking.

Table 8: Case Processing Summary

	Valid		Cases Missing		Total	
	N	Percent	N	Percent	N	Percent
Usage Frequency *	383	100.0%	0	0.0%	383	100.0%
Encourage Independency						

Table 9: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	65.518 ^a	16	.000
Likelihood Ratio	61.259	16	.000
Linear-by-Linear Association	17.826	1	.000
N of Valid Cases	383		

a. 10 cells (40.0%) have expected count less than 5. The minimum expected count is .03.

Discussion of Results

The findings from this study provide valuable insights into the impact of AI-assisted learning tools on personalised learning and adaptive education. The discussion focuses on the implications of the results, their alignment with existing literature, and potential areas for further investigation.

AI Usage and Critical Thinking Enhancement

The statistical connection between students' AI utilisation frequency and their reported enhancement of important problem-solving capabilities proved significant and positive ($r = 0.215$, $p < 0.01$). Students who use AI learning tools frequently view them as valuable instruments to develop their analytical reasoning ability, together with their decision-making competencies. The research confirms past studies (Zawacki-Richter et al., 2019), which show that AI-based learning systems develop higher-order thinking skills with personalised feedback and problem-solving tasks and adaptive pathway design. The enhancement of critical thinking by AI requires investigation into its influence on long-term cognitive progress compared to students' tendency to use AI tools as their primary problem-solving method instead of thinking on their own. Qualitative studies should examine how students interact with AI recommendations as they either interact with the solutions directly or accept the suggestions.

AI Helpfulness and Academic Performance

Regression analysis indicated that students who perceive AI as helpful in learning tend to report better academic performance ($\beta = 0.294$, $p < 0.001$). Although the relationship is statistically significant, the relatively low R-Square value (0.086) suggests that AI helpfulness accounts for only a small portion of performance variation. This implies that while AI is beneficial, other factors such as study habits, motivation, and instructor support play a more substantial role in academic success.

Moreover, these findings suggest that AI tools serve as supplementary resources rather than replacements for traditional learning methods. The moderate effect size indicates that while AI helps students understand concepts more effectively, it does not necessarily lead to superior academic performance unless combined with active learning strategies. This supports the argument that AI should be integrated as an assistive tool rather than a standalone learning solution.

AI Usage and Independent Learning

Students who use AI learning tools frequently tend to recognize AI usage as a tool to advance independent study, according to a t-test analysis ($p = 0.024$). The data indicates that artificial intelligence applications can help students learn by themselves at their own speed. The research backs the fundamental premise of the self-

determination theory (Deci & Ryan, 2000) since students develop autonomy through controlled decision-making in their educational activities. Student initiative in essential learning tasks could potentially decrease when they depend too heavily on AI-generated recommendations. Research in the future should analyze the dual impact of AI on students' independent learning development as opposed to its limitation of creative problem-solving through predetermined answers.

AI Usage and Perceived Learning Quality

An interesting result showed that students using AI did not relate to higher learning quality perceptions ($r = -0.079$, $p = 0.124$). Some college students perceive AI-driven education as less engaging than instructor-led discussions combined with peer collaboration because AI learning lacks depth, according to their perspective. The use of AI platforms in education continues to generate doubts about their tendency to reduce complexity in educational content, thus undermining deep cognitive learning, according to Selwyn (2020). The preferences of students regarding interactive discussions and AI-based independent modules affect the overall quality of their learning experience. Research should investigate if a combination of AI-assisted learning modules with instructor-led group lessons would create the most effective method for individualized teaching approaches.

AI and Personalised Learning Pathways

Students who used AI technology demonstrated a strong association with their belief that AI enables personalized learning, according to chi-square test results ($p < 0.001$). The use of AI tools in education enables personalized learning features by distributing adaptive instruction materials, together with assessment feedback and prospective guidance through measurement of individual scholarship advancement. AI-driven education develops its content to match various proficiency levels according to published research by Hwang et al. (2020). The effectiveness of AI in personalization relies on excellent AI algorithms as well as student involvement, combined with a variety of educational content. The delivery of AI systems that feature biased data together with restricted content diversity produces learning experiences that enhance solely narrow understanding instead of creating open-ended learning possibilities.

5. Conclusion and Implications for Educators and Institutions

Educational institutions with their educators need to increase the integration of AI tools in their programs through the simultaneous implementation of traditional teaching methods to create well-rounded professional competencies. The use of AI should boost educational content through interactive methods, such as discussions along with case studies, without aiming to replace these established teaching practices. The implementation of AI technology in the development of critical thinking skills needs a proper balance between technological integration levels. Professors need to teach students to study AI-generated material in depth by requesting rationale explanations for developing more advanced thinking capabilities. Educational institutions that provide learning experiences need to recognize AI constraints properly. The tracking of student feedback concerning AI-driven education helps educational institutions identify when AI systems cannot satisfy students' connection needs. Products developed by AI developers require interactive platforms that teach actively over machine-like, passive content delivery.

Conclusion

AI-assisted learning tools generate beneficial effects in creating individualized teaching strategies and enhancing students' critical thinking abilities and autonomy in research work. The academic achievements enabled by AI remain limited to tool-based functionality since quality learning requires student engagement and proper educational design methods supported by modern technology. Because students sometimes question whether AI can boost learning quality, educational staff must employ AI tools together with conventional educational practices. Research units must focus on various main areas to establish a better understanding of the AI educational framework operation. Regular research observation about AI's impact on academic outcomes is essential because it will produce conclusive evidence regarding the effects on long-term student academic achievement. Systematic research of combined AI and traditional learning methods will lead to finding optimal implementation scenarios between the two educational approaches. The evaluation of AI-driven learning systems must analyze their outcome on student ability to solve problems and be creative because these traits will shape their success in the future. Institutional AI implementation should utilize

technology to personalize learning materials instead of putting human educators at risk of obsolescence through the system.

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