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Conceptualizing AI dependency as the primary mechanism shaping students' academic impact

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Abstract

The rapid adoption of *Artificial Intelligence* (AI) in higher education has intensified debate regarding its impact on students' academic abilities, while previous studies have not adequately explained the mechanism through which AI use evolves into dependency that shapes academic outcomes. This study aims to examine the effects of AI dependency and the drivers of AI utilization on students' academic impact while proposing a conceptual model explaining their relationships. A quantitative explanatory survey was conducted involving 81 undergraduate students selected through purposive sampling, and the data were analyzed using multiple linear regression. The findings reveal that AI dependency has a positive and significant effect on students' academic impact ($\beta = 0.643$, $p < 0.001$), whereas the drivers of AI utilization have no significant partial effect ($p = 0.066$). The proposed model explains 57.0% of the variance in academic impact ($R^2 = 0.570$). This study contributes by developing a conceptual model demonstrating that academic consequences emerge through the transformation of AI utilization into dependency, which subsequently alters students' learning behavior.

Keywords: Artificial intelligence; AI dependency; Academic impact; Higher education; Learning behavior.

Abstrak

Perkembangan *Artificial Intelligence* (AI) di pendidikan tinggi memunculkan perdebatan mengenai dampaknya terhadap kemampuan akademik mahasiswa, sementara penelitian sebelumnya belum menjelaskan mekanisme bagaimana penggunaan AI berkembang menjadi ketergantungan yang memengaruhi aktivitas akademik. Penelitian ini bertujuan menganalisis pengaruh ketergantungan penggunaan AI dan faktor-faktor pendorong penggunaan AI terhadap dampak akademik mahasiswa serta menyusun model konseptual yang menjelaskan hubungan antarvariabel tersebut. Penelitian menggunakan pendekatan kuantitatif dengan desain *explanatory survey* terhadap 81 mahasiswa yang dipilih melalui *purposive sampling*, kemudian dianalisis menggunakan regresi linear berganda. Hasil penelitian menunjukkan bahwa ketergantungan penggunaan AI berpengaruh positif dan signifikan terhadap dampak akademik mahasiswa ($\beta = 0{,}643$; $p < 0{,}001$), sedangkan faktor pendorong penggunaan AI tidak berpengaruh signifikan secara parsial ($p = 0{,}066$). Model penelitian mampu menjelaskan 57,0% variasi dampak akademik mahasiswa ($R^2 = 0{,}570$). Penelitian ini berkontribusi dengan menawarkan model konseptual yang menjelaskan bahwa dampak akademik terbentuk melalui proses berkembangnya penggunaan AI menjadi ketergantungan yang kemudian mengubah perilaku belajar mahasiswa.

Kata Kunci: Artificial intelligence; Ketergantungan AI; Dampak akademik; Pendidikan tinggi; Perilaku belajar.

Introduction

The rapid development of *Artificial Intelligence* (AI) in recent years has fundamentally transformed the way students acquire information, complete academic tasks, and construct knowledge in higher education (Vieriu & Petrea, 2025). Various AI-powered applications, including generative chatbots and digital writing assistants, enable students to obtain instant responses, develop writing outlines, translate texts, and even assist with data analysis in a relatively short time (Kim, 2023). As a result, AI has become increasingly integrated into students' daily academic activities and is now widely regarded as an integral component of the modern learning ecosystem. The emergence of this technology not only enhances the efficiency of completing academic work but also reshapes how students interact with learning resources (Ansari & Khan, 2020). Consequently, AI is no longer perceived merely as a complementary innovation but has evolved into one of the primary instruments influencing the learning process in higher education.

Despite these advantages, the widespread adoption of AI has also sparked considerable debate regarding its implications for students' learning quality. AI is widely recognized for improving learning efficiency, accelerating task completion, and expanding access to academic information. However, its increasingly intensive use has raised concerns about the potential decline in critical thinking, creativity, independent learning, and the growing risk of academic integrity violations (Bittle & El-Gayar, 2025). Students who become accustomed to receiving instant answers may gradually reduce the processes of exploration, analysis, and reflection that have traditionally formed the foundation of higher education learning (Lee et al., 2024). Therefore, the primary concern surrounding AI in education is no longer whether the technology should be used, but rather how AI influences students' learning behavior and the academic consequences that arise from its continued use.

Although AI adoption among university students continues to increase, the mechanisms through which this technology influences academic ability remain insufficiently understood. Most existing discussions have focused on the intensity of AI use or its benefits in supporting learning activities, while the issue of AI dependency has received relatively limited scholarly attention (Bauer et al., 2025; Zheng et al., 2023). In practice, students who use AI occasionally differ substantially from those who rely on it as their primary resource for completing nearly all academic tasks. This distinction suggests that academic impact may not be determined solely by the frequency of AI use but rather by the degree of dependency that develops throughout the learning process. Accordingly, further investigation is needed to systematically explain the relationships among the drivers of AI utilization, AI dependency, and students' academic impact, thereby providing a more

comprehensive understanding of the mechanisms through which AI influences academic outcomes.

Research on the application of *Artificial Intelligence* in higher education has been conducted from various perspectives. Research by Chen et al. (2020) demonstrated that AI enhances learning efficiency, accelerates task completion, and facilitates faster access to academic information. Research by Gligorea et al. (2023) found that AI utilization contributes to improved learning productivity while supporting more flexible learning experiences. In contrast, research by Deep and Chen (2025) revealed that excessive AI use may reduce students' critical thinking, creativity, and independence in completing academic tasks. Research by Kofinas et al. (2025) further highlighted the increasing risk of academic integrity violations resulting from students' tendency to rely on AI without adequately evaluating or reflecting on the generated outputs. Nevertheless, most previous studies have treated AI utilization as an independent variable, without adequately explaining the mechanisms through which AI produces varying academic impacts among students.

Based on these considerations, this study aims to examine the influence of *Artificial Intelligence* dependency and the drivers of AI utilization on students' academic impact while developing a conceptual model that explains the mechanism through which such impacts emerge. Unlike previous studies that primarily emphasized the direct relationship between AI utilization and learning outcomes, this study positions AI dependency as the central mechanism linking AI utilization, changes in learning behavior, and students' academic consequences. Therefore, this research not only provides empirical evidence regarding the influence of AI dependency on students' academic impact but also offers a conceptual contribution through a model that enhances understanding of AI utilization dynamics in higher education. The findings are expected to serve as a valuable reference for developing educational policies, promoting AI literacy, and designing AI utilization strategies that continue to foster students' critical thinking, creativity, and academic integrity.

Method

This study employed a quantitative approach using an *explanatory survey* design to examine the influence of *Artificial Intelligence* (AI) dependency on students' academic impact (Creswell, 2014). This approach was selected because it enables the examination of causal relationships among variables based on empirical data collected through a *cross-sectional* survey. The study population consisted of active undergraduate students who had utilized AI in their academic activities. The sample was determined using a *purposive sampling* technique. Respondents were required to meet the following criteria: (1) active undergraduate students, (2) individuals who had used AI applications such as ChatGPT, Gemini, Copilot, or similar platforms for academic purposes, and (3) students who actively incorporated AI into their learning

activities (Hair et al., 2021). Based on these criteria, a total of 81 respondents were selected, providing a representative sample of AI users in higher education.

Data were collected using a structured online questionnaire administered through Google Forms. The research instrument was developed based on a comprehensive literature review and adapted to the context of AI utilization in students' academic activities. The *AI dependency* variable (X_1) was measured using six indicators, including the use of AI as the primary resource for completing academic tasks, frequency of AI use, diversity of AI applications across academic activities, dependence on AI for task completion, lack of confidence in one's own answers without AI confirmation, and the tendency to use AI as the first option when encountering academic problems. The *drivers of AI utilization* variable (X_2) was measured using three indicators: perceptions of AI's speed and comprehensiveness in providing answers, heavy academic workload, and peer influence on AI use. Meanwhile, the *students' academic impact* variable (Y) was assessed using six indicators, including reduced creativity in generating original ideas, diminished critical thinking skills, declining independent writing ability, the tendency to submit AI-generated work without attribution, reduced motivation to understand course materials in depth, and an increased risk of academic integrity violations. All items were measured using a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Prior to hypothesis testing, the instrument was evaluated through validity testing using the *Pearson Product-Moment* correlation and reliability testing using *Cronbach's Alpha* to ensure that each indicator measured the intended construct accurately and consistently (Astivia & Zumbo, 2019).

The data were analyzed using IBM SPSS Statistics through a series of sequential procedures. The analysis began with descriptive statistics to describe respondent characteristics and patterns of AI utilization, followed by instrument quality assessment through validity and reliability tests. Subsequently, classical assumption tests, including normality, multicollinearity, heteroscedasticity, and linearity, were conducted as prerequisites for multiple linear regression analysis. Hypothesis testing was performed using multiple linear regression, complemented by the coefficient of determination (R^2), partial significance (*t-test*), and simultaneous significance (*F-test*) to examine the influence of each independent variable on students' academic impact (Ghozali, 2006). The empirical findings were subsequently synthesized into a conceptual model explaining the mechanism through which AI utilization develops into dependency, alters students' learning behavior, and ultimately leads to various academic consequences. Accordingly, this study not only provides statistical evidence regarding the relationships among the investigated variables but also offers a conceptual model as a theoretical contribution to understanding the dynamics of *Artificial Intelligence* utilization in higher education.

Results and Discussion

High intensity of artificial intelligence utilization in students' academic activities

The rapid development of *Artificial Intelligence* (AI) has fundamentally transformed the way students engage in various academic activities (Sajja et al., 2024). Based on a questionnaire administered to 81 students from the Information Systems Study Program at Methodist University of Indonesia, the majority of respondents reported incorporating AI into their daily academic routines. Its use extends beyond information retrieval to include report writing, programming, content summarization, and the completion of various other academic tasks. These findings indicate that AI has evolved from being merely a supporting technology into a tool that substantially influences students' learning processes. To provide an overview of the research participants prior to further analysis of AI utilization patterns, respondent characteristics are presented according to gender, academic semester, and age group.

Table 1. Characteristics of the research respondents

Characteristics	**Category**	**Frequency (n)**	**Percentage (%)**
Gender	Male	46	56.8
	Female	35	43.2
Semester	Second Semester	16	19.8
	Fourth Semester	23	28.4
	Sixth Semester	26	32.1
	Eighth Semester	16	19.8
Age	18 years	8	9.9
	19 years	22	27.2
	20 years	27	33.3
	21 years	16	19.8
	>21 years	8	9.9

Source: Primary data processed by the authors, 2026.

As presented in Table 1, the respondents were predominantly male, accounting for 46 students (56.8%), while female respondents totaled 35 students (43.2%). In terms of academic standing, most respondents were enrolled in the sixth semester (26 students; 32.1%), followed by the fourth semester (23 students; 28.4%), whereas both the second and eighth semesters each contributed 16 respondents (19.8%). Regarding age, the largest proportion of respondents was 20 years old (33.3%), indicating that most participants had accumulated sufficient experience in university learning while actively utilizing digital technologies, including *Artificial Intelligence*, to support their academic activities.

Students' utilization of AI is reflected not only in their demographic characteristics but also in the platforms they choose to support their academic work. Various *Generative Artificial Intelligence* applications are employed to facilitate faster and more efficient task completion. Since each platform offers distinct capabilities, students tend to select applications that best suit their academic needs, ranging from literature searches and report writing to computer programming.

Table 2. The most frequently used artificial intelligence platforms among students

AI Platform	Frequency (n)	Percentage (%)
ChatGPT	42	51.9
Google Gemini	21	25.9
Microsoft Copilot	10	12.3
Claude AI	4	4.9
DeepSeek	4	4.9

Source: Primary data processed by the authors, 2026.

As shown in Table 2, ChatGPT was the most widely used AI platform, accounting for 51.9% of respondents, followed by Google Gemini (25.9%) and Microsoft Copilot (12.3%). In contrast, Claude AI and DeepSeek were used by only a small proportion of respondents. The dominance of ChatGPT suggests that students prefer platforms capable of generating rapid responses, offering ease of access, and supporting multiple academic needs within a single application. These findings indicate that students' preferences for AI platforms are influenced more by usability and comprehensive functionality than by the number of available alternatives.

Beyond the choice of AI platforms, the intensity of AI utilization also serves as an important indicator of the extent to which this technology has become integrated into students' academic activities. The more frequently AI is used, the greater the likelihood that it has become embedded in students' daily learning habits. Accordingly, this study also examined respondents' frequency of AI utilization throughout their academic activities.

Table 3. Intensity of artificial intelligence utilization in academic activities

Frequency of Use	Frequency (n)	Percentage (%)
Every day	28	34.6
4–6 times per week	25	30.9
2–3 times per week	18	22.2
Less than twice per week	10	12.3

Source: Primary data processed by the authors, 2026.

The results presented in Table 3 indicate that 34.6% of respondents used AI on a daily basis, while another 30.9% reported using AI four to six times per week. Consequently, more than two-thirds of the respondents regularly relied on AI to support their academic activities. This high level of utilization suggests that AI has become an integral component of students' learning processes rather than a technology employed only in specific situations. These findings further reinforce the initial indication that AI utilization among university students has evolved into a habitual academic practice, warranting further investigation into its influence on students' academic abilities.

The diverse intensity of AI utilization is also reflected in the purposes for which students employ this technology in academic activities. Students rely on AI not only to complete written assignments but also to support a wide range of learning activities that require time efficiency and convenient access to information. The broader the purposes of AI utilization, the more evident it becomes that this technology has evolved into an integrated learning tool supporting both information acquisition and technically oriented academic tasks.

Table 4. Purposes of artificial intelligence utilization in academic activities

Purpose of Use	**Frequency (n)**
Completing coursework	75
Searching for references	68
Writing programming code	59
Summarizing learning materials	52
Preparing presentations	39

Source: Primary data processed by the authors, 2026.

The findings in Table 4 demonstrate that completing coursework was the primary purpose of AI utilization, followed by searching for academic references and writing programming code. AI was also widely used to summarize course materials and prepare presentation content. These results indicate that AI has been integrated into nearly every stage of students' academic activities, from gathering information and understanding course materials to producing academic outputs. This pattern illustrates that AI has progressed beyond functioning as a supplementary tool and has become a technology that broadly supports the effectiveness of the learning process.

The extensive utilization of AI is further reflected in the descriptive statistical analysis of all research variables. The mean scores provide an overview of respondents' perceptions regarding AI dependency, the factors driving AI utilization, and its perceived impact on their academic performance. In addition, the categorization of AI dependency levels offers insight into the distribution of respondents according to the degree of dependency developed during their learning activities.

Table 5. Descriptive statistics of the research variables

Variable	Mean	Standard Deviation	Percentage (%)
AI Dependency (X_1)	21.16	3.92	70.5
Drivers of AI Utilization (X_2)	11.43	2.11	76.2
Academic Impact (Y)	20.51	4.83	68.4

Source: Primary data processed by the authors, 2026.

As presented in Table 5, the *drivers of AI utilization* recorded the highest percentage (76.2%), followed by *AI dependency* (70.5%), while *students' academic impact* reached 68.4%. These findings suggest that ease of access, time efficiency, and heavy academic workloads are the primary reasons students adopt AI, which is subsequently followed by an increasing level of dependency on the technology in academic activities.

Table 6. Students' levels of artificial intelligence dependency

Category	Score Range	Frequency (n)	Percentage (%)
Low	15–35	7	8.6
Moderate	36–55	37	45.7
High	56–75	37	45.7

Source: Primary data processed by the authors, 2026.

According to Table 6, students demonstrated a relatively high level of dependency on *Artificial Intelligence*. A total of 37 respondents (45.7%) were classified as having a high level of AI dependency, while another 37 respondents (45.7%) fell into the moderate category. In contrast, only seven respondents (8.6%) were categorized as having low AI dependency. This distribution indicates that more than 90% of the respondents exhibited moderate to high levels of dependency on AI in supporting their academic activities. These findings suggest that AI is no longer used merely as a supplementary tool but has become an essential component of task completion, information retrieval, and academic decision-making. The results further support the subsequent regression analysis, which identifies AI dependency as the dominant factor influencing students' academic impact. Therefore, the primary concern regarding AI utilization in higher education should extend beyond the frequency of its use to encompass the level of dependency that develops throughout the learning process.

Overall, the descriptive findings indicate that *Artificial Intelligence* has become an integral component of the academic activities of students in the Information Systems Study Program at Methodist University of Indonesia. The dominance of ChatGPT, the high frequency of AI utilization, and the diverse purposes for which AI is employed demonstrate that this technology has become embedded in various aspects of the learning process. At the same time, the descriptive statistics and dependency categorization reveal that most students exhibit moderate to high levels of AI

dependency. Collectively, these findings provide preliminary evidence that AI is no longer merely an alternative tool for completing academic tasks but has evolved into a fundamental element of students' learning strategies. Therefore, further inferential statistical analysis is required to determine whether this high level of AI utilization significantly influences students' academic impact, as discussed in the following section.

The influence of artificial intelligence dependency on students' academic impact

The increasing utilization of *Artificial Intelligence* (AI) in higher education has generated considerable debate regarding its implications for the quality of students' learning processes. On the one hand, AI is widely recognized for enhancing learning efficiency through easier access to information, faster task completion, and support for various academic activities (Ouyang et al., 2022). On the other hand, the growing intensity of AI use has raised concerns about the emergence of dependency that may reduce students' critical thinking, creativity, and independent learning abilities (Zhai et al., 2024). These contrasting perspectives suggest that the high intensity of AI utilization presented in the previous section does not automatically explain whether AI genuinely affects students' academic abilities. Therefore, this study employed a series of statistical analyses, including instrument quality assessment, classical assumption testing, and multiple linear regression analysis, to provide empirical evidence regarding the relationships among the research variables. To ensure that the research instrument accurately measured each construct, validity testing was first conducted for all questionnaire items. The results of the instrument validity test are presented in Table 7.

Table 7. Instrument validity test results

Variable	**Item**	***r* Calculated**	***r* Table**	**Sig.**	**Interpretation**
AI Dependency	P1	0.753	0.219	0.000	Valid
	P2	0.778	0.219	0.000	Valid
	P3	0.736	0.219	0.000	Valid
	P4	0.809	0.219	0.000	Valid
	P5	0.758	0.219	0.000	Valid
	P6	0.704	0.219	0.000	Valid
Drivers of AI Utilization	P7	0.812	0.219	0.000	Valid
	P8	0.803	0.219	0.000	Valid
	P9	0.804	0.219	0.000	Valid
Academic Impact	P10	0.800	0.219	0.000	Valid
	P11	0.788	0.219	0.000	Valid

	P12	0.733	0.219	0.000	Valid
	P13	0.706	0.219	0.000	Valid
	P14	0.804	0.219	0.000	Valid
	P15	0.614	0.219	0.000	Valid

Source: Primary data processed using IBM SPSS Statistics, 2026.

As shown in Table 7, all questionnaire items produced *r*-values greater than the critical *r*-table value of 0.219, with significance values below 0.05. These findings indicate that every indicator adequately represents the construct it was designed to measure, confirming that all questionnaire items are valid. Accordingly, the research instrument satisfies the requirements for accurately measuring AI dependency, the drivers of AI utilization, and students' academic impact. Nevertheless, a valid instrument does not necessarily demonstrate satisfactory consistency. Therefore, reliability testing was subsequently conducted to evaluate the stability of the measurement results. The reliability of the instrument was assessed using *Cronbach's Alpha*, and the results are presented in Table 8.

Table 8. Instrument reliability test results

Variable	**Number of Items**	**Cronbach's Alpha**	**Interpretation**
AI Dependency (X_1)	6	0.847	Reliable
Drivers of AI Utilization (X_2)	3	0.730	Reliable
Academic Impact (Y)	6	0.834	Reliable
Overall Instrument	15	0.912	Highly Reliable

Source: Primary data processed using IBM SPSS Statistics, 2026.

According to Table 8, all variables achieved *Cronbach's Alpha* values exceeding the minimum acceptable threshold of 0.70. The reliability coefficients were 0.847 for AI dependency, 0.730 for the drivers of AI utilization, and 0.834 for academic impact, while the overall instrument achieved a coefficient of 0.912, indicating excellent internal consistency. These findings confirm that the research instrument provides stable and reliable measurements suitable for subsequent statistical analysis. After establishing the quality of the instrument, the analysis proceeded to classical assumption testing to ensure that the regression model fulfilled all statistical requirements. Prior to conducting multiple linear regression, the model was evaluated for normality, multicollinearity, heteroscedasticity, and linearity. Meeting these assumptions ensures unbiased estimation of the regression coefficients and supports accurate interpretation of the analytical results. A summary of the classical assumption tests is presented in Table 9.

Table 9. Summary of classical assumption test results

Test	**Result**	**Criterion**	**Conclusion**

Kolmogorov–Smirnov	Sig. = 0.843	Sig. > 0.05	Normal
Shapiro–Wilk	Sig. = 0.684	Sig. > 0.05	Normal
Tolerance (X_1)	0.625	> 0.10	No multicollinearity
Tolerance (X_2)	0.625	> 0.10	No multicollinearity
VIF (X_1)	1.600	< 10	No multicollinearity
VIF (X_2)	1.600	< 10	No multicollinearity
Glejser (X_1)	0.471	Sig. > 0.05	No heteroscedasticity
Glejser (X_2)	0.624	Sig. > 0.05	No heteroscedasticity
Linearity $X_1 \rightarrow Y$	0.417	Sig. > 0.05	Linear
Linearity $X_2 \rightarrow Y$	0.356	Sig. > 0.05	Linear

Source: Primary data processed using IBM SPSS Statistics, 2026.

As presented in Table 9, all classical assumption tests confirmed that the regression model satisfied the required statistical assumptions. The significance values obtained from the normality tests exceeded 0.05, indicating normally distributed residuals. Furthermore, Tolerance values greater than 0.10 and *Variance Inflation Factor* (VIF) values below 10 indicate the absence of multicollinearity among the independent variables. The Glejser test also produced significance values above 0.05, demonstrating that heteroscedasticity was not present, while the linearity test confirmed linear relationships between the independent and dependent variables. Since all assumptions were fulfilled, the regression model was considered appropriate for examining the influence of *Artificial Intelligence* dependency on students' academic impact.

Table 10. Summary of multiple linear regression analysis

Aspect	**Indicator**	**Value**
Model Fit	R	0.755
	R Square	0.570
	Adjusted R Square	0.559
	Std. Error	2.413
	F-value	51.646
	Model Significance	0.000
Regression Coefficients	Constant	1.198
	$X_1 \rightarrow Y$	B = 0.717; β = 0.643; *t* = 6.755; Sig. = 0.000
	$X_2 \rightarrow Y$	B = 0.361; β = 0.178; *t* = 1.867; Sig. = 0.066

Source: Primary data processed using IBM SPSS Statistics, 2026.

As shown in Table 10, the correlation coefficient (R) of 0.755 indicates a strong relationship between AI dependency, the drivers of AI utilization, and students' academic impact. The R^2 value of 0.570 demonstrates that the two independent variables explain 57.0% of the variance in students' academic impact, while the remaining 43.0% is attributable to factors beyond the scope of this study. In addition, the ANOVA results yielded a significance value of 0.000 ($p < 0.05$), indicating that the regression model is statistically significant and appropriate for explaining the relationships among the investigated variables.

The resulting regression equation is $Y = 1.198 + 0.717X_1 + 0.361X_2$. This equation indicates that both AI dependency and the drivers of AI utilization exhibit positive relationships with students' academic impact. However, based on the standardized regression coefficients, AI dependency ($\beta = 0.643$) contributes substantially more than the drivers of AI utilization ($\beta = 0.178$). These findings suggest that changes in students' level of AI dependency exert a considerably stronger influence on academic impact than the reasons motivating students to adopt AI. To determine the statistical significance of each independent variable, partial and simultaneous hypothesis testing was subsequently conducted, and the results are presented in Table 11.

Table 11. Research hypothesis testing results

Hypothesis	**Test Statistic**	**Sig.**	**Decision**
H_1: AI Dependency → Academic Impact	$t = 6.755$	0.000	Accepted
H_2: Drivers of AI Utilization → Academic Impact	$t = 1.867$	0.066	Rejected
H_3: AI Dependency and Drivers of AI Utilization → Academic Impact	$F = 51.646$	0.000	Accepted

Source: Primary data processed using IBM SPSS Statistics, 2026.

Based on Table 11, the partial hypothesis test indicates that AI dependency significantly influences students' academic impact, as evidenced by a significance value of 0.000 and a t-value of 6.755. Accordingly, the first hypothesis was accepted. These findings demonstrate that AI dependency has a positive and statistically significant effect on students' academic impact. In contrast, the drivers of AI utilization produced a significance value of 0.066, exceeding the 0.05 threshold; therefore, the second hypothesis was rejected. This result indicates that the reasons motivating students to use AI do not necessarily exert a direct influence on the academic consequences they experience.

The simultaneous hypothesis test yielded an F-value of 51.646 with a significance level of 0.000, leading to the acceptance of the third hypothesis. This finding confirms that AI dependency and the drivers of AI utilization jointly exert a significant influence on students' academic impact. Overall, the results demonstrate that AI dependency is the most dominant factor explaining variations in students' academic impact. Therefore,

AI utilization in higher education should be guided as a learning support tool that continues to promote students' critical thinking, creativity, and independent learning, rather than functioning as a substitute for the cognitive processes involved in completing academic activities.

Artificial intelligence dependency as the dominant factor influencing students' academic impact

The rapid advancement of *Artificial Intelligence* (AI) has fundamentally transformed the landscape of higher education. Initially positioned as a supporting tool, AI has increasingly assumed a more prominent role in academic activities, ranging from searching for references and generating ideas to completing assignments. This transformation has generated considerable debate among scholars. Research by Al Naqbi et al. (2024) views AI as an innovation capable of improving learning efficiency and academic productivity, whereas research by Yavich (2025) argues that intensive AI utilization may diminish students' critical thinking, creativity, and independent learning. These contrasting perspectives suggest that the central issue lies not in the existence of AI itself but in how students utilize it throughout their academic activities. Therefore, this study develops a conceptual model to explain the mechanism through which academic impacts emerge based on the empirical findings obtained.

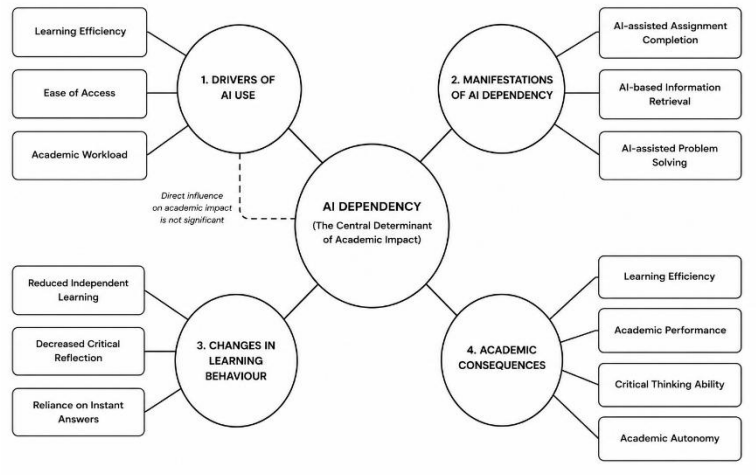

Figure 1. Conceptual model of AI dependency and academic impact

Source: Developed by the authors based on research findings (2026).

The conceptual model presented in Figure 1 illustrates that students' academic impact does not emerge immediately following AI utilization but develops through a gradual and sequential process. The model demonstrates that several factors—including learning efficiency, easy access to information, and increasing academic demands—serve as the initial drivers motivating students to adopt AI. As the intensity of AI utilization increases, the technology evolves from being merely a supporting tool into an integral component of students' approaches to completing academic tasks (Grassini, 2023). This progression gradually fosters AI dependency, which

subsequently alters students' learning patterns, cognitive processes, and academic decision-making. Accordingly, the conceptual model positions AI dependency as the principal mechanism linking AI utilization with the various academic consequences experienced by students.

The first component of the conceptual model explains the *drivers of AI use*, referring to the factors that encourage students to adopt AI in their academic activities. Task efficiency, easy access to information, and heavy academic workloads emerged as the most influential reasons for AI adoption. However, the regression analysis revealed that the *drivers of AI utilization* produced a standardized beta coefficient of only 0.178 with a significance level of 0.066, indicating no statistically significant effect on students' academic impact. These findings suggest that students' motivations for using AI do not sufficiently explain changes in the quality of their academic performance. Consistent with research by Yan et al. (2025), AI adoption in higher education is primarily driven by perceptions of convenience and efficiency rather than improvements in academic competence. Similarly, research by Chan and Lee (2023) reported that students' decisions to adopt digital technologies are motivated more by practical benefits than by pedagogical considerations. In contrast to research by Feng et al. (2025), which identified technology adoption as a primary determinant of learning outcomes, the present study demonstrates that these factors merely function as initial triggers that create opportunities for AI dependency rather than directly causing students' academic impact.

The second component of the conceptual model identifies the *manifestations of AI dependency* as the core mechanism explaining changes in students' academic performance. At this stage, AI is no longer employed solely to retrieve information but increasingly assumes responsibility for various academic processes, including assignment preparation, idea generation, problem-solving, and decision-making during coursework. The regression analysis revealed that AI dependency produced a standardized beta coefficient of 0.643, a *t*-value of 6.755, and a significance level of 0.000, making it the most influential predictor of students' academic impact. These findings indicate that the greater the level of students' dependency on AI, the more substantial the changes in their academic activities. This result confirms the findings of research by Jose et al. (2025), which suggested that repeated AI utilization gradually shifts students' cognitive processes from active thinking toward verifying technology-generated outputs. Likewise, research by Shah and Asad (2024) demonstrated that dependency on AI-based systems tends to improve task completion efficiency while simultaneously reducing students' capacity for academic exploration and reflection. More importantly, the present study extends the findings of research by Revesai (2025) by demonstrating that AI dependency is not merely a consequence of intensive technology utilization but also serves as the principal mechanism linking AI utilization to students' academic impact.

The subsequent stage of the conceptual model explains how AI dependency influences *learning behavior changes*, which ultimately lead to *academic consequences*. As students become increasingly dependent on AI to complete academic activities, changes occur in the ways they acquire information, evaluate arguments, and construct knowledge independently. Learning processes that previously required exploration, analysis, and reflection gradually shift toward more immediate and technology-assisted approaches, as portions of students' cognitive effort are delegated to AI. Consequently, these changes affect multiple academic dimensions, ranging from greater efficiency in completing assignments to the potential decline of critical thinking and independent learning. Consistent with research by Tanveer et al. (2020), AI utilization can indeed enhance students' academic productivity in the short term. However, research by Gerlich (2025) cautioned that AI utilization without sufficient reflective thinking skills may lead to intellectual dependency. In contrast to research by Wu and Yu (2024), which concluded that AI contributes solely to improvements in learning effectiveness, the present study demonstrates that academic consequences are considerably more complex because they are shaped by students' level of AI dependency rather than merely by the frequency of AI utilization. Consequently, the conceptual model developed in this study not only explains the relationships among variables but also illustrates the behavioral mechanism through which learning behavior changes become the bridge leading to various academic consequences.

The findings of this study have important implications for learning management in higher education during the era of digital transformation. Existing institutional policies have generally focused on restricting or prohibiting AI utilization because of concerns regarding academic misconduct. However, the findings indicate that such approaches do not adequately address the underlying issue. The determining factor is neither the existence of AI nor students' reasons for using it, but rather the extent to which students become dependent on AI throughout their academic activities. Therefore, AI governance in higher education should emphasize strengthening AI literacy, promoting the ethical use of AI, and designing learning environments that continue to prioritize critical thinking, reflective learning, and problem-solving as core competencies. Through this approach, AI can function as a valuable learning support tool without diminishing students' roles as the primary agents in constructing knowledge.

From a conceptual perspective, this study offers a new understanding of the relationship between *Artificial Intelligence* utilization and students' academic impact. Unlike many previous studies that emphasized the direct relationship between technology adoption and learning outcomes, the present study demonstrates that this relationship operates through a more complex mechanism. The proposed conceptual model confirms that the *drivers of AI use* function only as the initial triggers of technology adoption, whereas *AI dependency* serves as the central mechanism

connecting changes in learning behavior with the academic consequences experienced by students. Therefore, the primary contribution of this study lies not only in providing empirical evidence that AI dependency significantly influences students' academic impact but also in developing a conceptual model that explains the mechanism through which this influence occurs in a more comprehensive manner. This model is expected to provide a foundation for future studies investigating AI utilization in higher education while also serving as a reference for universities in formulating policies that promote productive, ethical, and responsible AI utilization.

Conclusion

This study demonstrates that *Artificial Intelligence* (AI) dependency is the most influential factor affecting students' academic impact, whereas the drivers of AI utilization do not exert a statistically significant partial effect. These findings indicate that the primary issue surrounding AI utilization in higher education lies not in the reasons why students adopt the technology but rather in the level of dependency that develops throughout the learning process. Through multiple linear regression analysis and the development of a conceptual model, this study explains that academic impact emerges through a sequential mechanism beginning with the drivers of AI utilization, progressing toward AI dependency in academic activities, subsequently altering students' learning behavior, and ultimately resulting in various academic consequences. Accordingly, the findings reinforce the view that AI should be positioned as a learning support tool that enhances students' cognitive processes rather than serving as a substitute for their intellectual capabilities in completing academic tasks.

This study contributes conceptually by proposing a model that explains the mechanism linking AI utilization, AI dependency, changes in learning behavior, and students' academic impact. The proposed model extends previous research, which has generally focused on the direct relationship between AI utilization and learning outcomes, by offering a more comprehensive perspective on the dynamics of AI utilization in higher education. Nevertheless, this study has several limitations, as it was conducted using respondents from a single student population and examined only two independent variables, thereby limiting its ability to capture the full range of factors influencing academic impact in the AI era. Future research is therefore encouraged to involve more diverse respondent populations, integrate qualitative or *mixed-methods* approaches, and expand the proposed model by incorporating additional variables such as AI literacy, critical thinking, self-regulated learning, academic integrity, and AI ethics to achieve a more comprehensive understanding of *Artificial Intelligence* utilization in higher education.

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