

EXAMINING THE INFLUENCE OF AI SELF-EFFICACY AND ATTITUDE TOWARD ARTIFICIAL INTELLIGENCE ON AI LITERACY AMONG UNIVERSITY STUDENTS

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Abstract: *The rapid integration of artificial intelligence (AI) in higher education has transformed students' learning experiences and raised important questions regarding readiness, ethical awareness and effective use. This study examines the influence of AI self-efficacy and attitude toward artificial intelligence on AI literacy among university students. Using a quantitative research design, data were collected through a structured questionnaire adapted from recent validated instruments and administered to diploma and degree students at a Malaysian public university. The data were analysed using reliability analysis and multiple regression techniques. The findings indicate that both AI self-efficacy and attitude toward artificial intelligence in learning have a significant positive influence on students' AI literacy. The study contributes to the growing empirical literature on AI literacy in higher education and offers insights for educators and policymakers in promoting responsible and ethical use of artificial intelligence.*

Keywords: *Artificial Intelligence, AI Literacy, AI Self-Efficacy, Attitude toward AI, Higher Education.*

Introduction

Artificial intelligence (AI) has become an integral component of contemporary higher education, significantly transforming teaching practices, assessment approaches and students' learning experiences. The increasing availability of AI-powered tools, including intelligent tutoring systems, generative AI applications and learning analytics platforms, has enabled students to access information more efficiently, automate academic tasks and personalise their learning processes. While these developments offer substantial educational benefits, they also introduce new challenges related to students' preparedness to use AI effectively, critically and ethically.

Despite the widespread adoption of AI technologies in university settings, there remains considerable uncertainty regarding students' actual level of AI readiness. Although many students actively use AI tools in their academic work, it is unclear whether they possess sufficient technical understanding, ethical awareness and responsible use skills required for meaningful engagement with AI. Emerging concerns such as overreliance on AI-generated outputs, diminished critical thinking and potential violations of academic integrity suggest that students may be interacting with AI tools without fully understanding their limitations and implications. These issues highlight the importance of examining AI literacy as a critical competency in higher education.

AI literacy extends beyond basic technical knowledge and encompasses the ability to understand AI concepts, evaluate AI-generated outputs, recognise ethical implications and apply AI tools responsibly. As higher education institutions aim to produce graduates who are not only technologically competent but also ethically responsible, developing AI literacy has become increasingly important. However, existing research has largely focused on AI adoption and usage patterns rather than critically examining the underlying factors that influence the development of AI literacy among students.

In particular, limited empirical attention has been given to the roles of psychological and attitudinal determinants in shaping AI literacy. AI self-efficacy, defined as students' confidence in their ability to use AI tools effectively, is a crucial factor that may influence how students explore, experiment with and critically evaluate AI technologies. Students with higher levels of AI self-efficacy are more likely to engage actively with AI tools, overcome technical challenges and develop deeper understanding of AI-related concepts. Conversely, students with low confidence may avoid using AI tools or rely on them passively without critical evaluation.

Similarly, students' attitudes toward artificial intelligence in learning represent an important determinant of their engagement with AI technologies. Positive attitudes, such as perceiving AI as useful and beneficial for learning, can encourage greater adoption and more meaningful interaction with AI tools. In contrast, negative perceptions, including concerns about fairness, accuracy or ethical risks, may limit students' willingness to engage with AI or influence how they use these technologies in academic contexts. Therefore, attitudes toward AI not only shape adoption behaviour but also play a significant role in influencing responsible and ethical use.

Despite the importance of these factors, existing studies have generally examined AI self-efficacy and attitudes toward AI independently, with limited research integrating both variables within a single empirical framework. This gap restricts a comprehensive understanding of how

confidence and perceptions jointly contribute to students' AI literacy. Addressing this limitation is essential, particularly in the context of increasing reliance on AI in higher education.

Therefore, this study aims to examine the influence of AI self-efficacy and attitude toward artificial intelligence in learning on AI literacy among university students. By investigating these relationships, the study seeks to provide empirical insights into the key determinants of AI literacy and to inform educators and policymakers on strategies to promote responsible, effective and ethical use of AI in higher education.

Literature Review

The growing integration of artificial intelligence (AI) into higher education has prompted increasing scholarly attention toward understanding how students engage with AI technologies and develop the competencies required for effective and responsible use. While early research primarily focused on AI adoption and usage, recent studies emphasise the importance of examining underlying psychological, attitudinal and cognitive factors that shape students' AI-related competencies. Within this context, AI self-efficacy, attitude toward artificial intelligence in learning and AI literacy have emerged as key constructs for explaining student interaction with AI in academic environments.

Artificial Intelligence in Higher Education

AI technologies such as intelligent tutoring systems, adaptive learning platforms and generative AI tools are transforming higher education by enhancing access to information, supporting personalised learning and improving academic efficiency. Empirical studies suggest that these technologies can increase student engagement and promote independent learning when used appropriately. However, the rapid adoption of AI has also raised concerns regarding students' overreliance on automated systems, reduced critical thinking and potential risks to academic integrity. Recent studies highlight both the benefits and challenges of AI integration in higher education, particularly in relation to student engagement, ethical concerns and overreliance on automated systems (Zawacki-Richter et al., 2019; Kasneci et al., 2023; Chan, 2023).

In the Malaysian and broader Southeast Asian context, AI adoption in higher education has increased significantly in recent years. Students frequently utilise AI tools to support learning, complete assignments and access academic resources. Nevertheless, emerging evidence suggests that many students engage with AI at a surface level, often prioritising convenience over critical evaluation. This indicates that widespread usage does not necessarily translate into meaningful understanding or responsible practice, thereby reinforcing the need to examine AI literacy as a key educational outcome. In the Malaysian context, recent studies have shown that although students increasingly utilise AI tools, gaps remain in critical understanding and responsible use of artificial intelligence technologies (Yusnilzahri et al., 2025; Jamaluddin et al., 2025). Similarly, studies conducted in Southeast Asia indicate that while students recognise the benefits of AI, they also express concerns regarding ethical implications, overdependence and reduced engagement in learning processes (Homer et al., 2025).

AI Self-Efficacy

AI self-efficacy refers to individuals' beliefs in their ability to effectively use AI tools to accomplish specific tasks. Rooted in Bandura's social cognitive theory, self-efficacy has been widely recognised as a significant determinant of behaviour, influencing individuals'

motivation, persistence and performance. In higher education, students with higher levels of AI self-efficacy are more likely to explore AI technologies, overcome technical challenges and engage in deeper learning processes.

However, prior research presents mixed findings regarding the impact of self-efficacy. While some studies indicate that high self-efficacy promotes active engagement and skill development, others suggest that confidence alone may not guarantee critical or responsible use of technology. For instance, students who are highly confident in using AI tools may still rely excessively on AI-generated outputs without evaluating their accuracy or limitations. This suggests that self-efficacy, although important, may be insufficient in explaining AI literacy when considered in isolation.

In Southeast Asian contexts, variations in digital exposure and institutional support may further influence students' levels of AI self-efficacy. Despite its importance, empirical studies focusing specifically on AI self-efficacy within this region remain limited, highlighting the need for further investigation.

Attitude toward Artificial Intelligence in Learning

Attitude toward artificial intelligence in learning refers to students' overall perceptions, beliefs and emotional responses toward the use of AI in academic contexts. Drawing from technology acceptance theories, attitudes play a crucial role in shaping individuals' willingness to adopt and continuously use new technologies. Students who perceive AI as useful, beneficial and easy to use are more likely to incorporate AI tools into their learning activities.

Nevertheless, the literature also indicates that attitudes toward AI are complex and sometimes contradictory. While positive attitudes are associated with higher engagement and usage, they do not always lead to meaningful or responsible application. Some students may adopt AI tools primarily for efficiency and convenience rather than for enhancing understanding. Conversely, negative attitudes—often influenced by concerns regarding accuracy, fairness and ethical implications—may reduce students' willingness to engage with AI, even when such tools could be beneficial.

In Malaysia and Southeast Asia, students' attitudes toward AI are shaped by contextual factors such as institutional policies, digital literacy levels and cultural perceptions of technology. Studies have reported generally positive attitudes toward AI among university students; however, concerns regarding academic integrity and overdependence remain significant. These mixed findings suggest that attitudes toward AI must be examined critically in relation to students' actual competencies and behaviour.

AI Literacy

AI literacy has become a critical competency in the contemporary educational landscape. It encompasses not only technical knowledge of AI systems but also the ability to critically evaluate AI-generated outputs, understand ethical implications and apply AI tools responsibly. Unlike traditional digital literacy, AI literacy requires students to engage with AI technologies in a reflective and informed manner. AI literacy has been conceptualised as a multidimensional competency involving technical understanding, critical evaluation and ethical awareness (Ng et al., 2021; Long & Magerko, 2020; Su et al., 2023).

Despite its growing importance, research on AI literacy is still developing. Many studies focus primarily on technical awareness or basic usage skills, while fewer address higher-order competencies such as ethical reasoning and critical evaluation. Additionally, inconsistencies in conceptual definitions and measurement approaches across studies make it difficult to establish a standardised understanding of AI literacy.

In the Malaysian context, empirical research on AI literacy remains limited and often focuses on general digital skills rather than AI-specific competencies. This gap highlights the need for more comprehensive investigations that consider AI literacy as a multidimensional construct influenced by various factors. Recent empirical studies further reveal that AI literacy levels vary significantly across educational contexts and are influenced by factors such as academic background, institutional support and prior exposure to AI technologies (Mansoor et al., 2024).

Synthesis of the Literature

Although AI self-efficacy, attitude toward AI and AI literacy are widely discussed in the literature, they are often examined in isolation rather than as interconnected constructs. This fragmented approach limits the ability to fully understand how students develop the competencies required for responsible AI use.

From a theoretical perspective, AI self-efficacy influences students' confidence and willingness to engage with AI tools, while attitude toward AI shapes their perceptions of the value and appropriateness of using such technologies. These factors interact in meaningful ways. Students with high self-efficacy are more likely to explore AI tools, but without positive attitudes, their engagement may be limited or inconsistent. Similarly, students with positive attitudes but low self-efficacy may lack the confidence to use AI effectively.

Importantly, existing findings suggest that neither self-efficacy nor attitude alone is sufficient to explain AI literacy. Self-efficacy may drive usage, but not necessarily responsible or critical use, while positive attitudes may encourage adoption without ensuring depth of understanding. Therefore, examining these constructs together provides a more comprehensive explanation of how AI literacy is developed.

Despite this conceptual importance, empirical studies integrating AI self-efficacy and attitude toward artificial intelligence in learning as joint predictors of AI literacy remain scarce, particularly within the Malaysian higher education context. This represents a significant gap in the literature. Emerging empirical studies increasingly demonstrate the interconnected nature of AI literacy, self-efficacy and attitudes, showing that these variables jointly influence individuals' ability to engage with AI technologies effectively and responsibly (Obadă et al., 2025).

Research Gap and Justification of the Study

Based on the review, three key gaps can be identified. First, there is limited empirical research that conceptualises AI literacy as a multidimensional construct incorporating ethical awareness, critical thinking and responsible use. Second, studies examining AI self-efficacy and attitudes toward AI within Malaysian and Southeast Asian contexts are still insufficient. Third, existing research lacks integrated models that simultaneously examine both constructs as predictors of AI literacy.

Addressing these gaps is essential to better understand how students develop AI-related competencies in higher education. Therefore, this study aims to examine the influence of AI self-efficacy and attitude toward artificial intelligence in learning on AI literacy among university students, providing empirical evidence from the Malaysian context.

Research Framework and Hypotheses

This study is grounded in social cognitive theory and technology acceptance perspectives. AI self-efficacy and attitude toward AI are conceptualized as independent variables, while AI literacy is the dependent variable.

H₁: AI self-efficacy has a significant effect on AI literacy among university students.

H₂: Attitude toward AI has a significant effect on AI literacy among university students.

Methodology

This section describes the research design, sampling technique, participants, research instruments and data analysis procedures employed in the study.

Research Design

A quantitative, cross-sectional survey design was employed to examine the relationships among AI self-efficacy, attitude toward artificial intelligence in learning and AI literacy among university students. This design is appropriate for testing relationships between variables and identifying predictors of AI literacy.

Sampling Technique and Population

The study employed a convenience sampling technique, as participants were selected based on their accessibility and willingness to participate in the online survey. The target population consisted of diploma and degree students enrolled at Universiti Teknologi MARA (UiTM) Cawangan Terengganu, Kampus Dungun, Malaysia.

The estimated population size includes several thousand students across multiple faculties, particularly in business, management and accountancy programmes, where exposure to digital and AI-related tools is increasingly relevant. Students from different academic levels and semesters were included to ensure variability in academic experience and exposure to AI technologies.

Participants

A total of 156 responses were initially collected through the online survey. However, to ensure data quality, a rigorous screening process was conducted using attention check questions. Four attention check items were embedded within the questionnaire: one logic-based question (“I have used artificial intelligence tools before I was born”) and three instructed response items requiring specific answers.

Out of the 156 responses, 63 respondents (40.4%) failed one or more attention checks and were therefore excluded from the analysis. This relatively high exclusion rate may indicate issues such as inattentive responding, lack of engagement or “straight-lining” behaviour, which are common in online survey research. The removal of these responses was necessary to enhance the reliability and validity of the findings.

As a result, a final sample of 93 valid responses (59.6%) was retained for subsequent analysis.

Research Instrument

Data were collected using a structured questionnaire comprising four sections: demographic information, AI self-efficacy, attitude toward artificial intelligence in learning and AI literacy. The constructs in this study were measured using multiple items adapted from prior validated instruments. AI self-efficacy was assessed using six items that captured students' confidence in their ability to use AI tools effectively for academic purposes. Attitude toward artificial intelligence in learning was measured using seven items evaluating students' perceptions, beliefs and acceptance of AI in educational contexts. AI literacy was measured using ten items reflecting students' understanding of AI concepts, ethical awareness and responsible use of AI technologies. All items were evaluated using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Minor modifications were made to the wording of the items to ensure clarity and suitability for the Malaysian higher education context.

Reliability Analysis

Reliability analysis was conducted to assess the internal consistency of the measurement scales used in this study. The results indicate that all constructs demonstrate acceptable to good reliability, with Cronbach's alpha values exceeding the recommended threshold of 0.70. Specifically, AI self-efficacy, measured using six items, recorded a Cronbach's alpha value of 0.775, indicating satisfactory internal consistency. Attitude toward artificial intelligence in learning, measured using seven items, achieved a higher reliability coefficient of 0.842, suggesting good internal consistency. Meanwhile, AI literacy, which was measured using ten items, demonstrated a Cronbach's alpha value of 0.857, indicating a high level of reliability. Overall, these results confirm that the measurement instruments used in this study are reliable and suitable for further statistical analysis.

Data Analysis

Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were used to summarise respondents' demographic characteristics and variable distributions. Pearson correlation analysis was performed to examine relationships among the variables, followed by multiple regression analysis to test the proposed hypotheses and determine the predictive effects of AI self-efficacy and attitude toward artificial intelligence in learning on AI literacy.

Findings

It is expected that AI self-efficacy and attitude toward AI will have significant positive effects on AI literacy. Students who are confident and hold positive perceptions toward AI are likely to demonstrate higher awareness of ethical issues, responsible use and critical evaluation of AI outputs. These findings would support prior studies and highlight the importance of integrating AI confidence-building and ethical discussions into university curricula.

From an Islamic and socio-economic development perspective, enhancing AI literacy supports the formation of knowledgeable, ethical and responsible graduates who can contribute meaningfully to society while adhering to moral values.

Table 1: Demographic Background of Respondents

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	22	23.7
	Female	71	76.3
Level of Study	Diploma	44	47.3
	Degree	49	52.7
Faculty	Accountancy	57	61.3
	Business and Management	29	31.2
	Others	7	7.5
Current Semester	Semester 1–2	17	18.3
	Semester 3–4	15	16.1
	Semester 5 and Above	61	65.6

A total of 93 students participated in this study. Table 1 presents the demographic profile of the respondents in terms of gender, level of study, faculty and current semester.

In terms of gender, the majority of respondents were female students ($n = 71$, 76.3%), while male students accounted for 22 respondents (23.7%). This distribution reflects the common gender composition in Malaysian public universities, particularly in social science and business-related programmes.

Regarding the level of study, the sample comprised a relatively balanced proportion of degree students ($n = 49$, 52.7%) and diploma students ($n = 44$, 47.3%). This balanced representation allows for broader insights into AI self-efficacy, attitudes toward artificial intelligence and AI literacy across different levels of tertiary education.

With respect to faculty affiliation, the majority of respondents were from the Faculty of Accountancy ($n = 57$, 61.3%), followed by students from the Faculty of Business and Management ($n = 29$, 31.2%). A smaller proportion of respondents were from other faculties ($n = 7$, 7.5%). This distribution indicates that the findings are largely informed by students from business-oriented and professional programmes, where the use of AI tools for learning and academic tasks is increasingly relevant.

In terms of current semester, most respondents were in Semester 5 and above ($n = 61$, 65.6%), indicating that the majority had substantial exposure to university learning environments. Meanwhile, 17 students (18.3%) were in Semester 1–2 and 15 students (16.1%) were in Semester 3–4. The dominance of senior students suggests that many respondents likely had prior experience using digital and AI-based tools in their coursework, which is appropriate for examining AI literacy and related factors.

Overall, the demographic profile suggests that the respondents represent a cohort with sufficient academic maturity and disciplinary exposure to meaningfully evaluate their self-efficacy, attitudes toward AI and AI literacy.

Table 2: Pearson Correlation Matrix among AI Self-Efficacy, Attitude toward Artificial Intelligence and AI Literacy

Variable	AI Self-Efficacy	Attitude toward AI in Learning	AI Literacy
AI Self-Efficacy	1		
Attitude toward AI in Learning	.755**	1	
AI Literacy	.650**	.738**	1

** N = 93. $p < .01$ (two-tailed).

Table 2 presents the Pearson correlation coefficients among AI self-efficacy, attitude toward artificial intelligence in learning and AI literacy. The correlation analysis indicates that all study variables are positively and significantly related to one another at the 0.01 significance level.

AI self-efficacy demonstrated a strong positive correlation with attitude toward artificial intelligence in learning ($r = .755$, $p < .01$), suggesting that students who possess higher confidence in using AI tools tend to hold more positive attitudes toward AI integration in their learning activities. In addition, AI self-efficacy was found to have a moderate to strong positive relationship with AI literacy ($r = .650$, $p < .01$), indicating that students who perceive themselves as competent in using AI tools are more likely to exhibit higher levels of understanding, ethical awareness and responsible use of artificial intelligence.

Furthermore, attitude toward artificial intelligence in learning showed a strong positive correlation with AI literacy ($r = .738$, $p < .01$). This finding suggests that students with more favourable perceptions and acceptance of AI in educational contexts tend to demonstrate stronger AI literacy, including awareness of AI concepts, ethical considerations and appropriate applications.

Overall, the results indicate robust and statistically significant associations among the study variables, thereby providing preliminary empirical support for the proposed research framework and justifying further hypothesis testing using regression analysis.

Table 3: Multiple Regression Analysis Predicting AI Literacy

Predictor	B	SE	β	t	p
Constant	0.939	0.270	–	3.482	< .001
AI Self-Efficacy	0.205	0.101	0.216	2.038	0.044
Attitude toward AI in Learning	0.557	0.103	0.575	5.423	< .001

Model statistics: $R = .752$, $R^2 = .565$, Adjusted $R^2 = .556$, $F(2, 90) = 58.494$, $p < .001$

A multiple regression analysis was conducted to examine the influence of AI self-efficacy and attitude toward artificial intelligence in learning on AI literacy. The results indicate that the regression model was statistically significant, $F(2, 90) = 58.494$, $p < .001$, demonstrating that the selected predictors collectively explain a substantial proportion of variance in AI literacy.

The model yielded an R^2 value of .565, indicating that 56.5% of the variance in AI literacy can be explained by AI self-efficacy and attitude toward artificial intelligence in learning. The adjusted R^2 value of .556 further confirms the robustness of the model after accounting for the number of predictors.

Analysis of individual predictors revealed that attitude toward artificial intelligence in learning emerged as a strong and significant predictor of AI literacy ($\beta = .575$, $t = 5.423$, $p < .001$). This finding suggests that students who hold more positive attitudes toward the use of AI in learning environments tend to demonstrate significantly higher levels of AI literacy.

In addition, AI self-efficacy was found to have a positive and statistically significant effect on AI literacy ($\beta = .216$, $t = 2.038$, $p = .044$). Although its effect size was smaller than that of attitude toward AI, the result indicates that students' confidence in using AI tools contributes meaningfully to their understanding and responsible use of artificial intelligence.

Overall, the findings provide empirical support for Hypothesis 1 and Hypothesis 2, confirming that both AI self-efficacy and attitude toward artificial intelligence in learning significantly influence AI literacy among university students.

Discussion

The present study examined the influence of AI self-efficacy and attitude toward artificial intelligence in learning on AI literacy among university students. The findings provide empirical evidence that both factors play significant roles in shaping students' AI literacy, thereby supporting the proposed research framework and hypotheses.

The results of the correlation and regression analyses indicate that AI self-efficacy has a significant positive relationship with AI literacy. This suggests that students who are more confident in their ability to use AI tools are more likely to demonstrate higher levels of understanding, ethical awareness and responsible use of artificial intelligence. This finding aligns with self-efficacy theory, which posits that individuals' beliefs in their capabilities influence their learning behaviours and cognitive engagement (Bandura, 1997). Consistent with prior empirical studies, students with higher AI-related confidence tend to explore AI tools more independently and critically, leading to improved AI literacy outcomes (Alateyyat & Soltan, 2024). The result highlights the importance of fostering students' confidence in using AI technologies as part of higher education learning environments.

In addition, attitude toward artificial intelligence in learning emerged as the strongest predictor of AI literacy in this study. Students who held more positive perceptions of AI, including beliefs about its usefulness and relevance in learning, were significantly more likely to exhibit higher AI literacy. This finding is consistent with prior studies indicating that positive attitudes toward AI are associated with increased engagement and willingness to adopt AI tools in educational contexts (Kobaba et al., 2025; Visvaldis, 2025). A favourable attitude toward AI may encourage students to learn about AI functionalities, limitations and ethical implications, thereby enhancing their overall AI literacy. This result underscores the importance of addressing students' perceptions and concerns regarding AI use in education.

Collectively, the findings suggest that both psychological (AI self-efficacy) and attitudinal (attitude toward AI) factors contribute meaningfully to AI literacy, with attitude toward AI playing a more dominant role. This pattern indicates that while confidence is important, students' broader perceptions and acceptance of AI technologies are particularly influential in shaping how responsibly and effectively they engage with AI tools. These findings are consistent with recent literature that emphasizes the need to integrate both confidence-building

and attitudinal development strategies when promoting AI literacy in higher education (Xia, 2025).

From an educational perspective, the findings have several important implications. Higher education institutions should not only provide technical exposure to AI tools but also create learning experiences that cultivate positive attitudes and confidence toward AI use. Structured training, guided practice and open discussions on the ethical dimensions of AI may help students develop a balanced and responsible approach to AI-assisted learning. Such initiatives are especially relevant in ensuring that students do not over-rely on AI outputs but instead use AI as a supportive tool for enhancing learning and critical thinking.

Moreover, the results resonate with broader socio-ethical considerations, particularly within contexts that emphasise responsible knowledge use and accountability. Enhancing AI literacy through positive attitudes and self-efficacy supports the development of graduates who are not only technologically competent but also ethically aware and socially responsible. In this regard, promoting AI literacy aligns with the broader goals of higher education in preparing students for meaningful participation in an increasingly AI-driven society.

Despite its contributions, this study is not without limitations. The use of a cross-sectional design limits the ability to infer causal relationships among the variables. In addition, the study was conducted within a single public university, which may restrict the generalisability of the findings. Future research is encouraged to employ longitudinal designs, include more diverse institutional contexts and explore additional variables such as ethical reasoning, academic discipline differences, or instructional support in influencing AI literacy.

Overall, the findings contribute to the growing empirical literature on AI literacy by demonstrating that AI self-efficacy and attitude toward artificial intelligence are significant determinants of students' AI literacy. These insights provide a foundation for future research and practical interventions aimed at enhancing responsible AI use in higher education.

Conclusion and Implications

This study contributes to the literature by empirically examining factors influencing AI literacy among university students. The findings are expected to inform educators, institutional leaders and policymakers on the need to cultivate positive attitudes and self-efficacy toward AI through structured training and curriculum design. Future research may extend this study by incorporating additional variables or qualitative approaches.

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