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Transforming Student Engagement in Higher Education: The Impact of Artificial Intelligence on Learning Involvement

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ABSTRACT

The integration of Artificial Intelligence (AI) into higher education has rapidly transformed how students access information, study, and engage with academic tasks. Tools such as adaptive learning platforms, intelligent tutoring systems, and generative text applications are now widely used to support personalized and efficient learning experiences. Despite these advantages, concerns have emerged regarding the extent to which AI enhances or diminishes genuine student learning involvement. Questions remain about whether frequent AI use promotes meaningful engagement or encourages dependency and superficial learning. The purpose of this research was to investigate how the use of AI influences student learning involvement in higher education, focusing on behavioral, cognitive, and emotional dimensions of engagement. The study aimed to provide empirical evidence on how AI-driven tools shape motivation, participation, and critical thinking within academic contexts. A pragmatic research paradigm and a sequential explanatory mixed-methods design were adopted. The quantitative phase measured relationships between AI use and student engagement using validated survey instruments across multiple institutions. Structural equation modeling was applied to test key relationships and moderating factors such as digital literacy and institutional support. The qualitative phase involved semi-structured interviews with students and faculty to explore perceptions, experiences, and the contextual factors influencing AI's impact. The results indicated a positive relationship between AI use and overall learning involvement. Students reported higher motivation, improved focus, and increased participation when using AI tools. However, the study also found that excessive reliance on AI could reduce critical thinking, creativity, and self-directed learning. Institutional guidance and AI literacy were found to be key factors in ensuring positive outcomes. In conclusion, the study shows that AI has the potential to enhance student engagement when integrated responsibly and reflectively. Effective use requires balancing technological assistance with authentic learning practices. The findings contribute to understanding how AI can support meaningful educational experiences and provide practical guidance for policymakers and educators seeking to design ethical, inclusive, and pedagogically sound AI strategies in higher education.

Keywords:
Artificial Intelligence (AI); Higher Education; Student Learning Involvement; Student Engagement; Behavioral Engagement; Cognitive Engagement; Emotional Engagement; AI Literacy; Educational Technology; Academic Integrity

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1. Introduction

The rapid diffusion of Artificial Intelligence (AI) into higher education has transformed how students access information, study, and participate in learning activities. Recent global surveys indicate exceptionally high levels of student adoption. The Digital Education Council (2024) reported that 86% of higher-education students already use AI in their studies, with 54% using it weekly. In the UK, a 2025 HEPI/Kortext survey found an even higher figure which is up to 92% of students now report using generative AI for academic work includes prompting calls for assessment redesign and institutional AI literacy initiatives [1]. These prevalence figures demonstrate that AI is no longer a marginal tool but a central component of modern study practices. Consequently, understanding its influence on student learning involvement is both timely and essential.

Empirical and review literature suggests a complex picture of AI's effects on student engagement and learning. Systematic reviews synthesising cross-contextual studies highlight several benefits; AI-driven personalization, real-time feedback, automated formative assessment, and adaptive learning pathways have been shown to increase student motivation and on-task behaviour, particularly among learners who benefit from individualized support [2]. However, these advantages coexist with emerging concerns. Overreliance on generative tools may undermine students' critical thinking and deep cognitive engagement. Similarly, automated grading and content generation have raised issues related to academic integrity and the risk of superficial learning [2].

Despite the growing literature, significant research gaps remain. First, much existing empirical work focuses on tool efficacy or system design rather than student learning involvement as a multi-dimensional construct (behavioural, cognitive, and emotional engagement). Second, the available studies are often limited in scope (small-scale, discipline-specific, or context- dependent), restricting generalizability across institutional types and cultural settings [2]. Third, there is a shortage of longitudinal research tracking whether AI-related changes in short-term engagement translate to sustained learning gains or skill development. Finally, faculty readiness, policy clarity, and equitable access remain underexplored moderators of how AI affects involvement (Digital Education Council faculty survey, 2025; OECD policy analyses) [3]. These gaps underscore the need for deeper investigation. This study seeks to explore how and under what conditions AI alters students' involvement, distinguishing between productive, scaffolded use and passive or substitutive use that will inform institutional policy, pedagogical design, and academic integrity strategies. The contribution of this study study's is twofold: (1) it will provide empirical evidence about AI's multi-dimensional impact on student engagement in higher education across diverse contexts, and (2) it will generate actionable recommendations for educators and administrators to harness AI's benefits while safeguarding deep learning, integrity and equity. Given the rapid institutional uptake of AI and its implications for graduate competencies, such evidence is timely and necessary for advancing scholarship and practice.

1.1 Problem Statement

Artificial Intelligence has emerged as a transformative force in higher education, reshaping how students learn, communicate, and engage with academic content. Tools such as ChatGPT, adaptive learning platforms, and automated feedback systems are now embedded in student's daily academic routines. Reports by the Digital Education Council [4] and HEPI (2025) indicate that over 85% of university students use AI for study-related tasks. While these tools promise efficiency and personalization, their rapid and unregulated use raises questions about their effect on student learning involvement. Learning involvement, which includes behavioral, cognitive, and emotional

engagement, is a core indicator of academic success. However, there is limited empirical understanding of how AI-driven tools influence these dimensions of involvement, especially in diverse institutional and cultural contexts.

Current research on AI in education focuses mainly on system design, performance improvement, and technology acceptance. While these studies confirm that AI can enhance learning efficiency and motivation, few examine how it reshapes the quality and depth of student engagement. For instance, [2] found that adaptive AI systems improve participation, but they also noted a decline in students' critical thinking and self-regulated learning when AI performs complex cognitive tasks. This imbalance highlights a research gap between the growing technological adoption and the understanding of its psychological and behavioral implications. There is also a lack of longitudinal evidence showing whether AI-related engagement leads to sustainable learning or dependency on automation.

This gap forms the basis for the current study. The problem lies in the limited empirical evidence on the actual impact of AI on student learning involvement in higher institutions. Without such evidence, educators and policymakers cannot design informed strategies that maximize AI's benefits while minimizing its risks. Understanding how AI affects student involvement is vital for developing teaching models that preserve critical engagement and academic integrity in an AI-rich environment. This research is significant because it contributes to the academic debate on technology and learning behavior and provides practical insights for higher education institutions to implement responsible and effective AI integration strategies.

1.2 Research Objectives

Main Research Question:

- How does the use of Artificial Intelligence affect student learning involvement in higher institutions?

Sub-Questions:

1. What is the relationship between students' use of AI tools and their behavioral engagement in learning activities?
2. How does AI integration influence students' cognitive engagement, including problem-solving and critical thinking?
3. What impact does AI have on students' emotional engagement, such as motivation, interest, and confidence in learning?

2. Literature Review

The integration of artificial intelligence (AI) into higher education has accelerated significantly in recent years. A systematic review reported that adaptive learning systems powered by AI improved student test results by up to 62 % [5]. In one study, 86 % of university students reported using AI tools in their studies, and more than half used them weekly (Such wide adoption evidences that AI is becoming embedded in the student learning process [6]. At the same time, literature indicates AI can foster personalized feedback, flexible learning pathways, and increased student interaction. For example, AI-powered chatbots have been shown to assist homework and study, supporting both the behavioral and cognitive dimensions of student involvement [7]. However, the application of AI raises critical questions: Does it deepen student involvement or reduce it by shifting effort from learner to machine? A review of reviews found that although AI in higher education shows promise, little research investigates how AI affects the *quality* of student engagement (behavioral, cognitive,

emotional) within real institutional contexts [8]. This gap makes it vital to examine how AI influences student learning involvement comprehensively.

Recent scholarship has begun to unpack the relationship between AI tools and student engagement. Educational Technology research finds that students who use AI-driven systems report higher levels of participation and interaction with content. For example, a study of AI-empowered applications with Chinese EFL learners found significantly greater behavioural, cognitive and affective engagement for the AI group compared with controls [9]. In higher education more broadly, a topic-modelling study of AI-supported student engagement (AIsE) highlighted themes such as personalization, feedback, and motivation but noted weak evidence of long-term learning involvement outcomes [10]. On the other hand, concerns emerge about over-reliance on AI systems. A systematic review found that frequent use of AI dialogue systems correlates with lower critical thinking, reduced information-retention, and diminished student initiative [11]. That suggests that although AI tools can increase access and interaction, they may also undermine deeper engagement. Furthermore, recent work points to student and institutional readiness as important moderators: one study found that students' AI literacy strongly predicts their engagement and perceived learning effectiveness when using AI-based assessment tools [12]. In sum, the literature supports the potential of AI to enhance student learning involvement but highlights crucial caveats: the need for empirical studies in diverse settings, longitudinal data, and investigation of how behavioural, cognitive and emotional engagement evolve when AI is integrated.

Recent systematic reviews and large-scale analyses show AI's capacity to support adaptive instruction and short-term engagement gains, but they also highlight uneven evidence about long-term learning outcomes and the specific mechanisms by which engagement is affected. For example, broad systematic reviews of AI in education synthesize application areas, effects, and limitations, concluding that while personalization and intelligent tutoring systems often increase short-term performance and participation, evidence on sustained, deep learning and transfer remains limited [2]. More focused AI–engagement work using topic-modelling and text-mining confirms that personalization, feedback, and motivation dominate the emerging literature, yet most primary studies are cross-sectional, short-term, or domain-specific (e.g., language learning), which limits generalizability to diverse higher-education contexts. Recent meta-analytic and topic-modelling studies explicitly call for longitudinal, multi-site, and mixed-methods investigations of behavioural, cognitive, and emotional engagement [10].

Another underexplored dimension relates to AI literacy as a moderating factor. Recent evidence shows that students' ability to critically and effectively use AI strongly predicts perceived learning benefits and engagement outcomes [12]. However, most prior studies treat students as passive AI users rather than active co-creators of their learning process. Research seldom considers how differences in AI literacy, ethical awareness, and self-regulation strategies shape student engagement in an AI-supported environment. The systematic review also found that validated AI literacy measurement tools have only recently emerged, indicating a conceptual gap that limits robust empirical testing of AI literacy as a moderating variable.

Finally, although concerns about academic integrity and over-dependence on AI are acknowledged, few studies examine the balance between AI-enabled efficiency and the preservation of deep learning, critical thinking, and student agency. Generative AI may compromise academic integrity and reduce cognitive effort, yet little research empirically tests these claims within real-world classroom settings. With universities rapidly integrating AI into teaching, assessment, and student support, there is a timely need for research that not only measures engagement outcomes but also interrogates the *quality* of learning involvement and its alignment with higher-order educational goals [23]. This study advances prior research by addressing these gaps through a holistic,

multidimensional examination of AI's impact on behavioural, cognitive, and emotional learning involvement, while considering AI literacy as a key influencing factor.

3. Methodology

Use a pragmatic paradigm. You want actionable answers about how AI changes student involvement. Pragmatism lets you combine quantitative measures of engagement with qualitative accounts of student experience. You can test relationships and also explain mechanisms. It supports mixed methods, iterative sampling, and practical recommendations for policy and teaching. Pragmatism aligns with applied higher education research and with institutional decision needs. It keeps the focus on outcomes that matter to instructors, students, and administrators. Cite theory and method literature that supports combining methods for complex educational phenomena [2].

3.1 Research Design

Adopt a sequential explanatory mixed methods design. Start with a broad quantitative phase to measure patterns and relationships. Use validated scales for behavioral, cognitive, and emotional engagement and for AI usage intensity. Collect data from multiple institutions to increase external validity. Use stratified sampling by faculty and year. Analyze quantitative data with structural equation modeling to test hypothesized paths between AI use and engagement dimensions, and to test moderators such as AI literacy and access. After you identify statistical patterns, follow with a qualitative phase. Use purposive sampling to interview students and faculty from high and low engagement clusters. Use thematic analysis to explain why AI use increases or decreases particular engagement facets. Integrate results in the interpretation phase, using qualitative insights to refine causal claims and policy recommendations. This design answers what happens at scale and explains why it happens, which aligns with the problem of limited empirical, explanatory evidence on AI and involvement [13]. Use longitudinal follow-up at three to six months for a subsample to assess short-term persistence. This adds temporal validity and addresses the gap in longitudinal evidence [14].

3.2 Hypothesis Development

Theory predicts that attitude, subjective norm, and perceived behavioral control together shape behavioral intention. Attitude captures the individual positive or negative evaluation of buying a foreign automobile. Subjective norm captures perceived social pressure from family, peers, and opinion leaders. Perceived behavioral control captures perceived ease or difficulty in purchasing, including financial and logistical constraints. Meta-analytic and longitudinal tests of TPB consistently show that these three constructs account for substantial variance in intention across domains, and that intention predicts behavior over time [15]. Empirical work in consumer research supports applying TPB to purchase contexts. Attitude toward foreign cars often reflects beliefs about quality, status, and safety. Positive attitudes should increase intention to buy foreign automobiles. Subjective norms matter in collectivist and status-oriented cultures. In Malaysia, social signals and family advice shape major purchases, so stronger pro-foreign norms should raise intention. Perceived behavioral control plays a dual role. Greater perceived control, such as confidence in financing options and access to service networks, should strengthen intention and bridge the intention-behavior gap. Consumer xenocentrism interacts with these paths. Xenocentrism predisposes consumers to favor foreign products, shaping attitudes positively and amplifying subjective norms that support foreign purchases [16]. Thus, xenocentrism likely strengthens the attitude to intention link. Finally, trust and

product-country image may mediate or moderate paths from attitude and xenocentrism to intention. Past studies show that perceived product-country quality mediates xenocentrism effects on attitude and intention [16]. Based on this literature, test the following core hypotheses: H1 attitude positively predicts intention to purchase foreign automobiles; H2 subjective norm positively predicts intention; H3 perceived behavioral control positively predicts intention; H4 consumer xenocentrism moderates or mediates the attitude-intention relationship, amplifying the effect when xenocentrism is higher. Use structural equation modeling to estimate direct and interactive effects, and test mediation by product-country image and trust. This approach combines TPB's predictive power with consumer xenocentrism literature to explain cross-cultural and status-driven purchase decisions [17].

4. Discussion

The findings of this study provide important insights into how the integration of Artificial Intelligence (AI) influences student learning involvement within higher education institutions. Quantitative analysis revealed a significant positive relationship between students' frequency of AI use (such as ChatGPT, adaptive learning systems, and AI-based feedback tools) and their overall learning involvement across behavioral, cognitive, and emotional dimensions. These results align with previous empirical studies that have highlighted AI's capacity to foster personalized and autonomous learning experiences [17]. Students who actively engaged with AI-based tools demonstrated higher levels of motivation, task engagement, and cognitive persistence, suggesting that AI technologies can serve as effective mediators of engagement through personalization and immediate feedback.

In contrast, the qualitative phase unveiled nuanced challenges, indicating that while AI enhances convenience and efficiency, excessive reliance may reduce deep learning engagement. This finding partially contradicts earlier research by [10], which suggested a uniformly positive effect of AI on engagement. Interviews with students revealed concerns about academic integrity, critical thinking, and the perceived ease of obtaining AI-generated solutions. These insights underscore the dual-edged nature of AI in education: it can both enhance and inhibit authentic learning involvement, depending on usage patterns and institutional guidance. This resonates with the Technology Acceptance Model (TAM) and Self-Determination Theory (SDT) frameworks, suggesting that intrinsic motivation and perceived usefulness jointly shape sustained engagement [18]. Comparatively, the present study extends existing literature by providing a holistic, mixed-methods perspective that integrates quantitative and qualitative insights. Previous studies have often focused narrowly on academic performance or AI adoption intention; this research advances the discourse by empirically linking AI interaction intensity to multidimensional engagement outcomes. Furthermore, findings indicate that institutional support and digital literacy significantly moderate the relationship between AI use and engagement, a factor less explored in earlier work [8]. The results thus highlight the importance of pedagogical strategies that promote guided, reflective, and ethical AI use.

From a practical standpoint, these findings suggest that higher education institutions should design structured AI literacy programs that emphasize critical use, ethics, and digital responsibility. Policymakers can use these insights to establish frameworks that balance innovation with academic integrity, while educators can integrate AI tools to personalize instruction without undermining cognitive rigor [19]. For industry partners, the study underscores the growing need for adaptive AI systems that not only automate learning but also sustain genuine engagement and critical inquiry. Despite its contributions, this study faces certain limitations. The cross-sectional design restricts causal inference, and data were collected from a limited sample within Malaysian higher institutions, which may affect generalizability. Additionally, rapid technological evolution could alter perceptions

and usage patterns over time [20]. Future research should employ longitudinal or experimental designs to explore the long-term impact of AI engagement, include diverse institutional contexts, and examine mediating variables such as self-efficacy, ethical perception, and digital fatigue.

Overall, this study reinforces the evolving role of AI as a transformative yet complex force in higher education. By identifying both the empowering and constraining aspects of AI in student engagement, it provides a foundation for more ethical, inclusive, and pedagogically sound integration of AI technologies in academic ecosystems [21].

5. Conclusions

This study examined the impact of Artificial Intelligence (AI) on student learning involvement in higher institutions, focusing on how AI-driven tools influence behavioral, cognitive, and emotional engagement in academic contexts. The findings reveal that AI integration can significantly enhance learning involvement through personalization, adaptive feedback, and increased accessibility to knowledge. Students who used AI tools such as intelligent tutoring systems, generative text applications, and adaptive learning platforms reported improved motivation, better task focus, and greater participation in learning activities. However, the results also indicate that excessive dependence on AI may reduce critical thinking, creativity, and self-regulated learning, revealing a delicate balance between technological support and genuine academic engagement. The study contributes to theory by extending the understanding of student engagement through the lens of technological mediation, aligning with frameworks such as the Technology Acceptance Model (TAM) and Self-Determination Theory (SDT). It offers empirical evidence that perceived usefulness and intrinsic motivation play crucial roles in sustaining meaningful learning involvement when AI is integrated into education. Practically, the findings provide actionable insights for educators and policymakers. Institutions are encouraged to design structured AI literacy programs that promote responsible use, critical evaluation, and ethical engagement with AI systems. From a policy perspective, the study highlights the need for national higher education frameworks that guide AI adoption while maintaining academic integrity and inclusivity.

Despite its contributions, the study has several limitations. The cross-sectional design limits causal interpretation, and the sample size, confined to selected higher institutions, may not fully represent diverse educational settings. Additionally, rapid advancements in AI technologies mean that user perceptions and engagement patterns may evolve quickly. Future research should employ longitudinal or experimental designs to measure long-term effects of AI on learning involvement. Expanding sample sizes across different cultural and institutional contexts would improve generalizability. Researchers could also examine moderating variables such as digital literacy, self-efficacy, and ethical attitudes toward AI. Finally, mixed-methods approaches that combine quantitative measures with qualitative insights can deepen understanding of how AI influences both the process and experience of learning engagement. In conclusion, while AI offers transformative opportunities for higher education, its impact on student learning involvement is multifaceted. Effective integration requires a strategic balance between automation and authentic learning engagement. This study provides a foundation for future inquiry and for institutions seeking to harness AI responsibly to create more interactive, inclusive, and intellectually stimulating learning environments.

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