ISSN: 1813-4890

Sustaining Student Engagement in AI-Supported Learning: The Role of Learning Continuity and Usage Intention

Haiyun Shi

Al-Farabi Kazakh National University, Kazakhstan.

Doctoral Candidate, Farabi International Business School, DBA in Business Administration (Major Code: 8D04104).

shihaiyun997@163.com

Abstract

As artificial intelligence becomes more common in education, keeping students actively engaged in AI-supported learning has become an important challenge. This study looks at how learning continuity and students' intention to keep using AI tools affect their engagement over time. It explores how students' trust in AI systems, their perception of usefulness, and the ease of using these tools influence their motivation and participation. The research also considers how AI-based features like personalized feedback, adaptive learning paths, and interactive systems can help students stay focused and continue learning even when they face difficulties. In addition, the study examines how institutional support, teaching design, and students' self-regulation skills work together to maintain engagement in AI-assisted learning environments. By combining insights from technology acceptance and motivation theories, this research aims to build a more comprehensive understanding of what drives sustainable engagement in AI-supported education. It also explores how emotional connection and social interaction within digital platforms contribute to learners' long-term satisfaction and continued participation. The findings are expected to offer both theoretical contributions and practical recommendations for educators, helping to create more inclusive, motivating, and effective AI-supported learning experiences. Ultimately, the goal is to help students not just start using AI tools, but to continue using them effectively for long-term learning success.

Keywords

Artificial Intelligence; Student Engagement; Learning Continuity; Usage Intention; Motivation; Higher Education; AI in Learning; Digital Learning; Personalized Education; Educational Technology; Learning Experience.

1. Introduction

In recent years, artificial intelligence has rapidly expanded its role in educational settings, offering unprecedented opportunities to personalize instruction, automate feedback, and support differentiated learning pathways. AI-driven tools such as intelligent tutoring systems, AI chatbots, and adaptive learning platforms are increasingly being used across universities to enhance student interactions with learning content and instructors, as well as to tailor learning experiences to individual needs. A systematic review of current research indicates that AI is being applied to support not only behavioural and cognitive engagement but also emotional engagement in students, suggesting its broad potential impact on educational outcomes.

Despite the promising advances, maintaining student engagement over extended periods continues to be a pervasive challenge in AI-supported learning environments. Whereas many studies have focused on initial user acceptance and adoption of AI technologies, fewer have

ISSN: 1813-4890

examined what drives sustained engagement, particularly after the novelty of AI tools wears off. For example, while AI can adapt content and provide immediate feedback—factors that may initially motivate students—there is limited research on how learning continuity and user intentions contribute to ongoing participation and engagement. This gap is significant because a tool that is adopted but not continuously used over time is unlikely to generate long-term learning benefits.

Closely related to sustained engagement are concepts such as continuance intention and usage intention, which reflect learners' decisions to continue using technology after initial exposure. Research in this area shows that factors like perceived usefulness, satisfaction, and confirmation of expectations play crucial roles in sustaining user engagement with AI tools, but such studies are still emerging in the educational context. For instance, Jung and Jo (2025) found that continuance intention among university students using generative AI was significantly influenced by perceived usefulness and satisfaction, indicating that the psychological and behavioural aspects of ongoing usage require deeper understanding.

Given both the theoretical interest and practical importance of sustaining engagement in AI-supported learning, this paper aims to develop an integrative theoretical understanding of how learning continuity and usage intention contribute to long-term student engagement. It also seeks to illustrate these dynamics through real educational cases, thereby offering insights that bridge academic theory and educational practice.

2. Theoretical Foundations

The theoretical foundation of this study is grounded in three key frameworks: the Technology Acceptance Model (TAM), the Self-Determination Theory (SDT), and Learning Continuity Theory. Together, these models explain how students' cognitive perceptions, intrinsic motivations, and behavioral patterns influence sustained engagement in AI-supported learning environments. Integrating these perspectives provides a multidimensional understanding of why students adopt AI learning systems, how they stay motivated, and what helps them maintain consistent learning behavior over time.

2.1. Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), first proposed by Davis (1989), is one of the most influential frameworks for explaining individuals' behavioral intentions toward technology use. The model identifies two fundamental determinants of user acceptance: perceived usefulness (PU) and perceived ease of use (PEOU). These perceptions shape a user's intention to use a technology, which subsequently predicts actual usage behavior. In AI-supported learning, TAM provides a valuable lens to understand why students adopt AI-driven systems such as adaptive feedback tools or virtual tutors. When learners perceive that these technologies enhance their learning efficiency and are easy to navigate, they are more inclined to engage with them regularly. Nugroho, Sutopo, and Wibowo (2024) confirmed that perceived usefulness and ease of use significantly influence students' willingness to continue using AI platforms in higher education, suggesting that TAM remains highly relevant for understanding technology-mediated learning behavior.

2.2. Self-Determination Theory (SDT)

The Self-Determination Theory (SDT), formulated by Deci and Ryan (2000), complements TAM by addressing the motivational dimension of sustained engagement. SDT posits that human motivation is governed by the fulfillment of three fundamental psychological needs: autonomy, competence, and relatedness. When these needs are satisfied, learners experience stronger intrinsic motivation, which drives continuous effort and satisfaction. In AI-supported learning contexts, personalization features allow students to make autonomous decisions, adaptive

feedback enhances their sense of competence, and social interaction tools create feelings of relatedness with peers and instructors. Zhao, Liu, and Chen (2023) found that AI systems designed around these psychological principles significantly increase learners' motivation and engagement. Thus, SDT helps explain the emotional and psychological mechanisms underlying long-term engagement in AI-enhanced learning environments.

2.3. Learning Continuity Theory

Learning Continuity Theory provides a behavioral and organizational perspective on sustained engagement, emphasizing the importance of consistent learning practices and uninterrupted participation. It focuses on how habit formation, institutional support, and technological stability contribute to the long-term maintenance of learning behaviors. In AI-based education, continuity is promoted when learning platforms offer reliable technical performance, progress tracking, and adaptive pacing that accommodate individual learner needs. Furthermore, institutional support—such as responsive faculty guidance and accessible technical assistance—plays a critical role in sustaining engagement. Kebritchi, Lipschuetz, and Santiague (2017) emphasized that the effectiveness of online and AI-supported learning depends on the integration of pedagogical design, technological infrastructure, and continuous student support. Learning continuity, therefore, serves as a bridge between technology use and sustained motivation, ensuring that engagement is not temporary but continuous over time.

2.4. Integrative Conceptual Model

By combining insights from TAM, SDT, and Learning Continuity Theory, this study proposes an integrative conceptual model to explain how cognitive, motivational, and behavioral factors collectively sustain student engagement in AI-supported learning environments. The model posits that cognitive perceptions such as perceived usefulness and ease of use (from TAM) influence students' usage intention, while motivational elements such as autonomy, competence, and relatedness (from SDT) enhance intrinsic motivation. Both usage intention and intrinsic motivation foster learning continuity, which ultimately drives sustained engagement. This integrative approach reflects recent findings by Jung and Jo (2025), who demonstrated that perceived usefulness and intrinsic motivation jointly predict students' continuance intention to use generative AI for learning. The proposed model provides a holistic framework that explains not only why students adopt AI tools initially but also how they remain consistently engaged over time through motivation and continuity mechanisms.

3. Literature Review and Conceptual Synthesis

Artificial intelligence has become a transformative force in higher education, offering new opportunities to improve teaching effectiveness, enhance student engagement, and personalize learning experiences. In recent years, universities have increasingly implemented AI-driven systems such as intelligent tutoring platforms, predictive analytics, and automated feedback tools to improve academic outcomes. Research indicates that AI integration can enhance learning efficiency and engagement by adapting instructional content to individual learner profiles and providing real-time feedback. These technologies can also help educators identify at-risk students early and design timely interventions, thus supporting both academic performance and retention. However, while the adoption of AI tools in education is expanding rapidly, their long-term impact on student engagement remains an area of ongoing exploration.

Previous studies on digital learning environments have shown that maintaining student motivation and retention over time is a major challenge, even when advanced technologies are available. Learners often demonstrate high engagement levels at the beginning of technology-mediated courses, but participation tends to decline as novelty fades or when technical or motivational difficulties arise. Research on online and blended learning contexts emphasizes

ISSN: 1813-4890

the importance of intrinsic motivation, self-regulated learning, and instructional design in sustaining engagement. These findings suggest that technological innovation alone is insufficient; sustained engagement requires supportive pedagogical strategies, learner autonomy, and continuous feedback mechanisms. In the context of AI-supported education, this calls for a deeper understanding of how learning continuity and usage intention contribute to long-term engagement beyond the initial adoption phase.

Despite these insights, there remain significant gaps in the empirical literature concerning long-term usage behavior in AI-supported learning. Most existing studies focus on technology adoption or user satisfaction but fail to examine how behavioral intention evolves over extended periods. Few longitudinal or mixed-method studies have explored how learners maintain consistent interaction with AI systems and what psychological or contextual factors sustain that continuity. Addressing these gaps requires not only theoretical refinement but also practical validation. Therefore, this study integrates theoretical frameworks with real-world educational cases to examine how learning continuity and usage intention jointly influence student engagement over time. By linking empirical findings with institutional experiences, this research aims to offer both conceptual contributions and actionable insights for improving the sustainability of AI-supported learning.

4. Case Study Analysis

This chapter presents two case studies that illustrate how the theoretical framework of this research—combining the Technology Acceptance Model (TAM), Self-Determination Theory (SDT), and Learning Continuity Theory—applies in real educational contexts. The first case examines the implementation of AI-supported learning systems at Al-Farabi Kazakh National University (KazNU), while the second compares it with global AI-enabled learning platforms such as Coursera. The analysis focuses on how technology acceptance, motivation, and continuity mechanisms jointly sustain or hinder student engagement.

4.1. Case Study 1: Al-Farabi Kazakh National University (Kazakhstan)

Al-Farabi Kazakh National University (KazNU) has been an early adopter of AI-based learning technologies within its digital education strategy. The university introduced an adaptive learning management system (LMS) in 2023 that integrates AI-driven analytics, virtual tutoring modules, and conversational tools such as ChatGPT to assist students in both academic and research activities. The system aimed to enhance personalized learning and increase engagement by tailoring study materials to students' performance levels.

However, during the first two semesters of implementation, participation rates showed a gradual decline. Students initially reported high satisfaction due to the novelty of the technology but later experienced reduced motivation and participation consistency. This decline reflected challenges related to overreliance on automated feedback, insufficient human interaction, and varying levels of technological literacy among students and instructors.

To counter these issues, the university implemented several engagement strategies, including teacher-AI collaboration, gamified learning modules, and peer-interaction activities. These interventions increased students' sense of autonomy and relatedness, aligning with SDT principles. The use of AI-driven progress dashboards and regular feedback loops helped maintain learning continuity by reminding students of their progress and achievements.

Table 1. Summary of AI Implementation and Engagement Outcomes at KazNU

Aspect	Description
AI Tools Implemented	Adaptive Learning Management System (LMS), AI Tutor, ChatGPT integration, Predictive Analytics Dashboard
Initial Challenges	Declining participation over semesters, overreliance on

ISSN: 1813-4890

	automation, low digital literacy among faculty
Engagement Strategies	Teacher–AI collaboration, gamification, peer-led discussions, interactive AI feedback
Impact on Learning Continuity	Regular progress updates and feedback loops maintained student interest and participation consistency
Connection to Theory	TAM: Perceived usefulness increased through adaptive features; SDT: Motivation enhanced by autonomy and relatedness
Observed Outcome	Improved long-term engagement, higher satisfaction with AI tools, gradual recovery in participation rates

4.2. Case Study 2: Coursera (Global Comparative Case)

Coursera, one of the world's leading AI-driven learning platforms, provides a useful comparative perspective. Its large-scale implementation of adaptive algorithms and personalized recommendations has demonstrated how AI can sustain learner engagement in open online environments. The platform employs artificial intelligence to recommend courses based on a learner's prior activity, track performance through analytics, and provide automated feedback on assessments.

Coursera's model emphasizes personalization, motivation, and continuity. Learners receive personalized notifications about deadlines, course progress, and new learning opportunities, which help them stay engaged even in self-paced environments. AI algorithms identify inactive users and trigger reminders to encourage re-engagement. Moreover, gamified badges and certificates strengthen a sense of achievement, while community discussion forums promote relatedness among global learners.

Compared to KazNU's structured academic environment, Coursera's open design places greater responsibility on learners' self-regulation and intrinsic motivation. While this autonomy aligns strongly with SDT principles, it can also lead to dropouts when external accountability is absent. Nonetheless, Coursera's continuous data-driven feedback mechanisms and flexible pacing options effectively promote learning continuity across diverse user populations.

Table 2. Summary of AI-Supported Engagement Mechanisms on Coursera

Aspect	Description
AI Tools Implemented	Adaptive content recommendation engine, automated assessment feedback, engagement analytics, progress notifications
Engagement Challenges	High dropout rates among self-paced learners, limited instructor–student interaction, motivation fluctuation
Engagement Strategies	Personalized reminders, gamified progress tracking, badges and certificates, community discussion forums
Impact on Learning Continuity	Regular notifications and adaptive pacing encourage sustained participation across diverse user groups
Connection to Theory	TAM: Perceived usefulness and ease of use promote adoption; SDT: Motivation driven by autonomy and competence
Observed Outcome	Improved engagement metrics and retention among active learners, stronger continuity for motivated users

4.3. Cross-Case Analysis

A comparison of the two cases，KazNU and Coursera，highlights both common success factors and distinctive challenges in sustaining engagement in AI-supported learning environments. Both cases demonstrate that personalization, feedback loops, and adaptive learning pathways are critical for maintaining continuity. In both settings, motivational support through autonomy and social interaction strengthens engagement more effectively than automation alone.

ISSN: 1813-4890

However, the cases also reveal barriers. At KazNU, limited faculty digital readiness and overreliance on automation initially hindered student participation. In Coursera's context, lack of personal connection and self-regulatory fatigue among learners led to attrition. These findings suggest that successful AI-supported engagement requires balancing technological usefulness (from TAM) with psychological motivation (from SDT) and habitual continuity (from Learning Continuity Theory).

Table 3. Cross-Case Comparison of Engagement Factors

Factor	KazNU Case	Coursera Case	Common Insights
AI Tools	University LMS, AI tutor, ChatGPT integration	Global MOOC platform with adaptive algorithms	Both use AI for personalization and feedback
Engagement Approach	Teacher-guided, blended AI-human model	Autonomous, self-paced model	Both rely on adaptive feedback and reminders
Motivational Drivers	Autonomy through peer learning, teacher interaction	Autonomy through self-regulation and badges	Autonomy and competence are key to motivation
Learning Continuity	Supported by regular feedback and institutional support	Sustained through personalized notifications and pacing	Consistency reinforced by adaptive systems
Main Challenge	Faculty readiness and reduced novelty	Learner fatigue and lack of social connection	Engagement sustainability needs human-AI balance

In summary, both cases illustrate that sustained engagement in AI-supported learning environments results from an interplay between perceived usefulness, intrinsic motivation, and institutional or system-level support. The evidence supports the study's theoretical proposition that usage intention and learning continuity jointly determine the sustainability of student engagement in AI-enhanced education.

5. Discussion

The results from both case studies confirm that AI-based personalization effectively supports learners' psychological needs as described by Self-Determination Theory (SDT). When AI systems provide adaptive feedback, autonomy in learning paths, and a sense of competence through progress tracking, students demonstrate stronger intrinsic motivation and sustained engagement. This finding aligns with the work of Kim and Lee (2023), who found that AI-enabled personalization significantly enhances learners' autonomy and competence, leading to higher satisfaction and commitment in online education. At Al-Farabi Kazakh National University, AI features such as adaptive quizzes and individualized tutoring strengthened students' sense of control and self-efficacy, while teacher-AI collaboration satisfied their need for relatedness. Similarly, Coursera's AI-based recommendation system promoted autonomy and achievement recognition through badges and certificates. Together, these elements illustrate that personalization functions not only as a cognitive support mechanism but also as a motivational catalyst for long-term engagement.

From the perspective of the Technology Acceptance Model, perceived usefulness remains the primary driver of initial adoption of AI-supported learning tools. Students are more likely to start using these systems when they believe the technology can improve their academic performance or learning efficiency. However, as the novelty of technology fades, intrinsic motivation becomes the critical factor sustaining continuous engagement. This observation

ISSN: 1813-4890

mirrors the findings of Al-Azawei (2022), who reported that although perceived usefulness encourages initial adoption, sustained participation in e-learning environments is better predicted by enjoyment, self-efficacy, and intrinsic motivation. At KazNU, students initially valued the efficiency and novelty of the AI system, but their continued engagement depended on whether the system maintained meaningful interaction and provided positive reinforcement. In Coursera's context, sustained learning was less about the technology itself and more about how well the AI features aligned with learners' motivational and emotional needs.

The analysis also highlights the mediating role of learning continuity between usage intention and student engagement. While TAM explains the intention to use AI tools, it does not fully account for how continuous learning behaviors are maintained over time. Learning continuity bridges this gap by emphasizing habitual engagement, feedback loops, and institutional support as sustaining forces. Both KazNU and Coursera demonstrated that consistent interaction, adaptive feedback, and progress reminders were crucial in transforming initial technology acceptance into enduring learning habits. This integration of TAM, SDT, and Learning Continuity Theory provides a comprehensive understanding of sustainable engagement: technology attracts users, motivation retains them, and continuity stabilizes their engagement over time. These insights suggest that institutions aiming to build effective AI-supported learning systems must design not only for usability and performance but also for emotional connection, autonomy, and consistent behavioral reinforcement.

6. Managerial and Educational Implications

The findings of this study offer several practical implications for educators, institutions, and educational technology developers seeking to sustain student engagement in AI-supported learning environments. For educators, it is essential to design AI-enhanced learning experiences that foster learner autonomy and provide meaningful feedback rather than relying solely on automation. Integrating human mentorship with AI-driven recommendations can strengthen human-AI partnerships and build trust, ensuring that students remain emotionally connected to the learning process. Research on human-centered AI design highlights the need for educational systems to prioritize learner agency, fairness, and transparency, which in turn supports long-term engagement and equity. For institutions, the results emphasize the importance of continuous technical and emotional support to sustain learning continuity, including policies that encourage balanced AI–human learning models where technology enhances but does not replace instructional relationships. AI developers should focus on adaptive and empathetic interactions capable of responding to learners' cognitive progress and emotional needs, and build robust engagement analytics to monitor behavior over time, aligning with frameworks for responsible AI integration in higher education.

7. Conclusion

This study examined how student engagement in AI-supported learning environments can be sustained over time through the interaction of learning continuity and usage intention. Guided by the theoretical foundations of the Technology Acceptance Model, Self-Determination Theory, and Learning Continuity Theory, the research combined theoretical reasoning with real-world case analysis to understand how cognitive perceptions, motivational factors, and behavioral consistency shape long-term engagement. The findings indicate that while technology acceptance influences the initial adoption of AI learning systems, lasting engagement depends primarily on intrinsic motivation and continuous participation reinforced by supportive institutional practices.

The case study of Al-Farabi Kazakh National University demonstrated that when AI systems provide adaptive feedback, personalized pathways, and opportunities for teacher collaboration,

students develop stronger motivation and maintain steady participation. Similarly, the Coursera case revealed that adaptive personalization, gamified feedback, and flexible pacing can sustain engagement by reinforcing learners' autonomy and competence. Together, these findings confirm that sustainable engagement arises not merely from technological novelty but from the alignment of AI design with human motivational and psychological needs. Effective AI-supported learning therefore requires both intelligent automation and the presence of empathy, guidance, and consistent interaction.

From a managerial and educational perspective, this study suggests that educators should design AI-based learning systems that promote autonomy, competence, and feedback while integrating human mentorship with technological support. Institutions should create policies and infrastructures that encourage balanced human–AI collaboration, ensuring that technology enhances rather than replaces the educator's role. Developers should focus on building adaptive and human-centered AI systems capable of tracking engagement patterns and providing timely motivational interventions. These strategies can transform AI-supported education into a more sustainable, learner-centered model that promotes lifelong engagement and growth.

While this research provides valuable insights, it also recognizes its limitations. The scope of case analysis was limited to higher education and large-scale online learning platforms, which may not capture all educational contexts. Future research should explore longitudinal data, diverse educational settings, and cross-cultural perspectives to deepen the understanding of how learning continuity, motivation, and AI integration interact over time.

In summary, the study concludes that technology acceptance initiates engagement, but motivation and learning continuity sustain it. The long-term success of AI-supported learning ultimately depends on how effectively educational technologies respect human needs, nurture curiosity, and maintain consistent learner involvement in a rapidly evolving digital landscape.

References

Chen, X., Xie, H., Qin, S. J., Wang, F. L., & Hou, Y. (2025). Artificial intelligence-supported student engagement research: Text mining and systematic analysis. European Journal of Education, 60(1), e70008. https://doi.org/10.1111/ejed.70008

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly, 13(3), 319–340. https://doi.org/10.2307/249008

Jung, Y. M., & Jo, H. (2025). Understanding continuance intention of generative AI in education: An ECM-based study for sustainable learning engagement. Sustainability, 17(13), 6082. https:// doi.org/ 10.3390/su17136082

Bhattacherjee, A. (2001). Understanding information systems continuance: An expectation-confirmation model. MIS Quarterly, 25(3), 351–370. https://doi.org/10.2307/3250921

Nugroho, D. A., Sutopo, W., & Wibowo, A. (2024). Exploring student acceptance of AI-based learning platforms using the extended Technology Acceptance Model (TAM): Evidence from higher education. Education and Information Technologies, 29(2), 1453–1472. https://doi.org/10.1007/s10639-023-11872-1

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. Psychological Inquiry, 11(4), 227–268. https://doi.org/ 10.1207/ S15327965PLI1104_01

Zhao, J., Liu, Y., & Chen, Q. (2023). Enhancing learners' intrinsic motivation through AI-supported personalized learning systems. Computers & Education, 204, 104868. https:// doi.org/ 10.1016/j. compedu.2023.104868

Kebritchi, M., Lipschuetz, A., & Santiague, L. (2017). Issues and challenges for teaching successful online courses in higher education: A literature review. Journal of Educational Technology Systems, 46(1), 4–29. https://doi.org/10.1177/0047239516661713

ISSN: 1813-4890

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education—Where are the educators? International Journal of Educational Technology in Higher Education, 16(1), 39. https:// doi.org/10.1186/s41239-019-0171-0

Panigrahi, R., Srivastava, P. R., & Sharma, D. (2018). Online learning: Adoption, continuance, and learning outcome—A review of literature. International Journal of Information Management, 43, 1–14. https://doi.org/10.1016/j.ijinfomgt.2018.05.005

Al-Azawei, A. (2022). Determinants of e-learning continuance intention: A confirmatory factor analysis of the extended Technology Acceptance Model. Education and Information Technologies, 27(8), 11135–11152. https://doi.org/10.1007/s10639-022-11011-9

Kim, D., & Lee, J. (2023). How artificial intelligence-based personalization promotes learner motivation and engagement in higher education. Computers & Education, 197, 104710. https://doi.org/ 10.1016/j.compedu.2023.104710

Fu, Y., & Weng, Z. (2024). Navigating the ethical terrain of AI in education: A systematic review on framing responsible human-centered AI practices. Computers and Education: Artificial Intelligence, 7, 100306. https://doi.org/10.1016/j.caeai.2024.100306

Le Dinh, T. (2025). Human-Centered Artificial Intelligence in Higher Education. Information, 16(3), 240. https://doi.org/10.3390/info16030240