

Strategic integration or skill compensation? Understanding GenAI use in online higher education

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205

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Abstract

Purpose – This study examines how non-traditional undergraduate students in online higher education environments utilize generative artificial intelligence (GenAI) as a tool to enhance academic engagement, personalize learning and improve productivity.

Design/methodology/approach – Using a quantitative, cross-sectional, correlational design, the study surveyed 491 non-traditional undergraduate students enrolled in online general education courses. Multiple regression analysis was conducted to evaluate how academic performance, skill confidence, technology proficiency and weekly time commitments relate to the frequency of GenAI use. Open-ended survey responses were also thematically analyzed to contextualize quantitative findings and explore student motivations, benefits and concerns.

Findings – Results indicate GenAI use is significantly associated with stronger academic performance and confidence in technology skills. Time constraints and lower academic confidence did not significantly predict use. High-performing and digitally proficient students were more likely to adopt GenAI to deepen understanding, generate ideas and streamline academic tasks. Qualitative responses described GenAI as a supportive thinking partner, while also highlighting ethical concerns around authorship, accuracy and academic integrity.

Research limitations/implications – This study examines GenAI use within a single large online university serving primarily adult, non-traditional learners in a flexible, asynchronous model. Findings should therefore be interpreted as contextually situated rather than broadly generalizable. The cross-sectional design captures adoption at an early stage and does not permit causal inference or analysis of long-term learning outcomes. Reliance on self-reported measures may introduce response bias. Future research should employ longitudinal, multi-institutional and mixed-method designs to examine how GenAI use evolves over time and how institutional context, discipline and learner demographics shape patterns of strategic AI integration.

Practical implications – Findings indicate GenAI adoption in online higher education is most strongly associated with digital confidence and academic motivation rather than remediation. Institutions serving adult and non-traditional learners should therefore embed structured GenAI literacy within curricula, emphasizing ethical use, critical evaluation and academic voice preservation. Faculty should design assignments that promote transparent, reflective engagement with AI tools instead of prohibition-based policies. Institutional leaders must develop coherent, context-sensitive AI frameworks and invest in digital skill development to prevent widening equity gaps as AI becomes normalized within asynchronous, autonomy-driven learning environments.

Social implications – As GenAI becomes integrated into online higher education, its social impact extends beyond productivity to issues of digital agency, equity and access. In adult-serving, asynchronous environments where learners self-manage academic decisions, disparities in digital fluency may amplify existing inequalities. Without intentional institutional support, students with lower technological confidence risk marginalization as AI-enhanced workflows become normative. Promoting inclusive, transparent and ethically guided GenAI integration can strengthen learner agency and participation, particularly among adult and non-traditional students balancing complex external responsibilities. Equitable AI adoption requires investment in digital empowerment alongside clear institutional standards.

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Originality/value – This study offers contextually grounded empirical insight into how adult, non-traditional undergraduates in online higher education strategically integrate GenAI into their learning practices. By situating adoption within frameworks of technology acceptance, self-directed learning and digital agency, the findings challenge deficit-based narratives and demonstrate that GenAI use is associated with academic confidence and digital fluency rather than remediation. The study contributes student-centered evidence from an autonomy-driven, asynchronous learning environment and provides theoretically informed guidance for ethical AI integration, digital equity initiatives and future longitudinal research on AI-supported learning.

Keywords Generative artificial intelligence, Online higher education, Digital literacy, Student engagement, Technology adoption, Academic confidence

Paper type Research article

Introduction

The rapid rise of generative artificial intelligence (GenAI) technology has catalyzed profound changes across higher education. In online learning, where instruction, feedback and coursework are mediated through digital platforms, GenAI has become both widely used and contested. As GenAI technologies become increasingly accessible and integrated into academic settings, critical questions emerge regarding their influence on student engagement, academic achievement and the accelerating digital transformation of educational environments (Vieriu and Petrea, 2025).

Questions investigating student engagement are especially salient in online higher education contexts serving adult and non-traditional learners, where autonomy, self-direction and strategic technology use are normative expectations. The aim of this research is to analyze the underlying drivers and patterns of GenAI adoption among non-traditional undergraduate students enrolled in online higher education programs. Specifically, the study examines whether GenAI use is primarily motivated by a desire to enhance engagement, compensate for academic skill gaps, or manage limited study time. Because course participation and assessment are often asynchronous and self-managed, students in online programs may make more independent decisions about when and how to use GenAI (Darvishi *et al.*, 2024; Koller, 2025). Despite growing attention to GenAI in education, there remains limited empirical clarity regarding how students use these tools in real-world online learning contexts.

Focusing on non-traditional undergraduate students enrolled in fully online programs, this study centers the student experience within an educational context characterized by learner autonomy and digitally mediated instruction. The findings inform ongoing conversations about responsible, inclusive and pedagogically sound approaches to GenAI integration, particularly in online learning environments serving diverse adult populations. The significance of this work extends well beyond higher education by clarifying prevailing assumptions about GenAI use in empirical evidence that can inform curriculum design, digital equity initiatives and institutional policies fostering responsible, ethical and equitable GenAI integration (Francis *et al.*, 2025; Vieriu and Petrea, 2025). Understanding how students actually use GenAI is essential in evaluating broader concerns related to academic integrity, authorship and whether short-term productivity gains translate into durable learning.

Literature review

Recent literature on GenAI in education reflects growing scholarly interest in understanding how GenAI shapes student learning, engagement and instructional design. At the same time, scholars call for a deeper interrogation of AI's "black box," raising ethical and pedagogical concerns about algorithmic influence on educational processes and outcomes. This concern is compounded by meta-review evidence highlighting fragmentation in how GenAI's impacts on learning, pedagogy and ethics are conceptualized across studies (Gillani *et al.*, 2023; Zhang *et al.*, 2026).

Within this broader discourse, much of the literature has concentrated on transparency, accountability and instructional implications, including institutional policy debates and instructor-facing considerations associated with GenAI adoption. Less is known about how students independently integrate GenAI in day-to-day coursework, particularly in online environments where learning is digitally mediated and students must self-manage task strategies and ethical boundaries (Belkina *et al.*, 2025; Wu *et al.*, 2025). Although GenAI adoption continues to expand, the mechanisms through which students independently integrate these tools into their learning processes and how this contributes to self-directed learning and skill development, remain insufficiently understood (Li and Awang, 2026).

This gap is especially pronounced in online learning contexts, where existing studies tend to examine structured instructional deployments, providing less insight into independent, student-directed use within online learning environments where engagement is asynchronous and instructor oversight is less immediate. Online learning conditions can intensify academic integrity and authorship concerns because acceptable GenAI use and expectations for disclosure may be inconsistently communicated across online courses, shifting responsibility onto students to interpret boundaries (Belkina *et al.*, 2025; Darvishi *et al.*, 2024; Wu *et al.*, 2025). Emerging evidence reinforces this concern, suggesting that while GenAI lowers barriers to access and productivity, it may introduce risks related to academic integrity, authorship ambiguity and the erosion of critical evaluation, particularly when students must independently regulate use without clear guidance (Francis *et al.*, 2025). These structural characteristics position online higher education as a critical context for examining how GenAI adoption is shaped by autonomy, self-regulation and digital competence.

Building on this perspective, additional scholarship examining GenAI use in online and distance education contexts underscore the importance of learner autonomy, asynchronous engagement and self-regulated study behaviors in shaping technology adoption. Studies of AI-supported learning in online environments suggest students are more likely to adopt intelligent tools when instructional structures emphasize flexibility, independent task management and personalized pacing (Adewale *et al.*, 2024; Lai *et al.*, 2026; Wu *et al.*, 2025). Extending this line of inquiry, recent research demonstrates the perceived alignment between GenAI affordances and course design, particularly modularized content and competency-based progression, significantly predicts sustained student use beyond initial experimentation (Nguyen *et al.*, 2025).

This pattern is especially evident among adult and non-traditional learners, who tend to engage with digital technologies strategically, selecting tools that reduce cognitive friction, clarify expectations and support efficient progression through coursework instead of relying on instructor mediation (Koller, 2025; Lim, 2025). Within asynchronous online learning contexts, GenAI has been shown to function as a supplementary learning resource supporting idea generation, content clarification and iterative refinement, particularly during early stages of academic work (Belkina *et al.*, 2025). Moreover, it can act as a “just-in-time” cognitive scaffold, enabling learners to navigate moments of uncertainty without disrupting workflow continuity, which is especially critical in self-paced environments (Iqbal *et al.*, 2025; Lai *et al.*, 2026). Collectively, this scholarship frames GenAI use in online higher education as a contextually embedded practice shaped by learner autonomy, digital competence and self-regulatory demands.

Despite rapid adoption, significant uncertainty remains regarding whether GenAI use reflects strategic academic enhancement or compensatory responses to perceived skill or time constraints. Addressing this gap, the present study examines patterns, predictors and self-reported purposes of GenAI use among non-traditional undergraduates in online general education courses, with attention to whether use reflects strategic learning support or compensatory responses to perceived academic or time constraints. By situating GenAI use within the institutional and learner context of online higher education, the study contributes

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student-centered evidence to ongoing discussions of digital literacy, academic integrity and equitable policy development.

Theoretical framework

Given the autonomy, flexibility and self-regulatory demands characterizing online higher education, this study draws on three complementary theoretical frameworks: the Technology Acceptance Model (TAM), self-directed learning (SDL) and digital agency. These frameworks clarify whether students decide to adopt GenAI, why self-directed learners may strategically integrate it into academic practices and how they critically regulate and evaluate its responsible use. This is especially important in contexts where responsibility for learning decisions and ethical boundaries rests largely with the learner.

208

Technology acceptance Model

The technology acceptance model (TAM) serves as a foundational lens to assess students' adoption of GenAI (Davis, 1989; Davis and Granić, 2024). Subsequent extensions of TAM further emphasize the role of social influence and cognitive instrumental processes in shaping sustained technology use, particularly in complex digital environments (Venkatesh and Davis, 2000). TAM explains that perceived usefulness and perceived ease of use are primary drivers of technology adoption. Within this study, TAM is operationalized through students' self-reported frequency of GenAI use, as an indicator of perceived academic utility, efficiency and usability in online coursework.

Self-directed learning

Self-directed learning (SDL) emphasizes the learner's proactive role in identifying learning needs, selecting strategies and evaluating outcomes (Knowles, 1975). Foundational models of SDL emphasize metacognitive regulation and learner control, particularly within self-managed learning contexts (Garrison, 1992). SDL is especially relevant in online learning environments where students independently manage their learning process with limited instructor interaction. In this study, SDL frames GenAI use as an intentional, goal-directed learning strategy, employed by learners who autonomously manage workload, pacing and academic decision-making.

Digital agency

Digital agency refers to a learner's capacity to act intentionally and responsibly within digital environments encompassing digital competence, confidence and critical engagement (Zhai *et al.*, 2021). In the context of this study, digital agency extends beyond adoption or autonomy to include the critical evaluation of AI-generated outputs, verification of accuracy and navigation of authorship and ethical boundaries. This lens provides insight into how students engage with GenAI in coursework, while maintaining academic voice, integrity and accountability within AI-mediated environments.

The integration of TAM, SDL and digital agency enables a multidimensional analysis of students' experiences with GenAI, capturing practical enablers of adoption alongside the cognitive, behavioral and ethical dimensions of use in online learning. These frameworks informed the development of the survey instrument and guided the interpretation of students' reported behavior as expressions of technology acceptance, self-directed learning practices and digital agency. Figure 1 illustrates how student GenAI use in online learning emerges at the intersection of technology acceptance, self-directed learning and digital agency.

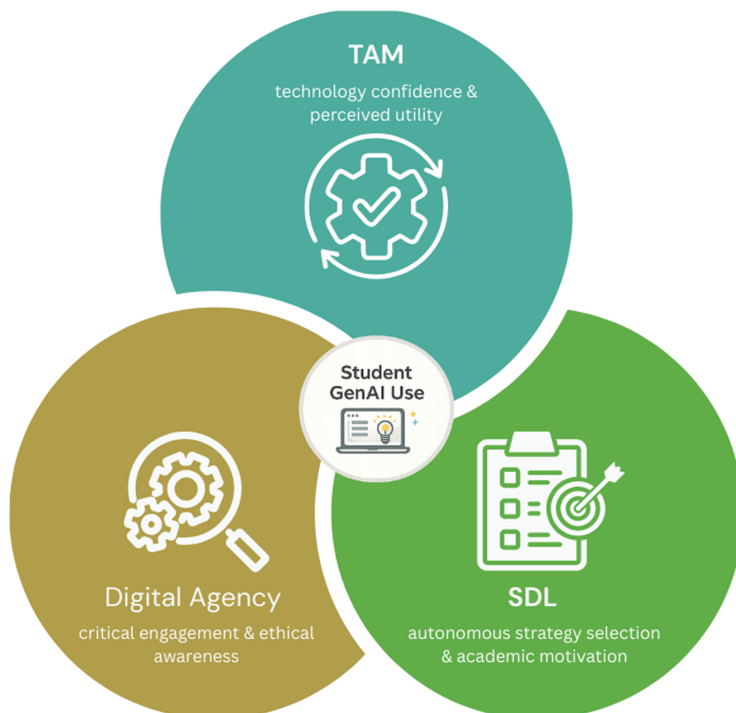


Figure 1. Model of student GenAI use in online learning. Source: Authors' own work

Methodology

This study employed a quantitative, cross-sectional, correlational research design to investigate how non-traditional undergraduate students enrolled in online courses utilize GenAI in their academic work. The primary aim was to examine whether the frequency of GenAI use correlates with academic performance, academic confidence and time allocation.

Academic performance was measured by grade point average (GPA), a cumulative indicator commonly used in U.S. higher education, typically calculated on a four-point scale, with higher values reflecting stronger academic achievement. Academic confidence was measured by students' self-reported confidence in core academic and digital skills. Time allocation was measured as weekly hours dedicated to studying, employment and family commitments, representing factors related to technology acceptance and digital empowerment.

A cross-sectional approach provided a timely snapshot of student behaviors and perceptions, thereby enabling the identification of statistically significant relationships between GenAI use and key factors such as academic performance, academic confidence and time investment. Quantitative methods are well-suited for estimating these relationships using standardized measures and inferential analysis (Capili, 2021).

Using multiple regression analysis, this study examined how theoretically informed indicators aligned with TAM, SDL and digital agency relate to patterns of GenAI use among students. Because GenAI adoption remains an evolving practice and objective behavioral logs were not available, self-reported measures were intentionally employed to capture perceptions, strategies and early-stage patterns of use. Such measures are commonly accepted in exploratory research on emerging technologies where behavioral data may be unavailable or incomplete.

This design is situated within a positivist research paradigm, emphasizing empirical evidence, hypothesis testing and uncovering measurable patterns in student behavior (Niure

and Sapkota, 2025). The efficiency and scalability of this methodology make it well-suited for studying large, distributed student populations. Similar quantitative, cross-sectional designs have been successfully leveraged in recent GenAI and educational technology research, supporting the rigor and suitability of this approach for examining emerging educational practices (Iqbal *et al.*, 2025; Pallant *et al.*, 2025).

Research question

To explore how non-traditional undergraduate students in online higher education utilize GenAI to enhance their academic engagement, this study employed the following quantitative research question: “Do higher education students use GenAI to maximize learning experiences, enhance inadequate academic skills, or support a shortage of study time?”

Investigating this research question helps clarify whether students primarily leverage GenAI to optimize learning outcomes, mitigate skill deficits, or accommodate competing time demands. The study aims to identify correlations between GenAI usage frequency and key variables, including academic performance, academic confidence and time allocation (study hours, work and family commitments).

In addition to the quantitative analysis, this cross-sectional study incorporated several open-ended survey questions. The responses enriched interpretation of numerical trends by providing contextual background, exploring participant motivations and identifying emergent themes complementing quantitative findings. Analyzing the qualitative data enhances the depth and interpretability, making the findings more meaningful and actionable (Neuert *et al.*, 2021). This approach enhanced interpretability by linking observed quantitative patterns to students’ reported experiences and decision-making. The open-ended items included:

- (1) Describe the greatest benefit you have experienced from using GenAI in your coursework?
- (2) Describe the greatest challenge you have faced when using GenAI in your coursework?
- (3) How can the university improve or better support students in using GenAI for completing coursework?

Sample and participants

A non-probability convenience sampling strategy was employed to recruit participants from a large online university serving non-traditional students across the United States. The institution operates under a flexible, asynchronous learning model, a structure designed to support students balancing academic study alongside employment, caregiving and other external responsibilities. This institutional context is characteristic of many contemporary online higher education environments and is particularly relevant for examining self-directed learning behaviors and technology adoption patterns. Eligibility required students to have completed at least three of five foundational general education courses: English Composition I, Critical Thinking in Everyday Life, Quantitative Reasoning I, Psychology of Learning and Elements of Health and Wellness. These courses were selected due to their emphasis on writing, critical thinking and quantitative reasoning; skills and tasks for which GenAI tools are particularly relevant and likely to be utilized by students in online coursework.

The final sample included 491 non-traditional undergraduate students, of whom 43.2% ($n = 212$) reported using GenAI tools during their coursework. This sample was diverse in age, academic background and external time commitments, mirroring the common demographic composition of adult learners in online education (Koller, 2025). The sample size exceeded the minimum threshold required for multiple regression analysis as established through *a priori* power analysis, ensuring adequate statistical power to detect meaningful relationships among the variables of interest. As a non-probability sample drawn from a single institution, findings

should be interpreted within the contextual characteristics of online adult-serving higher education. Figure 2 displays the age distribution of study participants. The sample was heavily concentrated in the 35–44 age range, with the 35–39 and 40–44 groups comprising the largest segments. Participation declined significantly among both younger (18–24) and older (60+) cohorts, indicating most respondents were mid-career adult learners. This age distribution is consistent with online and non-traditional learner demographic trends (Nietzel, 2025).

Figure 3 presents the distribution of participants by field of study. Representation was moderately concentrated, with the top three fields: Business, Psychology and Social Work, each accounting for approximately 10.9% of participants. The remaining programs were comparably represented, reflecting a reasonably diverse academic profile among the survey sample and supporting examination of GenAI use across varied academic disciplines.

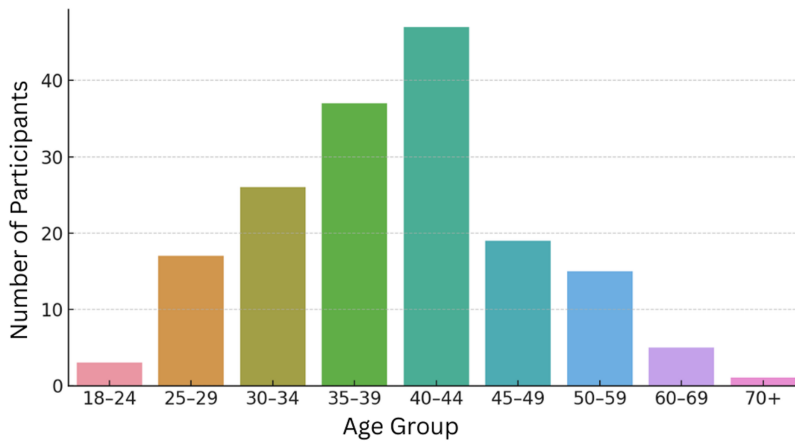


Figure 2. Participant age distribution. Source: Authors' own work

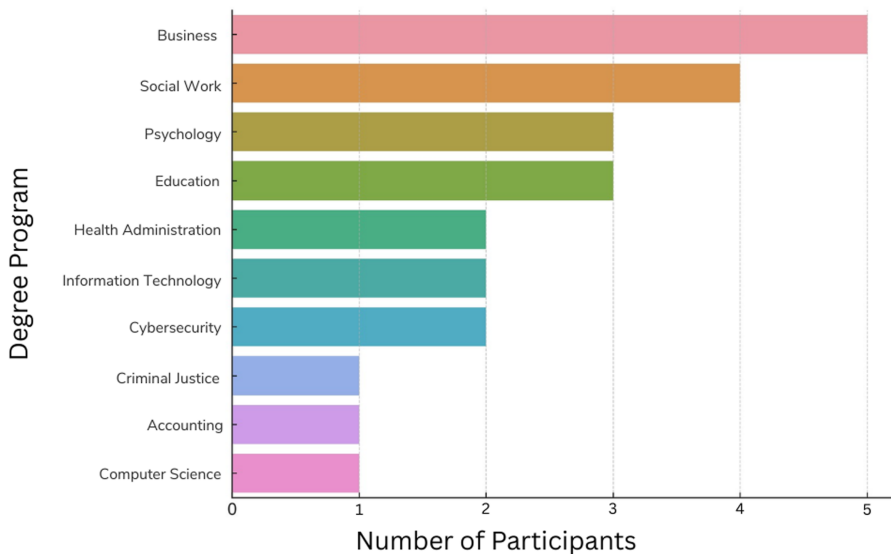


Figure 3. Participant field of study distribution. Source: Authors' own work

Data collection

Data for this study were gathered through a researcher-designed online survey administered via a secure institutional platform. All variables in the survey were measured using self-reported responses. The instrument comprised Likert-scale, ordinal and ratio-level items measuring the following variables:

- (1) Dependent Variable: Frequency of GenAI use
- (2) Independent variables:
 - Academic performance: GPA
 - Academic confidence: Confidence in reading, writing, mathematics and technology
 - Time allocation: Weekly hours dedicated to studying, employment and family commitments

To enrich interpretation of quantitative trends and deepen understanding of student experiences, the survey incorporated several open-ended questions. These were designed to provide contextual background, explore participant motivations and identify emergent themes, complementing quantitative findings.

The survey underwent review by subject matter experts and pilot testing with a small student sample to ensure clarity and usability. This study was reviewed and approved by the university's Institutional Review Board (IRB). All participants provided informed consent prior to participation and no personally identifiable information was collected, ensuring anonymity and adherence to ethical research standards.

Data analysis

Data were cleaned and analyzed using Python-based statistical software. Descriptive statistics were first used to summarize participant characteristics and response distributions. The primary analytical method was multiple linear regression, chosen to evaluate the predictive relationship between the frequency of self-reported GenAI use (dependent variable) and independent variables. To enhance analytical rigor and ensure validity, the following steps were implemented:

- (1) Outliers and incomplete responses were excluded from the dataset prior to analysis
- (2) Variables were examined for normality, multicollinearity and homoscedasticity to confirm the assumptions of linear regression were met
- (3) Predictor variables were consistently operationalized using standardized scale formats

Although the present study centers on quantitative analysis, qualitative feedback was also solicited via open-ended survey items to enrich the interpretation of quantitative results with student perspectives. Thematic analysis was conducted to identify recurring patterns and deeper insights into student motivations, behaviors and perceptions. Coding was iterative and responses were organized into categories and themes grounded in participant experiences. Relevant quotes were extracted to support each theme, ensuring clarity and analytical rigor.

Findings

Quantitative

Among the 491 respondents, 43.2% reported using GenAI tools (e.g. ChatGPT, Microsoft Copilot, Gemini) in their coursework. Of these users, 91.1% earned a GPA of 3.0 or above, with 68.9% achieving a 4.0 in the course where GenAI was used. Technology confidence

emerged as the highest-rated self-assessed skill, while mathematics confidence was the lowest. Figure 4 illustrates the distribution of GenAI use across GPA bands, highlighting the concentration of GenAI users among higher-performing students.

Multiple linear regression analysis identified two significant predictors of GenAI use frequency: GPA and confidence in technology. The model, $F(7, 204) = 3.26, p = 0.002$, accounted for 4.6% of the variance ($R^2 = 0.046$), a modest effect size consistent with behavioral research examining emerging technology adoption. Figure 5 presents the standardized regression coefficients for variables that significantly predicted the frequency of GenAI use.

- (1) GPA ($\beta = 0.15, p = 0.002$): Higher academic performance was associated with more frequent GenAI use.

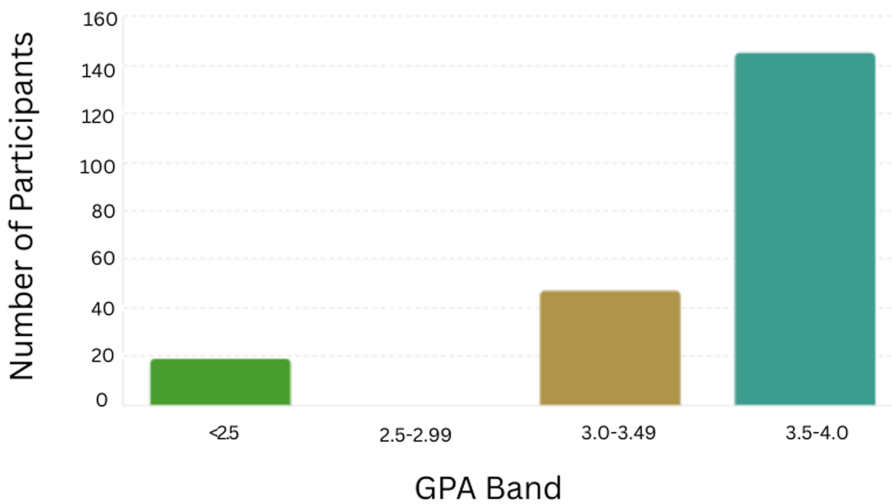


Figure 4. GenAI use by GPA Band. Source: Authors' own work

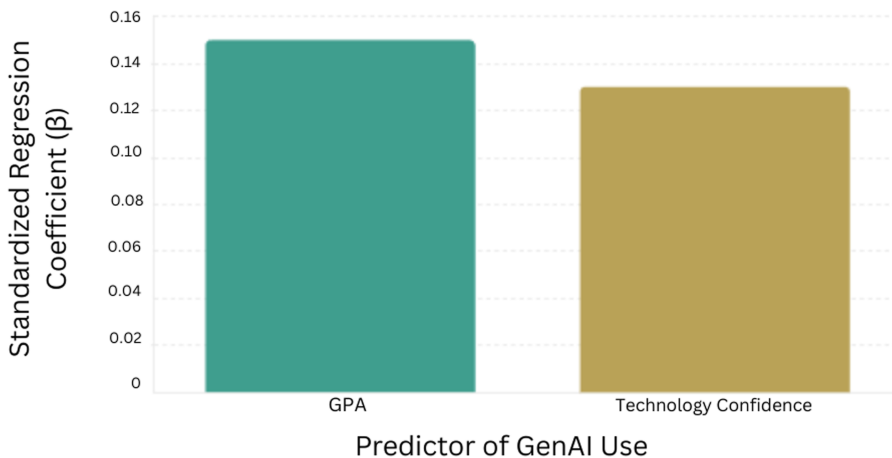


Figure 5. Significant predictors of GenAI Use. Source: Authors' own work

(2) Confidence in technology skills ($\beta = 0.13, p = 0.007$): Higher confidence in technology was associated with more frequent GenAI use.

Confidence in reading, writing and math did not significantly predict GenAI use. Similarly, time-related variables such as hours devoted to studying, working, or family commitments showed no statistically significant relationship to GenAI usage. [Table 1](#) summarizes the standardized regression coefficients for all predictor variables included in the model. Additional information on student GenAI usage can be found in [Appendix](#).

Qualitative findings

To complement the quantitative findings, open-ended survey questions were included to gain deeper insights into students’ perspectives on the benefits and challenges of GenAI in coursework. Thematic analysis of responses from 212 students who had used GenAI identified three dominant themes. [Table 2](#) summarizes the primary themes identified through thematic analysis and the number of responses aligned with each theme.

Theme 1. Improved Understanding and Concept Clarification

The most frequently cited benefit of GenAI use was its capacity to deepen understanding of complex academic content. Students described how GenAI clarified assignment instructions, explained challenging concepts in accessible terms and provided alternative perspectives when initial comprehension was lacking. One participant shared, “GenAI helped clarify what the teacher was asking and made things less confusing,” while another noted, “I used it to reword hard-to-understand concepts into language that made more sense to me.”

Theme 2. GenAI as a Thinking Partner or Learning Aid

Many students characterized GenAI as a supportive, non-judgmental “thinking partner” facilitating brainstorming, idea organization and alleviating early-stage writing anxiety. One participant reported, “I use it to get started when I don’t know how to begin,” while another

Table 1. Key predictors of GenAI use

Predictor	β	<i>p</i>
GPA	0.15	0.002
Technology confidence	0.13	0.007
Reading/Writing/Math confidence	—	>0.05
Time (Work, Study, Family)	—	>0.05

Note(s): β = standardized regression coefficient; — = not statistically significant ($p > 0.05$)
Source(s): Authors’ own work

Table 2. Findings from thematic analysis

Themes	Aligned participant responses
Theme 1: Improved Understanding and Concept Clarification	158
Theme 2: GenAI as a Thinking Partner or Learning Aid	111
Theme 3: Efficiency and Productivity	107

Note(s): Counts reflect the number of respondents whose open-ended responses aligned with each theme; responses could be coded to more than one theme
Source(s): Authors’ own work

commented, “AI helped me brainstorm and organize my thoughts . . . some instructions and ideas are written in ways that only a PhD would understand. AI is more like talking to someone and bouncing ideas back and forth.”

Theme 3. Efficiency and Productivity

Participants frequently cited time savings and improved task efficiency as key benefits of GenAI, particularly for repetitive or time-consuming assignments. A student shared, “AI made it easier to organize my writing and stay focused.” Students described GenAI as helping streamline early-stage work, improve clarity and support overall academic workflow. One participant recalled, “it allows me to write down all my thoughts and ideas about my assignments, without needing to adhere to any set standard, then helps me filter and sort things by relevancy. It allows me to refine ideas more easily and helps me structure my writing much faster.”

Additional qualitative themes

While less prevalent, two additional themes emerged: (1) support for writing quality and (2) trust and ethical concerns.

Support for Writing Quality. Several students highlighted GenAI’s value in improving grammar, sentence structure and fluency in academic writing. One participant remarked, “it helped with grammar and fixing sentence structure.”

Trust and Ethical Concerns. Some students expressed apprehensions regarding the accuracy, originality and ethical use of GenAI-generated content. Concerns included a potential loss of their authentic voice, as one participant noted, “it can alter your written voice and remove the feeling you are trying to relay in the writing.” Students also shared concerns about unintentionally violating academic integrity guidelines due to unclear institutional policies as well as the reliability of AI outputs. Another participant remarked, “I’m not sure how much I can trust that the information is right.”

Table 3 provides a synthesized overview of students’ GenAI use patterns and emergent qualitative themes, illustrating convergence across findings. Additional data detailing student use of GenAI in courses are provided in Appendix. These results should be interpreted in light of the study’s reliance on self-reported data and a single institutional context, which may limit transferability but remain appropriate for examining early-stage GenAI adoption in online higher education.

Discussion

These findings challenge deficit-based assumptions about GenAI use in education by showing GenAI use is associated with academic confidence and digital fluency instead of compensating

Table 3. Convergence of student-reported GenAI use behaviors and qualitative themes

Qualitative theme	GenAI use patterns	Convergence focus
Theme 1: Improved Understanding and Concept Clarification	Concept clarification; simplification of complex material; use of examples and explanations	GenAI supports comprehension and conceptual understanding
Theme 2: GenAI as a Thinking Partner or Learning Aid	Brainstorming; idea organization; exploratory learning	GenAI functions as a cognitive scaffold during early learning stages
Theme 3: Efficiency and Productivity	Writing refinement; summarization; workflow support	GenAI enhances efficiency while preserving student control over academic work

Source(s): Authors’ own work

for academic deficits or time scarcity (Cotton *et al.*, 2023; Darvishi *et al.*, 2024; Pallant *et al.*, 2025). The positive association between technology confidence and GenAI use is consistent with TAM, which emphasizes perceived usefulness and ease of use as central drivers of technology adoption (Davis, 1989; Davis and Granić, 2024). Similarly, higher GenAI use among academically confident students is aligned with SDL theory, which characterizes self-motivated, high-achieving learners as proactive adopters of tools supporting autonomy, self-regulation and personalized learning (Knowles, 1975). This theme is reflected in recent literature documenting students’ preference for AI explanations given their accessibility and adaptability to individual learning styles (Fitria, 2021). These findings reflect key principles of SDL, as learners actively seek and utilize tools to improve conceptual mastery and support independent learning.

Study findings also support the digital agency framework, suggesting students with strong digital agency are proactively leveraging GenAI to reinforce autonomy and comprehension. This pattern is consistent with recent research indicating high-performing students are more likely to adopt AI-driven tools as a form of academic enhancement (Belkina *et al.*, 2025; Wu *et al.*, 2025; Pallant *et al.*, 2025).

Qualitative evidence further indicates students critically evaluated GenAI’s limitations and appropriate boundaries of use, reflecting informed and intentional engagement. When implemented purposefully and supported by faculty or institutional guidance, AI tools can further expand learner agency by fostering ethical and effective human–AI collaboration (Kim *et al.*, 2025; Zhai *et al.*, 2021). As summarized in Table 4, findings demonstrate convergence across theoretical frameworks, providing a structured theoretical lens for interpreting patterns of GenAI adoption in online higher education. Overall, students’ reported use aligns with digital agency insofar as they described varying outputs, making informed decisions about when to rely on GenAI, and articulating concerns about ethics, accuracy, authorship and academic voice.

The findings contribute critical evidence demonstrating GenAI use in online higher education is embedded within broader patterns of self-directed learning, digital confidence and strategic task engagement rather than functioning as a compensatory response to academic difficulty. The demographic profile of participants, largely mid-career adult learners with substantial external commitments, provides essential contextual grounding. Unlike traditional undergraduates, these students are accustomed to autonomous learning, pragmatic tool use and efficiency-driven strategies for managing cognitive load. Within online higher education

Table 4. Theoretical framework alignment to study findings

Framework	Core constructs	Aligned findings
Technology Acceptance Model (TAM)	Perceived usefulness and ease of use	<ul style="list-style-type: none"> • Students with high confidence in technology are significantly more likely to use GenAI. • GenAI is valued for increasing efficiency, organization and saving time
Self-Directed Learning (SDL)	Learner autonomy, goal setting, self-regulation	<ul style="list-style-type: none"> • High GPA predicted GenAI use, suggesting motivated students proactively integrate tools to support learning • GenAI is used to clarify instructions, support brainstorming and deepen understanding
Digital Agency	Digital confidence, competence, ethical decision-making	<ul style="list-style-type: none"> • Students with strong digital fluency are more likely to adopt GenAI. • Learners critically evaluated the usefulness and limitations of GenAI, expressed ethical concerns and used it to enhance academic voice

Source(s): Authors’ own work

settings emphasizing learner independence, the proactive integration of GenAI aligns with established patterns of self-directed learning and strategic technology adoption (Koller, 2025). Accordingly, the absence of a significant relationship between GenAI use and time-based constraints reinforces interpretation of GenAI as a strategic learning resource rather than a mechanism for alleviating time scarcity, consistent with prior research on adult learners in flexible online environments (Koller, 2025).

Qualitative feedback from students positions GenAI as a “thinking partner” for brainstorming, clarifying concepts and enhancing writing efficiency. Students framed efficiency gains as support for early-stage organization and idea development instead of bypassing academic effort, a finding consistent with prior research indicating GenAI tools are most frequently used to reduce start-time friction, organize structure and support workflow without compromising rigor (Qian, 2025). This pattern is also consistent with research demonstrating GenAI’s effectiveness in supporting grammar correction, sentence rephrasing and tone adjustment, with particular benefits for non-native English speakers (Giglio and Costa, 2023).

However, students expressed concerns about GenAI’s accuracy and the preservation of authentic academic voice. These concerns reflect students’ active evaluation of GenAI’s limitations and appropriate boundaries of use, consistent with prior research highlighting how the opacity of AI systems can complicate perceptions of reliability and responsibility (Cotton *et al.*, 2023; Gillani *et al.*, 2023). Prior work further suggests that benefits of AI-supported scaffolding are maximized when faculty guidance and structured opportunities for critical reflection are embedded within instructional design (Chiu *et al.*, 2023).

By clarifying when, how and why students integrate GenAI into their learning routines, this research moves beyond deficit-based assumptions and offers an empirically grounded foundation for recommendations for AI-informed pedagogy, equitable policy frameworks and the development of robust digital literacy initiatives (Adewale *et al.*, 2024; Belkina *et al.*, 2025). These findings refine current understandings of GenAI use in online higher education by situating adoption within frameworks of autonomy, digital agency and self-directed learning.

Limitations

This study has several limitations to be considered when interpreting the findings. Data were collected using self-reported measures of GenAI use, academic confidence, time commitments and academic performance. While self-report instruments are methodologically appropriate for exploratory research on emerging technologies, they may be subject to response bias, including overestimation or social desirability effects.

The institutional context also shapes the interpretation of results. Participants were drawn from a single large online university serving primarily adult and non-traditional learners in a flexible, asynchronous learning environment. Although this context is well suited for examining self-directed learning and strategic technology use, it limits the generalizability of findings to other higher education settings, such as residential, selective, or traditionally structured institutions. The results should therefore be understood as contextually situated rather than broadly representative.

Additionally, the cross-sectional design captures student behaviors and perceptions at a single point in time, allowing for identification of associations but not causal inference or analysis of change over time. The qualitative component, while valuable for contextualizing quantitative results, was limited in depth due to its survey-based format. Future research employing longitudinal designs, multi-institutional samples and in-depth qualitative or behavioral data would strengthen understanding of how GenAI use evolves and influences learning outcomes.

Implications for practitioners

Serving adult learners in flexible online environments requires institutions to support intentional, transparent and ethically guided GenAI use aligned with norms of self-directed

learning and digital competence. The significance of these findings for higher education is multifaceted, urging educators and administrators to transform traditional pedagogical models by moving beyond the perception of GenAI as merely an academic shortcut or a threat to integrity.

GenAI should be recognized as a legitimate and valuable tool for cultivating greater student engagement, autonomy and advanced digital literacy. A further implication concerns digital equity: because high digital confidence significantly predicts GenAI use, institutions must address potential equity gaps to ensure students with lower digital fluency are not disadvantaged as AI tools become normalized in coursework.

Academic leadership and policy-makers

Academic leaders and policy-makers should prioritize the development of comprehensive GenAI guidelines and ethical use frameworks. Policies should move beyond prohibition toward practical guidance that supports responsible, transparent integration of AI tools into academic work. Concurrent investment in digital skills development is critical to ensure all students acquire the competencies necessary for effective GenAI adoption. Faculty development is also essential, as ongoing professional education will help instructors keep pace with rapid advances in AI and mentor students in ethical and effective use of these technologies. Institutions should encourage a culture of experimentation and reflective practice among instructors, supporting the piloting and sharing of innovative, AI-enhanced teaching strategies.

Findings indicate that ambiguity surrounding acceptable AI use contributes to uncertainty across courses and programs. Clear institutional frameworks that prioritize coherence, transparency and ethical literacy are more likely to promote responsible and equitable GenAI adoption than surveillance-oriented enforcement approaches.

Faculty and instructional designers

To maximize the positive impact of GenAI in higher education, several actionable recommendations emerge. Faculty and instructional designers should actively embed GenAI literacy and critical engagement with AI tools into curricula across all disciplines, not just technology-focused courses. Assignments should prompt students to reflect on, critique and use GenAI ethically as part of their regular learning activities. Structured dialog about GenAI's strengths, limitations and ethical implications can further strengthen students' evaluative judgment and digital agency.

Implications for the research community

This study provides a foundation for reframing GenAI use as an expression of digital agency. Future research should pursue longitudinal studies assessing the enduring academic and developmental outcomes of GenAI integration, including causal analyses that move beyond correlational designs to better isolate the effects of GenAI use over time. Scholars are also encouraged to investigate disciplinary differences in GenAI adoption, as well as how demographic factors such as race, gender and socioeconomic status may influence patterns of use and the emergence of inequities. Examining the roles of institutional culture, policy and instructional design will also be vital to understanding the environments that enable or hinder responsible GenAI adoption, including efforts to quantify the effectiveness and unintended limitations of emerging GenAI policies across institutional contexts. Finally, future work should explore the relationship between GenAI, student self-regulation and evolving forms of digital agency, thereby broadening both theoretical and practical understandings of digital learning in the AI era. As the field evolves, it will be essential to promote intentional, ethical and inclusive approaches to AI in teaching and learning, ensuring students and faculty alike are supported through this ongoing technological transformation.

Conclusion

This study provides compelling evidence that non-traditional undergraduate students in online higher education are using GenAI for academic enhancement, personalization and strategic engagement rather than a shortcut or remedial aid. Contrary to prevailing assumptions, GenAI adoption was not driven by limited time or a lack of academic skills. Instead, students with higher academic performance and stronger digital confidence were significantly more likely to incorporate GenAI into their learning routines. GenAI was most frequently used to clarify complex concepts, generate and organize ideas and improve academic workflow – actions indicative of self-directed and digitally fluent learners.

The findings also reveal students view GenAI as a supportive, idea-generating partner, capable of improving the efficiency and quality of academic tasks. While most participants demonstrated intentional and responsible use, some expressed concerns regarding the ethical implications of authorship, voice and accuracy. These concerns underscore the urgent need for higher education institutions to provide clear guidance and support for ethical, transparent GenAI integration.

As AI becomes increasingly embedded in academic life, this study affirms the importance of fostering digital fluency and learner agency across diverse student populations. Institutions must move beyond deficit-based narratives and instead support inclusive, strategic and pedagogically sound approaches to GenAI adoption. Future research should continue to explore the evolving role of GenAI in student learning and institutional transformation, ensuring technology enhances – not replaces – the human dimensions of education. Ultimately, the implications of this research extend beyond higher education, contributing to broader conversations on technology adoption, digital equity and the evolving relationship between human learning and artificial intelligence in education and workforce development.

AI usage

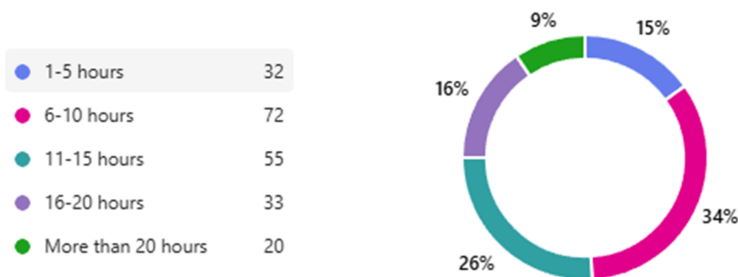
GenAI was used in the preparation of this manuscript for grammar and figure refinement, using ChatGPT 5.2 and Canva. The GenAI tools were not used to generate, analyze, or interpret research data, nor to create original scholarly content. All content was reviewed, verified and approved by the authors, who take full responsibility for the accuracy and integrity of the work.

Appendix

Additional Survey Data

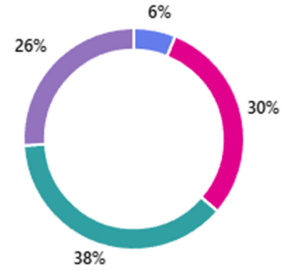
Question 7

How many hours do you spend completing coursework per week?



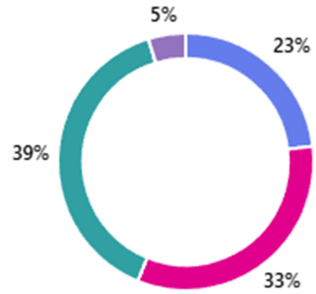
Question 8
How many hours do you spend at work per week?

● Less than 30 hours	13
● 30-40 hours	64
● More than 40 hours	80
● I am not currently employed	55



Question 9
How many hours do you spend taking care of your family, dependents, or loved ones per week?

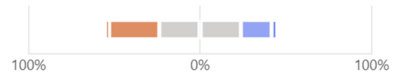
● Less than 20 hours	49
● 20-40 hours	70
● More than 40 hours	83
● Not applicable	10



Participant AI Use

Question 13
How often do you use GenAI in your coursework?

- Never
- Rarely
- Sometimes
- Often
- Always



Note. % of student AI usage includes Never: 1.9%, Rarely: 29.2%, Sometimes: 47.6%, Often: 17.9% and Always: 3.3%.

Question 14

How do you use GenAI in your courses? Check all that apply:



Note. Common responses for the open-ended text box for “Other” included image table, or chart generation, or N/A.

Question 15

What course did you use GenAI in the most?



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