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Studying the GenAI's Impact on Learning and Critical Thinking: A Multi-Site Field Experiment

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Short Paper

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Abstract

Generative AI (GenAI) is reshaping higher education, yet evidence of its pedagogical value remains scarce. This multi-site field experiment, grounded in Situated Cognition Theory, examines GenAI's impact on learning and critical thinking across ten universities and polytechnics in Portugal. About 270 students were randomly assigned to use licensed ChatGPT for a supervised task. Tasks, aligned with learning outcomes, were assessed via a rubric on critical thinking, accuracy, coherence, and originality. Observations and

questionnaires suggest ChatGPT improved comprehension and motivation, though challenges emerged in assessing reliability and prompt quality.

Keywords: *Generative AI; ChatGPT; Higher Education; Critical Thinking; Information Systems Educations*

Introduction

The emergence of generative AI tools like ChatGPT in late 2022 has accelerated digital transformation in higher education (Hashmi & Bal, 2024). Universities across disciplines are witnessing a paradigm shift in teaching and learning, with AI seen as a pivotal moment for rethinking pedagogical practices (Kurtz et al., 2024). Early evidence shows widespread awareness: over 80% of faculty and students report familiarity with generative AI, with many already experimenting with it for academic tasks (Yusuf et al., 2024). In Portugal, institutions are beginning to integrate ChatGPT into curricula and student support, raising debates around learning quality, integrity, and educational innovation (Maldonado-Mariscal and Alijew, 2023).

Generative AI is notably reshaping the role of instructors and students. Educators are adapting assessment methods, exploring AI-enhanced writing tasks, and emphasizing critical engagement over rote memorization (Batista et al., 2024). While AI is valued for simplifying complex content and supporting personalized learning, concerns about plagiarism, superficial knowledge, and best practices persist. Professional development is crucial, with over 75% of faculty highlighting the need for training and institutional guidance (O'Dea, 2024). Frameworks for AI integration advocate for AI literacy, revised assessment strategies, and inclusive policies (Kurtz et al., 2024).

Students also report positive experiences with ChatGPT, using it to clarify concepts, draft essays, and receive instant feedback (Li et al., 2024). However, procrastination and surface learning risks have been identified (Abbas et al., 2024), underlining the importance of critical engagement. Despite the tool's popularity, students still prefer human interaction and classroom discussions, suggesting AI is augmenting, not replacing, student-teacher relationships.

Given ChatGPT's transformative potential, examining its impact within specific educational contexts is essential. This study addresses this gap through a cross-institutional field experiment across 10 Portuguese higher education institutions. It presents early insights from an ongoing research project. It analyzes how faculty and students adapt to AI integration and explores the evolving pedagogical practices and learning behaviors emerging in response to generative AI.

Setting the Stage: The Rise of Generative AI in IS Education

Information Systems (IS) education has evolved from a technical focus on programming and systems design to encompass strategic, managerial, and human-centered perspectives (Föll et al., 2021). Today, IS education faces unprecedented transformation as institutions pivot to digital learning environments, revealing both significant pedagogical opportunities and substantial implementation challenges across core IS curriculum areas. The most critical finding is that while digital platforms enhance student engagement and enable innovative teaching methods, IS programs struggle with assessment authenticity and faculty digital competency, requiring fundamental rethinking of curriculum delivery and assessment strategies (Mitchell., 2022).

The emergence of generative artificial intelligence marks a break with the formerly incremental development of educational technology, as capabilities, access, and use patterns shift rapidly and at scale. Catalyzed by the public release of large-scale language models such as GPT-3 and GPT-4 and the rapid adoption of platforms like ChatGPT, Copilot, Claude, and Gemini, GenAI has transitioned swiftly from research to widespread educational use (Alier et al., 2024). Unlike previous innovations, GenAI tools generate text, code, and other outputs with contextual awareness and apparent creativity, raising pressing questions about the authenticity of student work and the development of critical thinking skills (van Slyke et al., 2023).

Institutional responses have varied: some universities have updated academic policies and launched pilot programs, while others have adopted more cautious approaches, delaying integration until more

unmistakable evidence emerges (McDonald et al., 2024). Within the academic community, discussions center on whether GenAI should be perceived as a threat, a practical tool, or a collaborative partner in learning (Sullivan et al., 2023).

Although generative AI is already reshaping IS education, empirical evidence remains limited. The literature is fragmented, with little consensus on best practices, effects on learning outcomes, or changes in teaching and learning behaviors prompted by these tools. To address these gaps, a cross-institutional field experiment involving ten Portuguese IS programs was launched. It combined experimental and observational methods to investigate how GenAI tools influence student learning, critical thinking, and engagement. The findings aim to inform academic practice and policy-making, offering guidance on meaningful AI integration while safeguarding core educational values.

Tracing the Conversation: Generative AI in IS Education

This section presents a narrative literature review on the impact of generative AI in higher education, with particular attention to its application in Information Systems (IS) education. A narrative literature review is a qualitative synthesis that interprets and integrates findings from diverse sources to identify key themes, trends, and insights, rather than aiming for the exhaustive coverage and protocol-driven rigor of a systematic literature review. While informed by principles of systematic inquiry, our review adopts an interpretative and integrative approach, synthesizing evidence to provide conceptual clarity and contextual understanding. This concise narrative sets the stage for establishing the relevance and significance of the empirical study currently being implemented.

Reviewing the Emerging Discourse

The literature review is structured around two central research questions: (1) How has generative AI been applied to improve teaching and learning in higher education? (2) In what ways has the IS field integrated generative AI into educational settings? The following core search string was applied:

A comprehensive literature search was conducted in Scopus using the following refined Boolean search string: ("generative AI" OR "generative artificial intelligence" OR "genAI" OR "large language models" OR "LLMs") AND ("higher education" OR "university") AND ("education" OR "teaching" OR "learning" OR "pedagogy").

The search was limited to peer-reviewed publications from 2020 to 2025, reflecting the rapid evolution of large language models and their educational uptake. Inclusion criteria focused on empirical or conceptual studies written in English, situated in higher education contexts and directly addressing the use of generative AI. Studies focused solely on general AI or unrelated educational technologies, and non-peer-reviewed literature and work outside higher education was excluded.

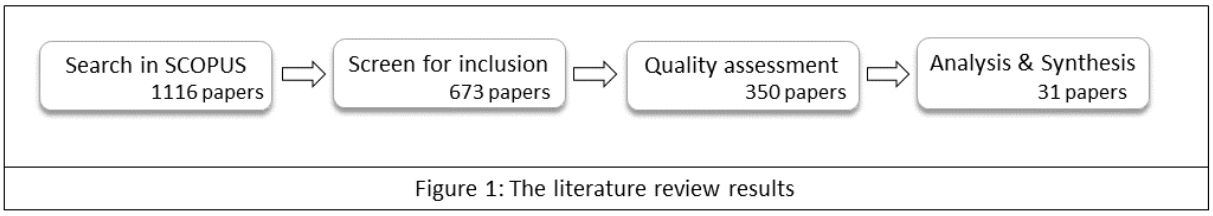

Figure 1: The literature review results

The uploaded image illustrates the literature review process, detailing the progressive filtering and evaluation stages from an initial SCOPUS search to the final selection. The process culminated in the in-depth analysis of 31 papers containing narrative and systematic literature reviews, with additional insights cross-verified against other high-quality research papers identified during the quality assessment phase (considering their classification in the ABS ranking, their placement in Scopus-indexed Q1 journals, and their citation count in Scopus). The selection process consisted of a two-stage screening procedure: first at the title and abstract level, and then through full-text review. All references were managed using Mendeley. For data synthesis, a structured extraction template was used to collect information on the educational context, focused AI tools, instructional strategies, and observed outcomes, with a focus on literature reviews relevant to IS education.

Emerging Narratives: How GenAI is Shaping IS Education

The proliferation of Generative Artificial Intelligence (GenAI) is reshaping educational landscapes, particularly in higher education (Aad & Hardey, 2024). Its adoption has fostered a wave of pedagogical innovation, characterized by personalized learning experiences, adaptive educational materials, and increased engagement among students (Wang et al., 2023).

The influence of GenAI on teaching and learning is profound and multifaceted. GenAI enables continuous, personalized support to learners, extending the educational process beyond the traditional classroom boundaries. Tools based on large language models, such as ChatGPT, provide real-time guidance on complex topics, including academic writing assistance, programming support, and in-depth explanations of scientific concepts (Jin et al., 2025; Wang et al., 2023). These tools bridge knowledge gaps and foster self-regulated learning through instant feedback, structured study plans, and goal-setting support (Hashmi & Bal, 2024). Additionally, GenAI enables the creation of adaptive educational materials tailored to individual learning needs, promoting personalized learning trajectories that maximize understanding and content retention (Aad & Hardey, 2024).

Moreover, the integration of GenAI has driven a new wave of pedagogical innovation, characterized by intelligent tutoring systems and the design of adaptive scenarios that promote active learning. These dynamic environments enhance crucial 21st-century skills, such as creativity, critical thinking, and problem-solving (Aad & Hardey, 2024; Hashmi & Bal, 2024). Through critical analysis of AI-generated content, comparative review between human and AI outputs, and participation in realistic simulations, students are challenged to develop greater adaptability in applying knowledge across contexts and innovative thinking (Jin et al., 2025; Wang et al., 2023). Thus, GenAI transforms traditional educational models, creating more student-centred, dynamic, and responsive learning ecosystems.

Moreover, GenAI has streamlined instructional processes significantly, assisting educators with tasks such as grading and assessment preparation. Through automation, GenAI ensures consistent evaluation and immediate, detailed feedback, allowing educators to concentrate on fostering deeper, strategic learning experiences (Batista et al., 2024; Medina-Gual & Parejo, 2025). These tools also support educators' professional development by recommending relevant educational resources and strategies, ensuring that teaching practices remain aligned with current technological advancements (Batista et al., 2024). Many educators appreciate that GenAI enables a shift from routine instructional activities toward more interactive, student-centred learning approaches, fostering not only students' but also their own critical thinking and creativity through the evaluation and adaptation of AI-generated content, comparison with their own materials, and the design of innovative, scenario-based learning activities. (Chithara & Madzvamuse, 2024). Students, too, perceive value in AI-supported learning, reporting increased engagement, personalized feedback, and greater efficiency in managing academic workloads (Medina-Gual & Parejo, 2025).

Nevertheless, not all perspectives are uniformly positive. Some educators express concerns about the erosion of academic integrity and the challenges in reliably detecting AI-generated content (Smolansky et al., 2023), while others worry that excessive reliance on automation might reduce opportunities for authentic learning and diminish the development of students' independent cognitive skills (Chithara & Madzvamuse, 2024; Smolansky et al., 2023). Students also exhibit mixed feelings: while many recognize the benefits of AI in simplifying tasks and enhancing learning efficiency, others fear that AI-driven assignments, especially when involving the critique of AI outputs, could constrain their creativity and critical engagement (Smolansky et al., 2023). Additionally, both students and educators highlight issues such as potential algorithmic bias and data privacy risks (Chithara & Madzvamuse, 2024), emphasizing the need for careful governance, transparent policies, and continuous ethical reflection as GenAI becomes increasingly integrated into educational practices (Batista et al., 2024).

Adopting GenAI in the Information Systems (IS) field has opened up domain-specific opportunities and challenges beyond those observed in broader educational contexts. Tools like MoodleBot have shown particular effectiveness in supporting self-regulated learning, offering context-specific assistance for complex technical subjects such as databases and programming (Neumann et al., 2024). GenAI has notably enhanced the development of computational thinking, which is critical for IS professionals, and fostered stronger programming self-efficacy among students (Yilmaz & Karaoglan Yilmaz, 2023). However, the reliance on AI-generated explanations introduces risks, particularly when inaccuracies or hallucinations go

undetected, potentially misleading learners or weakening their problem-solving autonomy (Neumann et al., 2024). Thus, critical evaluation skills must be integrated deliberately into IS curricula to ensure students learn to verify and challenge AI outputs.

Professional IS education faces additional complexities with GenAI integration. Studies in related fields, such as business education, highlight how GenAI can enrich ethical reasoning and decision-making training through intelligent co-ideation and interactive, values-based scenarios (Huo & Siau, 2024). These approaches align well with IS education's need to prepare students for ethically complex environments involving data governance, cybersecurity, and digital innovation. However, concerns about cognitive dependency, erosion of critical thinking, and compliance with evolving ethical and regulatory standards are particularly acute in IS, where professional practice increasingly intersects with sensitive information systems and autonomous technologies (Huo & Siau, 2024).

The reviewed literature highlights several essential knowledge gaps concerning generative AI (GenAI) integration in higher education. A consistent finding is the fragmentation and nascency of research on GenAI's role in assessment, learning processes, and educational practices (Mustafa et al., 2024). Studies point out that while there are numerous conceptual discussions and exploratory investigations, empirical validation remains limited, particularly regarding how GenAI reshapes assessment design, learning outcomes, and institutional policies (Batista et al., 2024). Furthermore, a lack of clear theoretical grounding has been noted, impeding cumulative knowledge development (McGrath et al., 2024). Research tends to overlook critical stakeholder groups beyond students and teachers, such as institutional leaders and policymakers, and there is insufficient exploration of long-term impacts, ethical considerations, and interdisciplinary applications (Lee & Palmer, 2025; Mustafa et al., 2024). Specific domains such as prompt engineering, AI literacy, and the development of higher-order thinking skills in AI-mediated learning environments are emerging but remain underexplored and inconsistently addressed across studies (Lee & Palmer, 2025).

The literature strongly emphasizes the urgent need for more empirical research to move beyond conceptual models and anecdotal evidence. There is a particular call for studies that can rigorously evaluate the impact of GenAI on students' learning outcomes, critical thinking development, self-regulated learning, and academic integrity (Batista et al., 2024). Empirical work is especially needed to assess the efficacy of GenAI-driven assessment designs, adaptive learning environments, and prompt engineering curricula (Lee & Palmer, 2025). Additionally, researchers advocate for investigating unintended consequences, such as cognitive dependency on AI tools, shifts in teacher and student agency, and the redefinition of educational roles (McGrath et al., 2024). Empirical studies are essential to inform evidence-based policy development, ensure ethical integration of AI technologies, and create resilient educational frameworks that can adapt to the rapidly evolving capabilities of GenAI systems (Mustafa et al., 2024).

Preliminary Insights from the Cross-Institutional Field Study

This paper focuses on an ongoing study in Portugal, involving 10 higher-education institutions selected from among those represented by researchers who are members of the Portuguese Chapter of AIS, ensuring coverage of institutions from the north to the south of the country. The study is theoretically grounded in Situated Cognition Theory, which posits that knowledge acquisition is deeply intertwined with the context, culture, and activities in which learning occurs (Brown et al., 1989). From this perspective, learning is not viewed as merely internalizing abstract knowledge but as an emergent, socially mediated process inseparable from authentic practices, tools, and interactions within real-world settings. Aligned with this theoretical lens, the field experiment described in this section seeks to explore how the integration of generative AI tools, specifically ChatGPT, influences students' learning processes, the development of critical thinking skills, and their engagement with course content. In this context, ChatGPT is conceptualized not simply as an auxiliary technological resource but as a situated artifact actively mediating cognitive engagement, reasoning, and reflection during authentic academic activities. By embedding generative AI into the students' natural learning environments, this study aims to capture the dynamic interplay between technology, context, and cognition, offering insights into how AI tools might transform educational practices in meaningful and contextually grounded ways.

Research Methodology

This study adopts a field experiment design implemented across 10 higher education institutions in Portugal, selected to represent diverse geographical and institutional contexts. The research is grounded in Situated Cognition Theory (Brown et al., 1989), which underpins the study's emphasis on real-world academic settings and authentic tasks, to observe the integration of generative AI in learning environments. The objective is to explore how integrating GenAI, specifically ChatGPT, affects students' learning processes and the development of critical thinking skills.

Research Design and Participants

Participating institutions were invited to integrate the study into one course of their choice, reflecting their specific pedagogical priorities and disciplinary diversity. Each institution selected the task in alignment with the specific course context and the learning dynamics implemented therein. The chosen tasks varied and could include programming, the production of formal documents, UML modeling, case study analysis, among other possibilities. In total, approximately 270 students participated in the study, distributed across these institutions. To operationalize the intervention, the project coordinator secured 20 premium ChatGPT licenses, which were distributed across institutions according to their needs and logistical capacities. Within each selected class, students were randomly divided into two groups.

Group	Used Tool	Description
Experimental Group	ChatGPT (licensed account)	Students used ChatGPT to assist in completing the task.
Control Group	Traditional tools (e.g., textbooks, notebooks)	Students completed the task without AI assistance, relying only on conventional study materials.

Table 1. Distribution of Students

This design compared student outcomes, engagement, and learning experiences between students using GenAI and those relying on conventional resources.

Learning Task and Procedure

Participating researchers designed a structured, well-defined task aligned with the course's learning objectives. Although tasks varied across institutions, they followed a common rationale. Each task was carried out during a single supervised class session, with class sizes ranging from 10 to 41 students, and was designed to produce a tangible academic output, such as meeting minutes, a presentation, a simple app, or a brief essay. For the experimental group, all prompts used with GenAI were collected, and supervision during the session ensured that the control group did not access GenAI tools.

Before starting the task, students in the ChatGPT group received a short orientation covering best practices for prompt writing, ethical use of AI, and strategies for critically engaging with AI-generated content.

The researcher facilitated both groups simultaneously during the session, observing their interactions and providing guidance when needed. In the ChatGPT group, special emphasis was placed on fostering reflective practices. After each interaction with the AI tool, students were asked to reflect on the quality, relevance, and reliability of ChatGPT's responses and their subjective experience. Prompts were discussed openly, and students were encouraged to revise their approach or consult course materials again whenever inconsistencies or misunderstandings emerged.

Data Collection and Analysis

Data collection employed a mixed-methods strategy, integrating the analysis of student outputs, systematic classroom observations, and the administration of a post-task questionnaire, the latter applied exclusively to the experimental group. Student outputs, generated either with or without the assistance of ChatGPT, were collected after each session and assessed through a standardized rubric developed to ensure evaluative consistency across institutions and conditions. This rubric focused on four dimensions: critical thinking, content accuracy, coherence (logical and consistent organization of ideas, ensuring smooth flow and clear

connections), and originality (presentation of novel ideas, perspectives, or approaches beyond mere reproduction of existing content).

To complement the analysis of outputs, participants in the AI group completed a self-administered questionnaire designed to capture their perceptions of the AI-mediated learning experience. The instrument comprised five Likert-scale items evaluating (i) content comprehension, understood as the extent to which ChatGPT facilitated understanding of the subject matter; (ii) motivation for further inquiry, reflecting whether AI use stimulated deeper exploration of the topic; (iii) perceived usability, indicating the ease or difficulty of interacting with the tool; (iv) cognitive effort and reflective engagement, assessing the degree to which ChatGPT fostered critical thinking; and (v) intention for future use, measuring the likelihood of continued reliance on ChatGPT for academic purposes.

An open-ended item at the end of the questionnaire solicited detailed qualitative feedback regarding students' experiences, including the types of prompts utilized, instances in which ChatGPT was perceived as either beneficial or problematic, and the interaction strategies adopted during task completion.

Preliminary Findings and Emerging Insights

This section presents initial findings organized according to the thematic dimensions outlined in the methodology. Although the analysis remains ongoing, several emerging patterns warrant early discussion.

Grounded in Situated Cognition Theory, the dimensions reflect how learning is tied to authentic contexts, activities, and social interactions. The dimensions of Situated Cognition Theory, namely *Learning Process, Academic Engagement, Barriers to Learning and Critical Thinking, Development of Critical Thinking, and Long-term Engagement and Educational Integration*, jointly describe how students construct knowledge through authentic practice, engage in communities of learning, confront obstacles that shape their evaluative capacity, refine critical reasoning via sustained disciplinary interaction, and embed learning into long-term academic and professional trajectories..

Dimension	**Key Insights**
Learning Process	ChatGPT was an effective supplementary tool, reinforcing students' understanding and supporting key learning objectives. Students across institutions reported that it helped them structure ideas and gain initial clarity, particularly in complex tasks.
Academic Engagement	Students showed greater motivation for further inquiry, though some struggled to assess the relevance and credibility of AI-generated content without instructor guidance.
Barriers to Learning and Critical Thinking	Challenges included interpreting AI outputs, detecting inaccuracies, formulating prompts, and avoiding uncritical acceptance. Students's reflections highlighted that the quality of responses depended strongly on prompt design, and that they had to remain attentive and exercise critical judgment.
Development of Critical Thinking	Mixed results emerged here. While some students engaged critically with AI outputs, others accepted them passively. ChatGPT also served as a mirror of students' own knowledge gaps, prompting them to validate and refine their reasoning, which suggests potential to foster metacognition.
Long-term Engagement and Educational Integration	Most students intend to continue using ChatGPT in the academic setting. Long-term engagement is not merely aspirational but already observable. About half of the respondents reported a daily or frequent use of ChatGPT.

Table 2. Early Results from the Study

Overall, the findings suggest a high adoption potential, contingent upon providing structured guidance and clear ethical frameworks. While preliminary, these insights indicate that students recognize both the pedagogical potential and the risks associated with AI use. The findings underscore the importance of investing in AI literacy, developing critical thinking, and establishing ethical guidelines to facilitate the responsible integration of generative AI in educational settings.

Conclusion

Preliminary findings, framed by Situated Cognition Theory, show that ChatGPT created a context-rich environment enhancing engagement and understanding. Acting as both information source and cognitive partner, it shaped how students accessed, questioned, and reflected on knowledge within authentic learning contexts.

Emerging patterns suggest that while ChatGPT can stimulate curiosity and reinforce learning, its effective integration requires scaffolding strategies that promote critical engagement and reflection. Students' struggles with interpreting AI outputs and assessing their reliability underline the situated nature of cognition, that is, the way learners' thinking and knowledge construction are influenced by the specific social, cultural, and instructional context in which the learning activity takes place. Without appropriate contextual cues and community guidance (e.g., teacher facilitation), learners may experience difficulty navigating the epistemic boundaries between AI-generated knowledge and disciplinary standards.

While the sample of 270 participants across 10 institutions does not allow for statistical validation, this study was conceived as a preliminary exploration, with subsequent phases of a more extensive longitudinal investigation planned. Future research will build upon these initial insights through extended longitudinal investigations, deepening the comparative analysis across institutions. This will include a continued application of the situated cognition theory, an expanded analysis of prompts to trace improvements over time and their relation to the quality of student outputs, and a situated examination of Generative AI users' behaviors and perceptions in contrast with those of control groups, thereby strengthening the robustness, contextual depth, and scalability of the conclusions.

The next stages of this study will compare institutions to examine differences and commonalities in critical thinking and learning outcomes between experimental and control groups. Attention will focus on contextual factors, namely discipline, culture, and implementation, shaping AI use. In parallel, qualitative responses will be coded to reveal patterns in perceptions, strategies, and emerging competencies in AI-supported learning.

References

Aad, S., & Hardey, M. (2024). Generative AI: hopes, controversies and the future of faculty roles in education. *Quality Assurance in Education*. https://doi.org/10.1108/QAE-02-2024-0043

Abbas, M., Jam, F. A., & Khan, T. I. (2024). Is it harmful or helpful? Examining the causes and consequences of generative AI usage among university students. *International Journal of Educational Technology in Higher Education*, *21*(1), 10. https://doi.org/10.1186/s41239-024-00444-7

Alier, M., García-Peñalvo, F. J., & Camba, J. D. (2024). Generative Artificial Intelligence in Education: From Deceptive to Disruptive. *International Journal of Interactive Multimedia and Artificial Intelligence*, *8*(5).

Batista, J., Mesquita, A., & Carnaz, G. (2024). Generative AI and Higher Education: Trends, Challenges, and Future Directions from a Systematic Literature Review. In *Information (Switzerland)* (Vol. 15, Issue 11). Multidisciplinary Digital Publishing Institute (MDPI). https://doi.org/10.3390/info15110676

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated Cognition and the Culture of Learning. *Educational Researcher*, *18*(1), 32–42. https://doi.org/10.3102/0013189X018001032

Chithara, H., & Madzvamuse, S. (2024). Perspectives on Teaching and Learning in Higher Education in the Era of Generative AI. *2024 4th International Multidisciplinary Information Technology and Engineering Conference (IMITEC)*, 81–85. https://doi.org/10.1109/IMITEC60221.2024.10851078

Föll, P., Röder, M., & Thiesse, F. (2021). Bridging The Gap Between Industry Skill Demand and University Skill Provison. *Proceedings of the 29th European Conference on Information Systems (ECIS)*, 1–16. https://aisel.aisnet.org/ecis2021_rp

Hashmi, N., & Bal, A. S. (2024). Generative AI in higher education and beyond. *Business Horizons*, *67*(5), 607–614. https://doi.org/10.1016/j.bushor.2024.05.005

Huo, X., & Siau, K. L. (2024). Generative Artificial Intelligence in Business Higher Education: A Focus Group Study. *Journal of Global Information Management*, *32*(1). https://doi.org/10.4018/JGIM.364093

Jin, Y., Yan, L., Echeverria, V., Gašević, D., & Martinez-Maldonado, R. (2025). Generative AI in higher education: A global perspective of institutional adoption policies and guidelines. *Computers and Education: Artificial Intelligence*, *8*, 100348. https://doi.org/10.1016/j.caeai.2024.100348

Kurtz, G., Amzalag, M., Shaked, N., Zaguri, Y., Kohen-Vacs, D., Gal, E., Zailer, G., & Barak-Medina, E. (2024). Strategies for Integrating Generative AI into Higher Education: Navigating Challenges and Leveraging Opportunities. *Education Sciences*, *14*(5), 503. https://doi.org/10.3390/educsci14050503

Lee, D., & Palmer, E. (2025). Prompt engineering in higher education: a systematic review to help inform curricula. *International Journal of Educational Technology in Higher Education*, *22*(1). https://doi.org/10.1186/s41239-025-00503-7

Li, M., Cheng, FF., & Yamamoto, B. A. (2024). Ethical Implications of ChatGPT in Higher Education: A Scoping Review. *Journal of Interdisciplinary Studies in Education*, *13*(1), 55–69.

Maldonado-Mariscal, K., & Alijew, I. (2023). Social innovation and educational innovation: a qualitative review of innovation's evolution. Innovation: The European Journal of Social Science Research, 36(3), 381–406. https://doi.org/10.1080/13511610.2023.2173152

McDonald, N., Johri, A., Ali, A., & Hingle, A. (2024). *Generative Artificial Intelligence in Higher Education: Evidence from an Analysis of Institutional Policies and Guidelines*.

McGrath, C., Farazouli, A., & Cerratto-Pargman, T. (2024).Generative AI chatbots in higher education: a review of an emerging research area. *Higher Education*. https://doi.org/10.1007/s10734-024-01288

Medina-Gual, L., & Parejo, J. L. (2025). Perceptions and Use of AI in Higher Education Students: Impact on Teaching, Learning, and Ethical Considerations. *European Journal of Education*, *60*(1). https://doi.org/10.1111/ejed.12919

Mitchell, A. (2022). Addressing the Dynamic Information Technology Landscape: A Course Reflection. Communications of the Association for Information Systems, 50(1), 452–469. https://doi.org/10.17705/1CAIS.05020

Mustafa, M. Y., Tlili, A., Lampropoulos, G., Huang, R., Jandrić, P., Zhao, J., Salha, S., Xu, L., Panda, S., Kinshuk, López-Pernas, S., & Saqr, M. (2024). A systematic review of literature reviews on artificial intelligence in education (AIED): a roadmap to a future research agenda. In *Smart Learning Environments* (Vol. 11, Issue 1). Springer. https://doi.org/10.1186/s40561-024-00350-5

Neumann, A. T., Yin, Y., Sowe, S., Decker, S., & Jarke, M. (2024). An LLM-Driven Chatbot in Higher Education for Databases and Information Systems. *IEEE Transactions on Education*. https://doi.org/10.1109/TE.2024.3467912

O'Dea, X. (2024). Generative AI: is it a paradigm shift for higher education? *Studies in Higher Education*, *49*(5), 811–816. https://doi.org/10.1080/03075079.2024.2332944

Smolansky, A., Cram, A., Raduescu, C., Zeivots, S., Huber, E., & Kizilcec, R. F. (2023). Educator and Student Perspectives on the Impact of Generative AI on Assessments in Higher Education. *L@S 2023 - Proceedings of the 10th ACM Conference on Learning @ Scale*, 378–382. https://doi.org/10.1145/3573051.3596191

Sullivan, M., Kelly, A., & McLaughlan, P. (2023). ChatGPT in higher education: Considerations for academic integrity and student learning. *Journal of Applied Learning and Teaching*, *6*(1), 31–40. https://doi.org/10.37074/jalt.2023.6.1.17

van Slyke, C., Johnson, R. D., & Sarabadani, J. (2023). Generative Artificial Intelligence in Information Systems Education: Challenges, Consequences, and Responses. *Communications of the Association for Information Systems*, *53*, 1–21. https://doi.org/10.17705/1CAIS.05301

Wang, H., Dang, A., Wu, Z., & Mac, S. (2023). *Generative AI in Higher Education: Seeing ChatGPT Through Universities' Policies, Resources, and Guidelines*.

Yusuf, A., Pervin, N., & Román-González, M. (2024). Generative AI and the future of higher education: a threat to academic integrity or reformation? Evidence from multicultural perspectives. International Journal of Educational Technology in Higher Education, 21(1).

Yilmaz, R., & Karaoglan Yilmaz, F. G. (2023). The effect of generative artificial intelligence (AI)-based tool use on students' computational thinking skills, programming self-efficacy and motivation. *Computers and Education: Artificial Intelligence*, *4*. https://doi.org/10.1016/j.caeai.2023.100147