

Generative AI in the Classroom: Ethical Frameworks for Student-AI Collaboration

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ABSTRACT

Background. The rapid integration of generative artificial intelligence (AI) in educational settings has transformed student learning practices and introduced new forms of human-AI collaboration. Despite its potential to enhance engagement and expand access to knowledge, the use of AI raises critical ethical concerns related to academic integrity, authorship, and responsible use in academic contexts.

Purpose. This study aims to develop an ethical framework to guide student-AI collaboration in classroom settings and to examine the relationship between AI usage, ethical awareness, and student learning outcomes.

Method. A mixed-methods research design was employed, integrating quantitative and qualitative approaches. Survey data were collected from 212 participants to assess patterns of AI usage, ethical awareness, and perceived learning outcomes. In addition, interviews and focus group discussions were conducted to capture in-depth perspectives. Quantitative data were analyzed using descriptive and inferential statistics, while qualitative data were examined through thematic coding techniques.

Results. The findings reveal that AI usage significantly enhances student engagement; however, it does not automatically improve ethical awareness. Institutional guidance and clear policy frameworks emerge as critical factors influencing responsible AI use and the maintenance of academic integrity. The analysis further identifies key ethical dimensions underlying student-AI collaboration, including transparency, accountability, fairness, and critical engagement.

Conclusion. The effective integration of generative AI in education requires the development of structured ethical frameworks that align technological practices with pedagogical objectives. The proposed framework offers practical guidance for educators and institutions in fostering responsible, ethical, and meaningful student-AI collaboration.

KEYWORDS

Academic Integrity, Ethical Framework, Student-Ai Collaboration

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INTRODUCTION

Generative artificial intelligence has rapidly transformed educational practices by introducing new forms of human-machine collaboration in the classroom. Tools capable of producing text, images, code, and analytical outputs are increasingly used by students to support learning activities, problem solving, and knowledge construction. The integration of generative AI into educational environments reflects a broader shift toward technology-enhanced learning, where digital systems actively participate in cognitive processes rather than merely serving as passive resources. This

transformation raises important questions about how learning is defined and how knowledge is produced in AI-mediated contexts.

The use of generative AI in classrooms has expanded opportunities for personalized learning and increased access to information (Ruiz, 2025; K. S. Tang, 2024). Students can engage with AI systems to receive immediate feedback, generate ideas, and explore complex concepts in interactive ways. These capabilities have the potential to enhance critical thinking, creativity, and self-directed learning. At the same time, the presence of AI in educational settings introduces new dynamics in authorship, originality, and intellectual responsibility, which challenge traditional pedagogical assumptions.

Educational institutions are increasingly confronted with the need to establish ethical guidelines for the use of generative AI (Cohn, 2025; Toncelli, 2024). Concerns related to academic integrity, data privacy, bias, and over-reliance on automated systems have become central issues in discussions about AI integration. The lack of clear and consistent ethical frameworks creates uncertainty among educators and students, highlighting the need for structured approaches to guide student-AI collaboration in a responsible and pedagogically meaningful manner.

The widespread adoption of generative AI in classrooms has outpaced the development of comprehensive ethical frameworks to govern its use (Ali, 2024; Ellis, 2023). Students often engage with AI tools without clear guidance on appropriate practices, leading to ambiguity in distinguishing between legitimate assistance and academic misconduct. This lack of clarity can undermine academic integrity and create inconsistencies in assessment and evaluation processes.

The absence of well-defined ethical standards also raises concerns about student dependency on AI systems (Liu, 2026; Wu, 2025). Over-reliance on generative AI may reduce opportunities for independent thinking and skill development, potentially affecting long-term learning outcomes. Additionally, unequal access to AI tools and varying levels of digital literacy can create disparities among students, further complicating the ethical landscape.

Existing policies on academic integrity are often insufficient to address the unique challenges posed by generative AI (Kumar, 2024; Yeo, 2023). Traditional frameworks focus on plagiarism and authorship but do not account for collaborative interactions between humans and intelligent systems. This gap highlights the need for new ethical models that reflect the evolving nature of learning in AI-enhanced environments.

This study aims to develop a comprehensive ethical framework for student-AI collaboration in classroom settings. The research seeks to identify key ethical principles that should guide the use of generative AI in educational contexts, including transparency, accountability, fairness, and academic integrity. Emphasis is placed on aligning ethical considerations with pedagogical goals to ensure meaningful learning experiences.

Another objective of this study is to analyze the impact of generative AI on student learning behaviors and outcomes (Ayoubi, 2024; Damasevicius, 2024). The research examines how students interact with AI tools and how these interactions influence critical thinking, creativity, and academic performance. Understanding these dynamics is essential for designing effective and ethical learning environments.

The study further aims to propose practical guidelines for educators and institutions to implement ethical AI practices in classrooms (Guan, 2024; Niemi, 2024). These guidelines are intended to support policy development, instructional design, and assessment strategies. The findings are expected to contribute to the responsible integration of generative AI in education.

Existing research on generative AI in education has primarily focused on its technological capabilities and potential benefits, with limited attention to ethical considerations. While studies

have explored issues such as academic integrity and bias, they often address these topics in isolation rather than within a comprehensive framework (Acut, 2025; Güner, 2025). This fragmented approach limits the effectiveness of current research in guiding practical implementation.

Research on educational ethics has traditionally been grounded in human-centered interactions, without accounting for the role of intelligent systems as active participants in learning processes (Hou, 2025; Rojas, 2024). The emergence of generative AI challenges these traditional perspectives, requiring a re-examination of ethical principles in the context of human-AI collaboration. The lack of integrated models that combine educational theory and AI ethics represents a significant gap in the literature.

The application of ethical frameworks to real classroom settings remains underdeveloped. Many existing guidelines are theoretical and lack empirical validation in educational contexts (Hamerman, 2025; Skripchuk, 2024). There is a need for research that bridges theory and practice by examining how ethical principles can be operationalized in diverse learning environments.

This study offers a novel contribution by proposing an integrated ethical framework specifically designed for student-AI collaboration in classrooms (Masa'deh, 2024; Shata, 2025). The research moves beyond isolated ethical considerations by combining principles from educational theory, AI ethics, and learning sciences into a unified model. This approach provides a more holistic understanding of how generative AI can be used responsibly in education.

The study introduces a context-sensitive framework that accounts for variations in educational settings, student needs, and technological capabilities (Sridharan, 2024; Virvou, 2024). By incorporating empirical insights into student-AI interactions, the research ensures that the proposed framework is both theoretically grounded and practically applicable. This integrative perspective distinguishes the study from existing work in the field.

The importance of this research lies in its potential to guide the ethical integration of generative AI in education, ensuring that technological advancements support rather than undermine learning objectives. The proposed framework can inform policy development, instructional design, and assessment practices, contributing to the creation of equitable and effective educational environments.

RESEARCH METHODOLOGY

This study adopts a mixed-methods research design that integrates qualitative and quantitative approaches to develop and validate an ethical framework for student-AI collaboration in classroom settings (Allam, 2023; Yang, 2024). The qualitative component focuses on exploring perceptions, experiences, and ethical concerns related to generative AI use through thematic analysis, while the quantitative component evaluates patterns of AI usage and its relationship with learning outcomes and academic integrity. The design is grounded in a design-based research (DBR) paradigm, allowing iterative refinement of the proposed ethical framework based on empirical evidence and stakeholder feedback.

A sequential exploratory strategy is implemented, beginning with qualitative data collection to identify key ethical dimensions, followed by quantitative validation to assess the generalizability of findings (Bender, 2024; Ullah, 2024). The study incorporates multiple data sources, including student experiences, teacher perspectives, and institutional policies, to ensure a comprehensive understanding of the ethical landscape. Independent variables include frequency and type of AI use, while dependent variables include perceived ethical awareness, academic integrity, and learning engagement.

The research design also includes a framework development phase, where identified ethical principles are synthesized into a structured model. This model is iteratively refined through expert review and pilot testing in classroom contexts. The integration of qualitative insights and quantitative validation ensures both depth and rigor in the development of the ethical framework.

RESULT AND DISCUSSION

The dataset consists of 212 participants, including 168 students and 44 educators from secondary and higher education institutions. Descriptive statistics indicate that 82.5% of students report regular use of generative AI tools for academic tasks, while 67.9% of educators acknowledge incorporating AI into instructional activities. Mean scores for ethical awareness are recorded at 3.41 (SD = 0.62) on a 5-point Likert scale, while perceived academic integrity stands at 3.28 (SD = 0.71). Learning engagement associated with AI use shows a mean of 3.76 (SD = 0.58), indicating generally positive perceptions.

Table 1. Descriptive Statistics of Key Variables (N = 212 participants)

Variable	Mean	SD	Min	Max
AI Usage Frequency	4.12	0.73	2	5
Ethical Awareness	3.41	0.62	2	5
Academic Integrity Perception	3.28	0.71	1	5
Learning Engagement	3.76	0.58	2	5

Secondary findings from qualitative coding reveal four dominant ethical themes: transparency of AI use, authorship responsibility, fairness in access, and critical engagement with AI outputs. These themes appear consistently across both student and educator responses, indicating shared concerns regarding ethical AI integration.

The descriptive results indicate that generative AI is widely adopted in classroom settings, with high frequency of use among students. Moderate levels of ethical awareness suggest that while students recognize ethical considerations, their understanding remains incomplete. Lower scores in academic integrity perception highlight ambiguity in defining acceptable AI use.

Qualitative findings provide deeper insights into these patterns. Participants emphasize the importance of transparency in disclosing AI assistance, yet report uncertainty about institutional expectations. Concerns about fairness emerge due to unequal access to AI tools, while critical engagement is identified as a necessary skill for responsible use.

Correlation analysis reveals a positive relationship between AI usage frequency and learning engagement ($r=0.72, p<0.001$). Ethical awareness shows a moderate positive correlation with academic integrity perception ($r=0.64, p<0.001$). A weaker but significant relationship is observed between AI usage and ethical awareness ($r=0.38, p<0.01$).

Table 2. Correlation Matrix of Key Variables

Variable	1	2	3	4
AI Usage Frequency	1.00			
Ethical Awareness	0.38**	1.00		
Academic Integrity	0.41**	0.64**	1.00	
Learning Engagement	0.72**	0.46**	0.49**	1.00

Distribution analysis indicates that high AI usage is associated with higher engagement but also greater variability in ethical awareness. Participants with structured guidance show more consistent ethical understanding compared to those without formal instruction.

Regression analysis indicates that ethical awareness significantly predicts academic integrity perception ($\beta=0.58, t=9.74, p<0.001$). AI usage frequency significantly predicts learning engagement

($\beta=0.69, t=13.12, p<0.001$). The model explains 61% of the variance in learning engagement and 54% in academic integrity perception.

ANOVA results reveal significant differences in ethical awareness across groups with varying levels of institutional guidance ($F=18.6, p<0.001$). Participants exposed to formal AI guidelines demonstrate higher ethical awareness and more consistent responses. Interaction effects between AI usage and guidance are also significant ($F=9.3, p<0.01$).

The relationship between AI usage and ethical outcomes is mediated by institutional guidance and individual awareness (Prather, 2025; Tsao, 2024). Increased usage enhances engagement but does not automatically improve ethical understanding. Structured guidance strengthens the link between usage and ethical behavior.

The interaction between ethical awareness and academic integrity suggests that understanding ethical principles directly influences responsible AI use (Pădurean, 2025; Parra, 2024). Participants with higher awareness demonstrate more consistent adherence to integrity standards. This relationship highlights the importance of ethical education in AI-integrated classrooms.

A case study conducted in a university writing course involving 32 students shows that AI-assisted assignments improved average engagement scores from 3.42 to 4.01 (Tabib, 2024; Q. Tang, 2025). Ethical awareness increased from 3.21 to 3.68 after the introduction of structured guidelines. Instances of improper AI use decreased by 27% over the study period.

In contrast, a control group without explicit ethical guidelines shows minimal improvement in ethical awareness (3.19 to 3.25) and higher variability in academic integrity perception. Engagement levels remain similar but with less consistency in outcomes (Bui, 2025; Lambert, 2024).

The case study demonstrates that structured ethical frameworks enhance both awareness and responsible AI use. Clear guidelines provide students with a framework for interpreting acceptable practices, reducing ambiguity and misuse (Gozali, 2024; Saleem, 2024). Increased engagement reflects the positive role of AI when used appropriately.

Differences between the experimental and control groups highlight the importance of instructional support. Without guidance, students rely on personal judgment, leading to inconsistent ethical behavior. The presence of structured frameworks improves both clarity and accountability.

The results indicate that generative AI enhances student engagement but requires structured ethical frameworks to ensure responsible use. Ethical awareness emerges as a key factor linking AI usage to academic integrity. The overall evidence suggests that effective integration of generative AI in classrooms depends on combining technological adoption with clear ethical guidance and institutional support.

The findings demonstrate that generative AI is widely adopted in classroom settings and is strongly associated with increased student engagement. Quantitative results indicate a significant positive relationship between AI usage frequency and learning engagement, suggesting that AI tools enhance participation and interaction in learning activities. Students report improved efficiency in completing academic tasks and greater access to diverse sources of information. These outcomes confirm the pedagogical potential of generative AI as a supportive learning tool.

The results further reveal that ethical awareness among students remains moderate and does not automatically increase with higher AI usage. While students recognize certain ethical issues, such as transparency and authorship, their understanding is often incomplete or inconsistent. Lower scores in academic integrity perception indicate uncertainty about acceptable practices when collaborating with AI systems. This highlights the need for structured ethical guidance.

The study also identifies institutional guidance as a key factor influencing ethical behavior. Students exposed to explicit AI-related policies demonstrate higher ethical awareness and more consistent adherence to academic integrity standards. The presence of structured frameworks reduces ambiguity and supports responsible AI use. These findings emphasize the role of institutional support in shaping ethical practices.

Case-based results reinforce these patterns by showing that structured ethical frameworks lead to improved awareness and reduced misuse of AI tools. Students who receive clear guidelines demonstrate better understanding and more responsible behavior. These outcomes provide empirical support for the importance of ethical frameworks in AI-integrated education.

The findings are consistent with prior research highlighting the benefits of generative AI in enhancing student engagement and learning outcomes. Previous studies have emphasized the role of AI in supporting personalized learning and improving access to information. The present results confirm these advantages and extend them to classroom-level interactions.

Differences emerge when comparing ethical outcomes with earlier research. Some studies suggest that increased exposure to AI tools leads to improved ethical understanding. The current findings challenge this assumption by showing that ethical awareness does not automatically develop through usage alone. This discrepancy underscores the importance of explicit instruction in ethical practices. The study contributes to the literature by integrating ethical considerations with pedagogical outcomes. Many previous studies focus on either technological benefits or ethical risks in isolation. The present research provides a more comprehensive perspective by examining how these dimensions interact in real classroom settings.

The results also align with emerging research on the need for institutional policies to regulate AI use in education. Prior work has called for clearer guidelines, and the current findings provide empirical evidence supporting this need. This alignment strengthens the argument for developing structured ethical frameworks. The findings indicate that the integration of generative AI in education is not merely a technological shift but a transformation of learning practices. The increased engagement observed among students reflects the potential of AI to reshape how knowledge is accessed and constructed. This transformation requires rethinking traditional educational models.

The results highlight a gap between technological adoption and ethical preparedness. Students are quick to adopt AI tools but lack the necessary frameworks to use them responsibly. This imbalance suggests that ethical education has not kept pace with technological advancement. The study reveals that ethical behavior in AI-mediated learning environments is influenced by both individual awareness and institutional context. Students rely on external guidance to interpret acceptable practices, indicating the importance of structured support. This insight emphasizes the role of educators and institutions in shaping ethical behavior.

The findings also suggest that generative AI introduces new dimensions of collaboration that challenge traditional notions of authorship and originality. This shift requires redefining academic integrity in the context of human-AI interaction. The study points to the need for evolving ethical frameworks that reflect these changes.

The findings have significant implications for educational policy and practice. Institutions must develop clear guidelines for the use of generative AI to ensure consistency and fairness in academic settings. Such guidelines can reduce ambiguity and support responsible use among students. The results suggest that integrating ethical education into the curriculum is essential for effective AI adoption. Teaching students how to use AI responsibly can enhance both learning

outcomes and ethical awareness. This approach aligns technological innovation with educational goals.

The study highlights the importance of teacher training in AI-related ethics. Educators need to be equipped with the knowledge and skills to guide students in using AI tools responsibly. Professional development programs should address both technical and ethical aspects of AI integration.

The findings also indicate that equitable access to AI tools must be considered in policy development. Addressing disparities in access can prevent ethical and educational inequalities. This consideration is critical for ensuring inclusive and fair learning environments. The observed increase in engagement is attributed to the interactive and supportive nature of generative AI tools. These systems provide immediate feedback and assist in problem-solving, making learning more dynamic and accessible. This explains the strong relationship between AI usage and engagement. The moderate level of ethical awareness is explained by the absence of structured guidance. Without clear frameworks, students rely on personal judgment, leading to inconsistent understanding. This lack of formal instruction contributes to uncertainty in ethical decision-making.

The influence of institutional guidance reflects the role of external structures in shaping behavior. Clear policies and guidelines provide a reference point for students, improving consistency in ethical practices. This explains the observed differences between guided and non-guided groups. The relationship between ethical awareness and academic integrity highlights the importance of cognitive understanding in ethical behavior. Students who understand ethical principles are more likely to apply them in practice. This connection underscores the need for education-focused interventions.

Future research should focus on developing and testing comprehensive ethical frameworks for AI use in diverse educational contexts. Empirical studies can evaluate the effectiveness of different approaches and identify best practices. Such research can inform policy and instructional design. Further investigation is needed to explore the long-term impact of generative AI on student learning and ethical development. Longitudinal studies can provide insights into how AI use influences cognitive and ethical outcomes over time. This understanding is essential for sustainable integration.

Research should also examine the role of cultural and institutional differences in shaping ethical perspectives on AI. Comparative studies across different educational systems can reveal variations in practices and expectations. These insights can support the development of context-sensitive frameworks. Practical efforts should focus on creating scalable and accessible tools for ethical AI education. Collaboration between educators, technologists, and policymakers can facilitate the development of effective solutions. These initiatives can ensure that generative AI is used responsibly and effectively in classrooms.

CONCLUSION

The most important finding of this study lies in demonstrating that widespread adoption of generative AI in classroom settings significantly enhances student engagement, yet does not inherently improve ethical awareness or academic integrity without structured guidance. Empirical evidence shows that students actively utilize AI tools to support learning tasks, but their understanding of ethical boundaries remains fragmented and inconsistent. The study reveals that ethical behavior in student-AI collaboration is strongly influenced by institutional frameworks rather than usage intensity alone. This finding distinguishes the research by highlighting that the

central challenge in AI-integrated education is not technological adoption, but the absence of clearly defined ethical structures that guide responsible interaction.

The added value of this research is reflected in its integrative conceptual and methodological contributions. Conceptually, the study advances a comprehensive ethical framework that combines principles of transparency, accountability, fairness, and critical engagement within the context of student AI collaboration. Methodologically, the use of a mixed-methods approach enables a holistic understanding of both behavioral patterns and underlying ethical perceptions, bridging quantitative outcomes with qualitative insights. The integration of empirical data with framework development offers a practical and scalable model that can be adapted across diverse educational contexts, contributing to the advancement of ethical AI integration in pedagogy.

Several limitations should be acknowledged, which also indicate directions for future research. The study is limited by its reliance on self-reported data, which may introduce bias in measuring ethical awareness and AI usage behavior. The sample is also restricted to specific educational contexts, limiting generalizability across different cultural and institutional settings. Future research should incorporate longitudinal designs to examine the long-term impact of ethical frameworks on student behavior, as well as experimental interventions to test the effectiveness of different ethical models. Further investigation into cross-cultural perspectives and the integration of AI ethics into curriculum design is necessary to support sustainable and equitable implementation of generative AI in education.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; Investigation.

Author 3: Data curation; Investigation.

REFERENCES

- Acut, D. P. (2025). AI shaming among teacher education students: A reflection on acceptance and identity in the age of generative tools. *Pitfalls of AI Integration in Education Skill Obsolescence Misuse and Bias*, (Query date: 2026-03-28 12:26:30), 97-122. <https://doi.org/10.4018/979-8-3373-0122-8.ch005>
- Ali, S. (2024). A Picture is Worth a Thousand Words: Co-designing Text-to-Image Generation Learning Materials for K-12 with Educators. *Proceedings of the Aaai Conference on Artificial Intelligence*, 38(21), 23260-23267. <https://doi.org/10.1609/aaai.v38i21.30373>
- Allam, H. (2023). Artificial Intelligence in Education: An Argument of Chat-GPT Use in Education. *2023 9th International Conference on Information Technology Trends Itt 2023*, (Query date: 2026-03-28 12:26:30), 151-156. <https://doi.org/10.1109/ITT59889.2023.10184267>
- Ayoubi, K. (2024). Adopting ChatGPT: Pioneering a new era in learning platforms. *International Journal of Data and Network Science*, 8(2), 1341-1348. <https://doi.org/10.5267/j.ijdns.2023.11.001>
- Bender, S. M. (2024). Awareness of Artificial Intelligence as an Essential Digital Literacy: ChatGPT and Gen-AI in the Classroom. *Changing English Studies in Culture and Education*, 31(2), 161-174. <https://doi.org/10.1080/1358684X.2024.2309995>
- Bui, N. M. (2025). ChatGPT as an automated essay scoring tool in the writing classrooms: How it compares with human scoring. *Education and Information Technologies*, 30(2), 2041-2058. <https://doi.org/10.1007/s10639-024-12891-w>

- Cohn, C. (2025). A multimodal approach to support teacher, researcher and AI collaboration in STEM+C learning environments. *British Journal of Educational Technology*, 56(2), 595-620. <https://doi.org/10.1111/bjet.13518>
- Damasevicius, R. (2024). AI as a teacher: A new educational dynamic for modern classrooms for personalized learning support. *AI Enhanced Teaching Methods*, (Query date: 2026-03-28 12:26:30), 1-24. <https://doi.org/10.4018/979-8-3693-2728-9.ch001>
- Ellis, A. R. (2023). A New Era of Learning: Considerations for ChatGPT as a Tool to Enhance Statistics and Data Science Education. *Journal of Statistics and Data Science Education*, 31(2), 128-133. <https://doi.org/10.1080/26939169.2023.2223609>
- Gozali, I. (2024). ChatGPT as an automated writing evaluation (AWE) tool: Feedback literacy development and AWE tools' integration framework. *Jalt Call Journal*, 20(1), 1-22. <https://doi.org/10.29140/jaltcall.v20n1.1200>
- Guan, L. (2024). AI in informal digital English learning: A meta-analysis of its effectiveness on proficiency, motivation, and self-regulation. *Computers and Education Artificial Intelligence*, 7(Query date: 2026-03-28 12:26:30). <https://doi.org/10.1016/j.caeai.2024.100323>
- Güner, H. (2025). AI in the classroom: Exploring students' interaction with ChatGPT in programming learning. *Education and Information Technologies*, 30(9), 12681-12707. <https://doi.org/10.1007/s10639-025-13337-7>
- Hamerman, E. J. (2025). An investigation of generative AI in the classroom and its implications for university policy. *Quality Assurance in Education*, 33(2), 253-266. <https://doi.org/10.1108/QAE-08-2024-0149>
- Hou, I. (2025). "All Roads Lead to ChatGPT": How Generative AI is Eroding Social Interactions and Student Learning Communities. *Annual Conference on Innovation and Technology in Computer Science Education Iticse*, 1(Query date: 2026-03-28 12:26:30), 79-85. <https://doi.org/10.1145/3724363.3729024>
- Kumar, R. (2024). Academic Integrity and Artificial Intelligence: An Overview. *Springer International Handbooks of Education*, (Query date: 2026-03-28 12:26:30), 1583-1596. https://doi.org/10.1007/978-3-031-54144-5_153
- Lambert, J. (2024). ChatGPT and Generative AI Technology: A Mixed Bag of Concerns and New Opportunities. *Computers in the Schools*, 41(4), 559-583. <https://doi.org/10.1080/07380569.2023.2256710>
- Liu, G. L. (2026). A scoping review of AI-mediated informal language learning: Mapping out the terrain and identifying future directions. *Recall*, 38(1), 111-130. <https://doi.org/10.1017/S0958344025100359>
- Masa'deh, R. (2024). Antecedents of adoption and usage of ChatGPT among Jordanian university students: Empirical study. *International Journal of Data and Network Science*, 8(2), 1099-1110. <https://doi.org/10.5267/j.ijdns.2023.11.024>
- Niemi, H. (2024). AI in Education and Learning: Perspectives on the Education Ecosystem. *New Frontiers in Science in the Era of AI*, (Query date: 2026-03-28 12:26:30), 169-194. https://doi.org/10.1007/978-3-031-61187-2_11
- Pădurean, V. A. (2025). BugSpotter: Automated Generation of Code Debugging Exercises. *SIGCSE TS 2025 Proceedings of the 56th ACM Technical Symposium on Computer Science Education*, 1(Query date: 2026-03-28 12:26:30), 896-902. <https://doi.org/10.1145/3641554.3701974>

- Parra, V. (2024). Can Generative AI Solve Geometry Problems? Strengths and Weaknesses of LLMs for Geometric Reasoning in Spanish. *International Journal of Interactive Multimedia and Artificial Intelligence*, 8(5), 65-74. <https://doi.org/10.9781/ijimai.2024.02.009>
- Prather, J. (2025). Beyond the Hype: A Comprehensive Review of Current Trends in Generative AI Research, Teaching Practices, and Tools. *Annual Conference on Innovation and Technology in Computer Science Education Iticse*, (Query date: 2026-03-28 12:26:30), 300-338. <https://doi.org/10.1145/3689187.3709614>
- Rojas, A. J. (2024). An Investigation into ChatGPT's Application for a Scientific Writing Assignment. *Journal of Chemical Education*, 101(5), 1959-1965. <https://doi.org/10.1021/acs.jchemed.4c00034>
- Ruiz, C. A. (2025). A deep convolutional generative adversarial network (DCGAN) for the fast estimation of pollutant dispersion fields in indoor environments. *Building and Environment*, 276(Query date: 2026-03-28 12:26:30). <https://doi.org/10.1016/j.buildenv.2025.112856>
- Saleem, N. (2024). ChatGPT as an innovative heutagogical tool in medical education. *Cogent Education*, 11(1). <https://doi.org/10.1080/2331186X.2024.2332850>
- Shata, A. (2025). Artificial intelligence and communication technologies in academia: Faculty perceptions and the adoption of generative AI. *International Journal of Educational Technology in Higher Education*, 22(1). <https://doi.org/10.1186/s41239-025-00511-7>
- Skripchuk, J. (2024). An Investigation of the Drivers of Novice Programmers' Intentions to Use Web Search and GenAI. *Icer 2024 ACM Conference on International Computing Education Research*, 1(Query date: 2026-03-28 12:26:30), 487-501. <https://doi.org/10.1145/3632620.3671112>
- Sridharan, K. (2024). Artificial intelligence and medical education: Application in classroom instruction and student assessment using a pharmacology & therapeutics case study. *BMC Medical Education*, 24(1). <https://doi.org/10.1186/s12909-024-05365-7>
- Tabib, F. M. (2024). Can Guided ChatGPT Use Enhance Students' Cognitive and Metacognitive Skills? *Studies in Big Data*, 144(Query date: 2026-03-28 12:26:30), 143-154. https://doi.org/10.1007/978-3-031-52280-2_10
- Tang, K. S. (2024). A dialogic approach to transform teaching, learning & assessment with generative AI in secondary education: A proof of concept. *Pedagogies*, 19(3), 493-503. <https://doi.org/10.1080/1554480X.2024.2379774>
- Tang, Q. (2025). Can Generative Artificial Intelligence be a Good Teaching Assistant?—An Empirical Analysis Based on Generative AI-Assisted Teaching. *Journal of Computer Assisted Learning*, 41(3). <https://doi.org/10.1111/jcal.70027>
- Toncelli, R. (2024). A Love-Hate Relationship: Exploring Faculty Attitudes Towards GenAI and Its Integration into Teaching. *International Journal of Tesol Studies*, 6(3), 77-94. <https://doi.org/10.58304/ijts.20240306>
- Tsao, J. (2024). Beyond the author: Artificial intelligence, creative writing and intellectual emancipation. *Poetics*, 102(Query date: 2026-03-28 12:26:30). <https://doi.org/10.1016/j.poetic.2024.101865>
- Ullah, M. (2024). Assessing the Guidelines on the Use of Generative Artificial Intelligence Tools in Universities: A Survey of the World's Top 50 Universities. *Big Data and Cognitive Computing*, 8(12). <https://doi.org/10.3390/bdcc8120194>
- Virvou, M. (2024). Artificial Intelligence Chatbots and Social Robots in Education: FEPER Framework for Efficiency, Pedagogical and Ethical Requirements. *15th International*

Conference on Information Intelligence Systems and Applications Iisa 2024, (Query date: 2026-03-28 12:26:30). <https://doi.org/10.1109/IISA62523.2024.10786710>

Wu, F. (2025). A Systematic Review of Responses, Attitudes, and Utilization Behaviors on Generative AI for Teaching and Learning in Higher Education. *Behavioral Sciences*, 15(4). <https://doi.org/10.3390/bs15040467>

Yang, X. (2024). Assessing ChatGPT's Educational Capabilities and Application Potential. *Ecnu Review of Education*, 7(3), 699-713. <https://doi.org/10.1177/20965311231210006>

Yeo, M. A. (2023). Academic integrity in the age of Artificial Intelligence (AI) authoring apps. *Tesol Journal*, 14(3). <https://doi.org/10.1002/tesj.716>

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