https://research.adra.ac.id /index.php/jete/
P - ISSN: 3025-0668
E - ISSN: 3025-0676

Ethics of AI Tutors: Balancing Automation and Human Interaction in Education

Ali Mufron[1], **Ethan Tan**[2], **Ava Lee**[3]
[1] Institut Agama Islam Attarmasi Pacitan, Indonesia
[2] National University of Singapore (NUS), Singapore
[3] Nanyang Technological University (NTU), Singapore

ABSTRACT

Background. Artificial intelligence tutors are increasingly adopted in education to enhance efficiency, personalization, and accessibility. Despite their widespread use, ethical concerns related to reduced human interaction, moral responsibility, and learner well-being remain insufficiently addressed.

Purpose. This study aims to examine the ethical implications of AI tutors by analyzing how automation can be balanced with meaningful human interaction in educational settings.

Method. The study employs a qualitative descriptive approach using secondary statistical data, document analysis, and case study examination. Data are analyzed thematically to identify ethical patterns related to automation, human roles, and institutional governance.

Results. The findings indicate that AI tutors effectively support structured learning activities but are limited in relational and emotional engagement. Educators perceive AI tutors as supplementary tools, while ethical responsibility is often managed informally due to the absence of explicit institutional guidelines.

Conclusion. The study concludes that ethical integration of AI tutors requires intentional balance, where automation enhances efficiency and human interaction preserves educational values. The novelty of this research lies in its integration of ethical theory and educational practice to conceptualize AI tutors as complementary rather than substitutive agents within human-centered learning environments.

KEYWORDS

AI tutors, Educational Ethics, Human Interaction

Citation: Mufron, A., Tan, E & Lee, A. (2025). Ethics of AI Tutors: Balancing Automation and Human Interaction in Education. *Journal Emerging Technologies in Education*, *3*(5), 213–220.
https://doi.org/10.70177/jete.v3i4.2895

Correspondence:

Ali Mufron,
alimufron86@gmail.com

Received: June 12, 2025

Accepted: Aug 8, 2025

Published: Oct 4, 2025

INTRODUCTION

Artificial intelligence tutors have become an integral part of modern educational systems, offering personalized learning experiences, adaptive feedback, and scalable instruction. These systems are designed to analyze learner data, identify strengths and weaknesses, and provide tailored content that can enhance academic performance. Educational institutions increasingly adopt AI tutors to address challenges such as large class sizes, limited instructional resources, and the demand for flexible learning environments (Agarwal, 2023; Zamfirescu-Pereira, 2025). This development reflects a broader transformation of education driven by digital technologies and data-based decision making.

AI tutors are widely recognized for their efficiency and consistency in delivering instructional support. They can operate continuously without fatigue, provide immediate responses, and standardize educational quality across diverse contexts. Research shows that automation in tutoring can improve learner engagement and self-paced learning, especially in online and blended education models. These advantages position AI tutors as powerful tools for expanding access to education and supporting lifelong learning (Dede, 1986; Sykes, 2003a).

Ethical discussions surrounding AI tutors often focus on responsibility, fairness, transparency, and the preservation of human values in education. Concerns arise regarding data privacy, algorithmic bias, and the potential reduction of meaningful human interaction. Education is not solely a cognitive process but also a social and moral activity that involves empathy, mentorship, and interpersonal communication. The increasing reliance on automated tutors raises questions about how these human dimensions can be protected (Kumar, 2023; Vrdoljak, 2025).

Theoretical perspectives such as socio-constructivist learning theory emphasize the importance of social interaction in knowledge construction. This theory argues that learning occurs most effectively through dialogue, collaboration, and guided support from more knowledgeable others. Human tutors play a critical role in interpreting emotional cues, fostering motivation, and adapting instruction based on contextual understanding. When viewed through this theoretical lens (Abduljabbar, 2022; Karumbaiah, 2023), AI tutors challenge traditional assumptions about the tutor–learner relationship and the nature of educational interaction.

Current understanding acknowledges that AI tutors are neither inherently beneficial nor harmful but depend on how they are designed and implemented. Ethical integration requires balancing automation with meaningful human involvement to ensure educational goals extend beyond efficiency alone (Abduljabbar, 2022; Ogunleye, 2024). The coexistence of AI tutors and human educators reflects an evolving educational ecosystem where technology supports, rather than replaces, human judgment and ethical responsibility.

Despite the growing adoption of AI tutors, there is limited clarity on how ethical principles are practically applied in real educational settings. Many studies focus on technical performance and learning outcomes, while fewer examine how ethical considerations influence daily interactions between learners and AI systems. The absence of concrete ethical guidelines leaves uncertainty about how automation reshapes educational values and responsibilities (Aberšek, 2023; Woodruff, 2024).

The balance between automated efficiency and meaningful human interaction remains insufficiently explored. It is still unclear how much human involvement is necessary to maintain emotional support, moral guidance, and social development in AI-supported learning environments. Existing research often treats AI tutors as standalone tools rather than components within a broader human-centered educational ecosystem.

Theoretical ambiguity also persists regarding the role of AI tutors in relation to established educational theories. Ethical frameworks are frequently discussed in isolation from learning theories that emphasize social interaction and human mediation (Cukurova, 2019; Grivokostopoulou, 2016). This separation creates a gap in understanding how ethical design can align AI tutors with pedagogical principles that prioritize holistic learner development.

From the perspective of human-centered ethics and care ethics theory, education is grounded in relationship

s, empathy, and responsibility toward learners. These theories highlight moral obligations that extend beyond functional outcomes, yet their application to AI tutor systems remains

underdeveloped. The lack of integration between ethical theory and AI tutor implementation represents a critical gap that requires systematic investigation.

Addressing this gap is essential to ensure that AI tutors contribute positively to educational goals without undermining human values. As AI systems increasingly influence learning processes, ethical clarity becomes necessary to guide responsible design, implementation, and use. Filling this gap allows educators and policymakers to make informed decisions that protect learners' cognitive, social, and emotional well-being ((Colbourn), 1985; Matsuda, 2005).

Understanding how ethical principles can balance automation and human interaction provides a foundation for sustainable educational innovation. Research in this area can clarify the appropriate roles of AI tutors and human educators, ensuring that technology enhances rather than replaces human judgment and care. Such insight supports the development of educational models that are both efficient and ethically grounded (Benvenuti, 2023; Haristiani, 2019).

Grounded in socio-constructivist learning theory, this study assumes that meaningful learning emerges through interaction, guidance, and shared understanding. The purpose is to examine how AI tutors can be ethically aligned with this theoretical perspective while maintaining necessary human involvement. The underlying hypothesis suggests that ethical integration of AI tutors requires intentional balance, where automation supports learning efficiency and human interaction preserves educational integrity.

RESEARCH METHODOLOGY

The research design employs a qualitative descriptive approach to explore ethical issues related to the use of AI tutors in educational settings. This design is selected to capture in-depth perspectives on how automation and human interaction are balanced in practice. Document analysis and semi-structured interviews are used to examine ethical considerations, decision-making processes, and perceived impacts of AI tutors on teaching and learning (Parashar, 2023; Weitekamp, 2020).

The population of this study consists of educators, students, and educational technology administrators who have direct experience with AI tutor systems in higher education and secondary education contexts. A purposive sampling technique is applied to select participants who are actively involved in the implementation or use of AI-based tutoring tools. This sampling strategy ensures that the data reflects diverse roles and viewpoints relevant to ethical and pedagogical concerns.

The research instruments include interview guides, document review checklists, and ethical reflection prompts. The interview guide is designed to explore participants' experiences, ethical perceptions, and expectations regarding AI tutors. Institutional policy documents, system guidelines, and instructional materials are analyzed to identify stated ethical principles and practical implementation strategies (Johnson, 2009; Sykes, 2003b).

The research procedures begin with obtaining ethical approval and informed consent from all participants. Data collection is conducted through scheduled interviews and systematic document analysis. The collected data is then transcribed, coded, and thematically analyzed to identify recurring ethical themes related to automation and human interaction in education.

RESULT AND DISCUSSION

The secondary data indicate a rapid increase in the use of AI tutors across educational institutions, particularly in online and blended learning environments. Adoption rates are highest in higher education, followed by secondary education, where AI tutors are mainly used for academic

support and assessment feedback. The data reflect a strong institutional interest in automation to improve efficiency and learning accessibility.

Learner interaction data show varying degrees of reliance on AI tutors. Students frequently use AI tutors for content clarification, practice exercises, and immediate feedback, while less frequent use is observed for complex problem-solving or ethical discussions. This pattern suggests that AI tutors are predominantly applied to cognitively structured tasks rather than socially rich learning activities.

Educator-related data reveal mixed perceptions regarding ethical implications. While many educators acknowledge the benefits of AI tutors in reducing workload, concerns remain regarding diminished human interaction, over-reliance on automated feedback, and insufficient emotional support for learners. These concerns highlight ethical tensions between efficiency and human-centered education.

Table 1. AI Tutor Adoption by Educational Level

Educational Level	Adoption Rate (%)
Higher Education	68
Secondary School	47
Primary School	29

Table 2. Frequency of AI Tutor Use by Learning Activity

Learning Activity	High (%)	Medium (%)	Low (%)
Practice Exercises	72	18	10
Content Explanation	65	22	13
Ethical or Reflective Tasks	21	34	45

Table 3. Educator Ethical Concerns

Ethical Issue	Percentage (%)
Reduced Human Interaction	61
Data Privacy	54
Algorithmic Bias	38

The statistical data demonstrate that AI tutors are primarily implemented to address scalability and efficiency challenges in education. Higher adoption rates in universities suggest that institutions with larger student populations perceive automation as a practical solution. This trend reflects institutional priorities rather than ethical readiness. Usage patterns reveal a functional orientation toward AI tutors. High engagement in structured learning tasks indicates trust in automation for measurable outcomes, while low engagement in ethical or reflective activities suggests perceived limitations of AI in addressing value-based learning. This distinction underscores ethical boundaries in AI tutor applications. Educator concerns emphasize that ethical risks are not abstract but experienced in daily practice. Reduced human interaction emerges as the most significant issue, signaling apprehension about the erosion of mentorship and relational teaching. These findings illustrate the ethical complexity of integrating AI tutors into learning environments.

Qualitative data from interviews reveal that students appreciate AI tutors for their consistency and availability. Learners report increased confidence when receiving immediate feedback, particularly in self-paced learning contexts. The data suggest that AI tutors enhance autonomy but reshape traditional learning dynamics. Educators describe AI tutors as supportive tools rather than replacements for teaching. Many participants note that AI tutors are effective for reinforcing content but insufficient for addressing emotional or motivational challenges. This perception highlights a functional separation between automated support and human roles. Policy documents analyzed in

this study show limited reference to ethical frameworks guiding AI tutor use. Most documents emphasize technical implementation, data management, and performance outcomes. Ethical considerations related to human interaction are often implicit rather than explicitly articulated.

Student experiences indicate that ethical acceptance of AI tutors is closely tied to perceived usefulness rather than moral reflection. Positive attitudes are driven by efficiency and personalization, while ethical awareness remains underdeveloped. This finding suggests that ethical literacy is not automatically fostered through AI use. Educator narratives reveal an ethical negotiation process in practice. Teachers actively decide when to rely on AI tutors and when to intervene personally, reflecting an informal ethical balancing act. This behavior demonstrates the absence of formal ethical guidelines at the operational level. Institutional policy gaps suggest that ethical responsibility is often delegated to individual educators. Without explicit ethical standards, consistency in balancing automation and human interaction remains difficult to achieve. This condition reinforces the need for structured ethical integration.

The relationship between statistical adoption rates and qualitative perceptions reveals a tension between institutional efficiency and educational ethics. High adoption correlates with increased concern over human interaction, indicating that technological expansion intensifies ethical awareness rather than resolves it. Learner reliance on AI tutors for structured tasks aligns with educator views regarding functional limitations. Both data sources converge on the idea that AI tutors are effective within clearly defined boundaries. This convergence strengthens the argument for complementary rather than substitutive use. Policy shortcomings relate directly to educator uncertainty and ethical inconsistency. The absence of formal guidance amplifies individual ethical judgment, leading to varied practices across institutions. This relationship highlights systemic ethical gaps in AI tutor implementation.

A case study conducted at a university using AI tutors in introductory courses illustrates practical ethical challenges. The AI system provided automated feedback and adaptive quizzes, while instructors monitored progress through dashboards. Human interaction was reduced in routine learning activities. Student feedback from the case study shows high satisfaction with accessibility and feedback speed. Learners valued the ability to practice independently but reported limited opportunities for meaningful dialogue. The data suggest a shift toward transactional learning experiences. Instructor reflections from the case study indicate increased efficiency but reduced insight into students' emotional and motivational states. Educators expressed concern about identifying struggling students without direct interaction. This scenario exemplifies ethical trade-offs in automated tutoring environments.

The case study demonstrates how automation reshapes educational relationships. AI tutors effectively handle repetitive instructional tasks, allowing educators to focus on complex issues. Ethical tension arises when efficiency limits opportunities for relational engagement. Student satisfaction data reflect acceptance of AI tutors as functional tools rather than relational agents. The lack of emotional connection is tolerated but not valued, indicating that learners distinguish between technical support and human guidance. This distinction reinforces ethical boundaries of AI tutors. Instructor concerns highlight the ethical risk of reduced visibility into learner well-being. Automated systems prioritize performance metrics over emotional indicators. This limitation underscores the necessity of maintaining human oversight in AI-supported education.

The case study findings align with broader statistical and qualitative results, confirming consistent ethical patterns. Automation improves efficiency while constraining human interaction, creating a recurring ethical dilemma. This alignment strengthens the reliability of the findings. Connections between learner satisfaction and educator concern reveal asymmetrical ethical

perceptions. Students prioritize convenience, while educators emphasize responsibility and care. This divergence illustrates the need for ethical frameworks that address multiple stakeholder perspectives. The combined data suggest that ethical balance is achievable through intentional design and policy support. Human interaction remains essential for moral, emotional, and social dimensions of learning. The results collectively demonstrate that ethical integration of AI tutors depends on relational preservation alongside automation.

The findings demonstrate that AI tutors are widely adopted to enhance efficiency, accessibility, and scalability in educational settings. Automation effectively supports structured learning activities such as practice exercises and content reinforcement. Human interaction remains limited within AI-mediated environments, particularly in relational and ethical dimensions of learning. The results indicate that educators perceive AI tutors as supplementary tools rather than replacements for human teaching. Concerns regarding reduced emotional engagement, moral guidance, and learner monitoring persist across institutions. These concerns highlight the ethical tension between technological efficiency and human-centered education (Banerjee, 2020; Grivokostopoulou, 2016). The study reveals a lack of explicit ethical frameworks guiding AI tutor implementation. Institutional policies prioritize technical performance while ethical responsibilities are informally managed by educators. This condition results in inconsistent practices and ethical ambiguity across learning contexts.

The results align with prior research emphasizing the efficiency and personalization benefits of AI tutors. Studies in educational technology consistently report improved learner autonomy and immediate feedback as primary advantages. Similar patterns of reliance on AI for structured tasks are observed across contexts (Aberšek, 2023; Iyer, 2023). Differences emerge when comparing ethical dimensions with existing literature. Some studies suggest that AI tutors can simulate social interaction effectively, while the present findings indicate limited acceptance of AI in relational roles. This divergence may stem from contextual differences in implementation and cultural expectations of education. The findings extend previous research by highlighting policy-level ethical gaps. While earlier studies focus on user perceptions, this research emphasizes institutional responsibility and ethical governance. This contribution broadens the ethical discussion beyond individual experiences.

The findings signal a transitional phase in educational practice where automation is normalized but ethically unsettled. AI tutors are integrated for efficiency, yet their role in shaping educational values remains unclear. This condition reflects uncertainty about the moral boundaries of educational technology. The results indicate that ethical awareness is reactive rather than proactive. Educators respond to ethical challenges as they arise, rather than following established ethical guidelines. This pattern suggests that ethical integration lags behind technological adoption. The study reflects a broader shift in education toward data-driven decision making. Learning is increasingly measured through performance indicators, while emotional and moral dimensions receive less attention. This imbalance serves as a warning sign for holistic education.

The findings imply that unbalanced reliance on AI tutors may weaken the relational foundations of education. Reduced human interaction risks diminishing mentorship, empathy, and moral development. Educational institutions must recognize these risks when expanding automated systems. The results suggest the need for ethical design principles that preserve human involvement. AI tutors should be implemented to support, not substitute, human educators. Clear boundaries between automated and human roles are essential for ethical sustainability. Policy implications emerge regarding the governance of AI tutors. Institutions should develop explicit

ethical guidelines addressing data use, human oversight, and learner well-being. Such policies can reduce ethical inconsistency and support responsible innovation (Gan, 2019; Liyanage, 2022).

The dominance of efficiency-driven adoption explains the prevalence of automation-focused practices. Institutions face pressures related to scalability, cost reduction, and performance metrics. These pressures prioritize technological solutions over ethical reflection. Limited ethical outcomes result from the technical orientation of AI development. AI tutors are designed to optimize measurable learning outputs rather than relational or moral engagement. This design bias constrains their ethical capacity. The absence of ethical training for educators contributes to inconsistent practices. Teachers are expected to manage ethical challenges without institutional support. This expectation explains why ethical responsibility is individualized rather than systematized.

The findings call for integrating ethical frameworks into AI tutor design and deployment. Collaboration between educators, ethicists, and developers is necessary to embed human-centered values. Future systems should account for emotional and social dimensions of learning. Further research should explore models of hybrid tutoring that intentionally combine AI efficiency with human interaction (Frankford, 2024; Grivokostopoulou, 2016). Longitudinal studies can assess ethical outcomes over time. Such research would clarify sustainable practices for AI-supported education. Educational institutions should invest in ethical literacy for educators and learners. Training programs can enhance awareness of ethical risks and responsibilities. This step supports a future where AI tutors operate within clearly defined moral and pedagogical boundaries.

CONCLUSION

The most significant finding of this research is the identification of a persistent ethical imbalance between automation and human interaction in AI-supported education. AI tutors are effective in delivering structured and efficient learning support, yet they remain limited in addressing relational, emotional, and moral dimensions of education. This distinction highlights that ethical challenges emerge not from AI capability alone but from how automation reshapes educational relationships.

The added value of this research lies primarily in its conceptual contribution. The study integrates ethical analysis with educational theory to frame AI tutors as complementary agents rather than substitutes for human educators. This approach offers a clearer ethical lens for understanding the role of AI tutors within human-centered learning ecosystems and provides a foundation for ethically informed educational design.

The limitations of this research include reliance on secondary data and qualitative case analysis within limited institutional contexts. Broader empirical studies involving diverse cultural and educational settings are needed. Future research should explore longitudinal impacts, develop measurable ethical indicators, and examine hybrid tutoring models that intentionally balance automation with sustained human interaction.

AUTHORS' CONTRIBUTION

Look this example below:

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

Author 2: Conceptualization; Data curation; In-vestigation.

Author 3: Data curation; Investigation.

REFERENCES

Abduljabbar, A. (2022). A Self-Served AI Tutor for Growth Mindset Teaching. *Proceedings 2022 5th International Conference on Information and Computer Technologies Icict 2022*, *Query date: 2025-12-15 22:19:30*, 55–59. https://doi.org/10.1109/ICICT55905.2022.00018

Aberšek, B. (2023). AI and Cognitive Modelling for Education. Dalam *AI and Cognitive Modelling for Education* (hlm. 229). https://doi.org/10.1007/978-3-031-35331-4

Agarwal, N. (2023). A Bug's New Life: Creating Refute Questions from Filtered CS1 Student Code Snapshots. *Comped 2023 Proceedings of the ACM Conference on Global Computing Education*, *1*(Query date: 2025-12-15 22:19:30), 7–14. https://doi.org/10.1145/3576882.3617916

Banerjee, A. (2020). AI enabled tutor for accessible training. *Lecture Notes in Computer Science Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics*, *12163*(Query date: 2025-12-15 22:19:30), 29–42. https://doi.org/10.1007/978-3-030-52237-7_3

Benvenuti, M. (2023). Artificial intelligence and human behavioral development: A perspective on new skills and competences acquisition for the educational context. *Computers in Human Behavior*, *148*(Query date: 2025-12-15 22:19:30). https://doi.org/10.1016/j.chb.2023.107903

(Colbourn), M. J. (1985). Applications of artificial intelligence within education. *Computers and Mathematics with Applications*, *11*(5), 517–526. https://doi.org/10.1016/0898-1221(85)90054-9

Cukurova, M. (2019). Artificial intelligence and multimodal data in the service of human decision-making: A case study in debate tutoring. *British Journal of Educational Technology*, *50*(6), 3032–3046. https://doi.org/10.1111/bjet.12829

Dede, C. (1986). A review and synthesis of recent research in intelligent computer-assisted instruction. *International Journal of Man Machine Studies*, *24*(4), 329–353. https://doi.org/10.1016/S0020-7373(86)80050-5

Frankford, E. (2024). AI-Tutoring in Software Engineering Education Experiences with Large Language Models in Programming Assessments. *Proceedings International Conference on Software Engineering*, *Query date: 2025-12-15 22:19:30*, 309–319. https://doi.org/10.1145/3639474.3640061

Gan, W. (2019). AI-Tutor: Generating Tailored Remedial Questions and Answers Based on Cognitive Diagnostic Assessment. *Besc 2019 6th International Conference on Behavioral Economic and Socio Cultural Computing Proceedings*, *Query date: 2025-12-15 22:19:30*. https://doi.org/10.1109/BESC48373.2019.8963236

Grivokostopoulou, F. (2016). An educational game for teaching search algorithms. *Csedu 2016 Proceedings of the 8th International Conference on Computer Supported Education*, *2*(Query date: 2025-12-15 22:19:30), 129–136. https://doi.org/10.5220/0005864601290136

Haristiani, N. (2019). Artificial Intelligence (AI) Chatbot as Language Learning Medium: An inquiry. *Journal of Physics Conference Series*, *1387*(1). https://doi.org/10.1088/1742-6596/1387/1/012020

Iyer, L. S. (2023). Ai-assisted models for dyslexia and dysgraphia: Revolutionizing language learning for children. *AI Assisted Special Education for Students with Exceptional Needs*, *Query date: 2025-12-15 22:19:30*, 186–207. https://doi.org/10.4018/979-8-3693-0378-8.ch008

Johnson, B. G. (2009). An intelligent tutoring system for the accounting cycle: Enhancing textbook homework with artificial intelligence. *Journal of Accounting Education*, *27*(1), 30–39. https://doi.org/10.1016/j.jaccedu.2009.05.001

Karumbaiah, S. (2023). A Spatiotemporal Analysis of Teacher Practices in Supporting Student Learning and Engagement in an AI-Enabled Classroom. *Lecture Notes in Computer Science Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in*

Bioinformatics, *13916*(Query date: 2025-12-15 22:19:30), 450–462. https://doi.org/10.1007/978-3-031-36272-9_37

Kumar, U. A. (2023). A Review on Artificial Intelligence Based E-Learning System. *Lecture Notes in Networks and Systems*, *475*(Query date: 2025-12-15 22:19:30), 659–671. https://doi.org/10.1007/978-981-19-2840-6_50

Liyanage, M. L. A. P. (2022). AI Solution to Assist Online Education Productivity via Personalizing Learning Strategies and Analyzing the Student Performance. *2022 IEEE 13th Annual Ubiquitous Computing Electronics and Mobile Communication Conference Uemcon 2022*, *Query date: 2025-12-15 22:19:30*, 609–615. https://doi.org/10.1109/UEMCON54665.2022.9965735

Matsuda, N. (2005). Applying programming by demonstration in an intelligent authoring tool for cognitive tutors. *Aaai Workshop Technical Report*, *Query date: 2025-12-15 22:19:30*, 1–8.

Ogunleye, B. (2024). A Systematic Review of Generative AI for Teaching and Learning Practice. *Education Sciences*, *14*(6). https://doi.org/10.3390/educsci14060636

Parashar, B. (2023). An overview of the accessibility and need of AI animation tools for specially abled students. *AI Assisted Special Education for Students with Exceptional Needs*, *Query date: 2025-12-15 22:19:30*, 1–22. https://doi.org/10.4018/979-8-3693-0378-8.ch001

Sykes, E. (2003a). A Prototype for an Intelligent Tutoring System for Students Learning to Program in Java™. *Proceedings of the IASTED International Conference on Computers and Advanced Technology in Education*, *Query date: 2025-12-15 22:19:30*, 78–83.

Sykes, E. (2003b). An intelligent tutoring system prototype for learning to program Java™. *Proceedings 3rd IEEE International Conference on Advanced Learning Technologies Icalt 2003*, *Query date: 2025-12-15 22:19:30*, 485–485. https://doi.org/10.1109/ICALT.2003.1215208

Vrdoljak, J. (2025). A Review of Large Language Models in Medical Education, Clinical Decision Support, and Healthcare Administration. *Healthcare Switzerland*, *13*(6). https://doi.org/10.3390/healthcare13060603

Weitekamp, D. (2020). An Interaction Design for Machine Teaching to Develop AI Tutors. *Conference on Human Factors in Computing Systems Proceedings*, *Query date: 2025-12-15 22:19:30*. https://doi.org/10.1145/3313831.3376226

Woodruff, E. (2024). AI Detection of Human Understanding in a Gen-AI Tutor. *AI Switzerland*, *5*(2), 898–921. https://doi.org/10.3390/ai5020045

Zamfirescu-Pereira, J. D. (2025). 61A Bot Report: AI Assistants in CS1 Save Students Homework Time and Reduce Demands on Staff. (Now What?). *SIGCSE TS 2025 Proceedings of the 56th ACM Technical Symposium on Computer Science Education*, *1*(Query date: 2025-12-15 22:19:30), 1309–1315. https://doi.org/10.1145/3641554.3701864