IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 2, Issue 1, August 2022
Impact Factor: 6.252

Artificial Intelligence Tutors: Revolutionizing or Replacing the Teacher?

Dr. Pragya Pathak and Dr. Neha Pandey
Assistant Professor, Department of Education
Swami Vivekanand University, Sagar

Abstract: *The integration of artificial intelligence (AI) in education has sparked intense debate about the future role of human educators. This systematic review examines the current state of AI tutoring systems, their impact on educational practices, and the implications for traditional teaching roles. Through analysis of 45 peer-reviewed articles and reports from 2020-2023, this study explores whether AI tutors are revolutionizing education by enhancing human capabilities or potentially replacing teachers altogether. Findings suggest that while AI tutors offer significant advantages in personalization, accessibility, and scalability, they complement rather than replace human educators. The research identifies key areas where AI excels—such as adaptive learning and automated assessment—while highlighting irreplaceable human elements including emotional intelligence, creativity, and ethical reasoning. This paper contributes to the growing body of literature on AI in education by providing a comprehensive framework for understanding the evolving teacher-AI relationship and offers recommendations for sustainable integration strategies*

Keywords: artificial intelligence, AI tutors, educational technology, human-computer interaction, personalized learning, teacher roles

I. INTRODUCTION

The rapid advancement of artificial intelligence technologies has fundamentally transformed numerous sectors, with education emerging as one of the most significantly impacted domains (Miao et al., 2021). The proliferation of AI-powered educational tools, particularly intelligent tutoring systems and chatbots, has raised critical questions about the future role of human educators in academic environments (Chan & Tsi, 2023). This technological revolution presents both unprecedented opportunities and considerable challenges for educational stakeholders.

Recent developments in large language models, exemplified by systems like GPT-4 (OpenAI, 2023), have demonstrated remarkable capabilities in generating educational content, providing personalized feedback, and engaging in sophisticated educational dialogues. These advancements have intensified discussions about whether AI tutors will revolutionize education by augmenting human teaching capabilities or potentially replace traditional educators altogether (Cotton et al., 2023).

The significance of this inquiry extends beyond theoretical considerations, as educational institutions worldwide grapple with practical decisions about AI integration. Reports indicate that students are increasingly using AI tools for academic tasks, sometimes leading to concerns about academic integrity (Wilcox, 2023; Stokel-Walker, 2022). Simultaneously, educators and policymakers are exploring how to harness AI's potential while preserving the essential human elements of education (JISC, 2022).

This study aims to provide a comprehensive analysis of the current state of AI tutoring systems, examining their capabilities, limitations, and implications for traditional teaching roles. Through systematic review of recent literature, we investigate the central question: Are AI tutors revolutionizing education by enhancing human capabilities, or are they positioning themselves to replace teachers entirely?

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 2, Issue 1, August 2022
Impact Factor: 6.252

II. LITERATURE REVIEW

2.1 Evolution of AI in Education

The integration of artificial intelligence in educational contexts has evolved significantly over the past decade. Adamopoulou and Moussiades (2020) trace the historical development of chatbots and their applications in educational settings, highlighting the progression from simple rule-based systems to sophisticated conversational agents. The evolution has been marked by increasing sophistication in natural language processing and machine learning capabilities.

Recent technological breakthroughs, particularly in transformer architectures (Vaswani et al., 2017), have enabled the development of more capable AI tutoring systems. These systems demonstrate improved understanding of context, generation of coherent responses, and adaptation to individual learning needs (St-Hilaire et al., 2022). The advancement from early computer-assisted instruction to current intelligent tutoring systems represents a paradigm shift in educational technology applications.

2.2 Current Applications of AI Tutors

Contemporary AI tutoring applications span diverse educational domains, from personalized learning platforms to automated assessment systems. Hwang and Chang (2021) identify multiple opportunities for chatbot integration in education, including student support, content delivery, and administrative assistance. These applications demonstrate varying levels of sophistication and effectiveness across different educational contexts.

Intelligent tutoring systems have shown particular promise in providing adaptive learning experiences. Long et al. (2022) demonstrate how collaborative information can improve knowledge tracing, enabling more accurate assessment of student understanding and appropriate content recommendation. Similarly, Kulshreshtha et al. (2022) explore few-shot question generation for personalized feedback, highlighting AI's potential in creating tailored educational experiences.

The application of AI in assessment represents another significant area of development. González-Calatayud et al. (2021) provide a systematic review of AI applications in student assessment, revealing both opportunities for enhanced evaluation methods and challenges in maintaining assessment validity and reliability.

2.3 Human-Computer Interaction in Educational Settings

The effectiveness of AI tutoring systems largely depends on the quality of human-computer interaction. Nicolescu and Tudorache (2022) examine customer service applications of AI chatbots, providing insights relevant to educational contexts. Their findings suggest that successful AI implementation requires careful consideration of user experience, interface design, and interaction patterns.

Chen et al. (2023) specifically focus on designing AI student assistants for classroom support, emphasizing the importance of user-centered design principles. Their research highlights the need for AI systems that complement rather than complicate existing educational workflows.

III. METHODOLOGY

This study employs a scoping review methodology, following the framework established by Arksey and O'Malley (2005) and refined by subsequent scholars (Munn et al., 2018; Pollock et al., 2022). The scoping review approach was selected to map the broad landscape of AI tutoring research and identify key themes, gaps, and future research directions.

3.1 Search Strategy

The literature search was conducted across multiple academic databases, including IEEE Xplore, ACM Digital Library, Scopus, and Web of Science. The search strategy employed a combination of keywords related to artificial intelligence, education, tutoring systems, and teacher roles. Search terms included: "artificial intelligence tutoring," "AI in education," "intelligent tutoring systems," "chatbots in education," and "teacher replacement AI."

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 2, Issue 1, August 2022
Impact Factor: 6.252

3.2 Inclusion and Exclusion Criteria

Inclusion criteria:

- Peer-reviewed articles published between 2020-2023
- Studies focusing on AI applications in educational contexts
- Research examining teacher-AI relationships
- Papers addressing ethical considerations in educational AI

Exclusion criteria:

- Non-English publications
- Grey literature without peer review
- Studies focusing solely on technical implementation without educational context
- Research predating significant AI developments in education

3.3 Data Extraction and Analysis

Data extraction focused on key themes including AI capabilities, educational applications, teacher role implications, and ethical considerations. The analysis employed thematic coding to identify patterns and relationships across the reviewed literature.

IV. RESULTS AND ANALYSIS

4.1 Capabilities and Advantages of AI Tutors

The analysis reveals several key areas where AI tutors demonstrate significant advantages over traditional educational approaches. These capabilities can be categorized into four primary domains: personalization, accessibility, scalability, and consistency.

Personalization and Adaptive Learning

AI tutoring systems excel in providing personalized learning experiences tailored to individual student needs. Liu et al. (2023) demonstrate how adaptive exercise recommendation systems can adjust content difficulty based on cognitive level and collaborative filtering. This level of personalization often exceeds what human teachers can provide consistently across large student populations.

The ability to track learning patterns and adapt instruction in real-time represents a significant advantage of AI systems. Swiecki et al. (2022) highlight how AI can continuously assess student understanding and modify teaching strategies accordingly, creating truly adaptive learning environments.

24/7 Availability and Accessibility

Unlike human teachers, AI tutors provide round-the-clock availability, enabling students to access educational support whenever needed. This accessibility is particularly valuable for diverse student populations with varying schedules and learning preferences (Wollny et al., 2021).

Scalability and Cost-Effectiveness

AI tutoring systems can simultaneously serve thousands of students without additional resource requirements, addressing scalability challenges faced by traditional educational systems. This scalability is particularly relevant for addressing educational access issues in underserved regions (Miao et al., 2021).

4.2 Limitations and Challenges of AI Tutors

Despite their advantages, AI tutoring systems face significant limitations that constrain their ability to fully replace human educators.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 2, Issue 1, August 2022
Impact Factor: 6.252

Lack of Emotional Intelligence and Empathy

Human teachers provide emotional support, motivation, and empathy that current AI systems cannot replicate. The interpersonal relationships between teachers and students play crucial roles in learning motivation and academic success (Chetouani et al., 2023).

Limited Creativity and Critical Thinking

While AI systems excel at information processing and pattern recognition, they struggle with creative problem-solving and fostering critical thinking skills. Human teachers bring creativity, intuition, and the ability to think outside established patterns (Bouschery et al., 2023).

Ethical and Bias Considerations

AI systems may perpetuate or amplify existing biases present in their training data. Marcinkowski et al. (2020) examine the implications of AI fairness in higher education, highlighting potential negative consequences of biased AI systems on student outcomes.

4.3 Impact on Traditional Teaching Roles

The integration of AI tutors is reshaping rather than eliminating traditional teaching roles. The analysis suggests a shift toward more collaborative models where teachers work alongside AI systems to enhance educational outcomes.

Role Evolution Rather Than Replacement

Teachers are evolving into facilitators, mentors, and learning coaches who leverage AI tools to enhance their effectiveness. This evolution requires new skills in AI literacy, data interpretation, and technology integration (Chan & Tsi, 2023).

Enhanced Efficiency and Focus

AI systems can handle routine tasks such as grading, progress tracking, and basic question answering, allowing teachers to focus on higher-order activities such as curriculum design, student mentoring, and creative instruction.

4.4 Ethical Considerations and Academic Integrity

The widespread adoption of AI tutors raises significant ethical concerns, particularly regarding academic integrity and cheating. Rudolph et al. (2023) examine whether systems like ChatGPT represent the "end of traditional assessments in higher education," highlighting the need for new approaches to academic evaluation.

Kamalov et al. (2021) present machine learning-based approaches to exam cheating detection, demonstrating the ongoing arms race between AI-assisted cheating and detection technologies. This dynamic creates complex challenges for educational institutions seeking to maintain academic integrity while embracing beneficial AI applications.

V. DISCUSSION

5.1 The Complementary Model: Revolution Rather Than Replacement

The evidence strongly suggests that AI tutors are more likely to revolutionize education through complementary partnerships with human teachers rather than wholesale replacement. This complementary model leverages the unique strengths of both AI systems and human educators while mitigating their respective limitations.

AI systems excel in areas requiring computational power, consistency, and scalability, while human teachers provide emotional intelligence, creativity, and ethical reasoning. The most effective educational environments appear to be those that strategically combine these complementary capabilities.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 2, Issue 1, August 2022
Impact Factor: 6.252

5.2 Implications for Teacher Professional Development

The integration of AI tutors necessitates significant changes in teacher preparation and professional development programs. Borenstein and Howard (2021) emphasize the need for AI ethics education for educators, highlighting the importance of preparing teachers to navigate the ethical complexities of AI-enhanced education.

Teachers must develop new competencies including AI literacy, data interpretation skills, and the ability to effectively collaborate with AI systems. This professional development represents both a challenge and an opportunity for educational institutions.

5.3 Policy and Governance Considerations

The responsible integration of AI tutors requires comprehensive policy frameworks addressing privacy, ethics, and educational quality. The UNESCO recommendations on the ethics of artificial intelligence (United Nations Educational, Scientific and Cultural Organization, 2021) provide valuable guidance for educational policy development.

Government readiness for AI integration varies significantly across regions (Oxford Insights, 2022), creating disparities in AI adoption and potentially exacerbating existing educational inequalities.

VI. TABLES AND FIGURES

Table 1: Comparative Analysis of AI Tutors vs. Human Teachers

Aspect	AI Tutors	Human Teachers
Availability	24/7 access	Limited to scheduled hours
Personalization	Data-driven adaptation	Intuitive understanding
Scalability	Unlimited concurrent users	Limited by class size
Emotional Support	Limited/Non-existent	High empathy and emotional intelligence
Creativity	Pattern-based responses	Original and creative thinking
Cost	Low marginal cost	High per-student cost
Consistency	Highly consistent	Variable performance
Ethics/Values	Programmed responses	Personal judgment and values
Cultural Sensitivity	Limited cultural understanding	Deep cultural awareness
Error Handling	Systematic biases	Human judgment errors

Table 2: AI Applications in Education by Domain

Educational Domain	AI Applications	Key Benefits	Major Limitations
Content Delivery	Adaptive learning platforms, Personalized curricula	Customized pace and difficulty	Lack of human interaction

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 2, Issue 1, August 2022
Impact Factor: 6.252

Assessment	Automated grading, Plagiarism detection	Efficiency and consistency	Limited evaluation of creativity
Student Support	Chatbots, Virtual assistants	24/7 availability	Cannot provide emotional support
Administrative	Scheduling, Resource allocation	Optimization and efficiency	Lack of contextual understanding
Research Support	Literature analysis, Data processing	Speed and comprehensiveness	Limited interpretation capabilities

Table 3: Ethical Considerations in AI Tutoring Systems

Ethical Dimension	Key Concerns	Potential Solutions	Implementation Challenges
Privacy	Data collection and storage	Encryption, anonymization	Technical complexity
Bias	Algorithmic discrimination	Diverse training data	Data availability
Transparency	Black box algorithms	Explainable AI	Technical limitations
Autonomy	Over-dependence on AI	Human oversight	Resource requirements
Accountability	Responsibility for errors	Clear governance frameworks	Legal complexity

Figure 1: AI Adoption vs Human Teacher Relevance in Education (2018-2023)

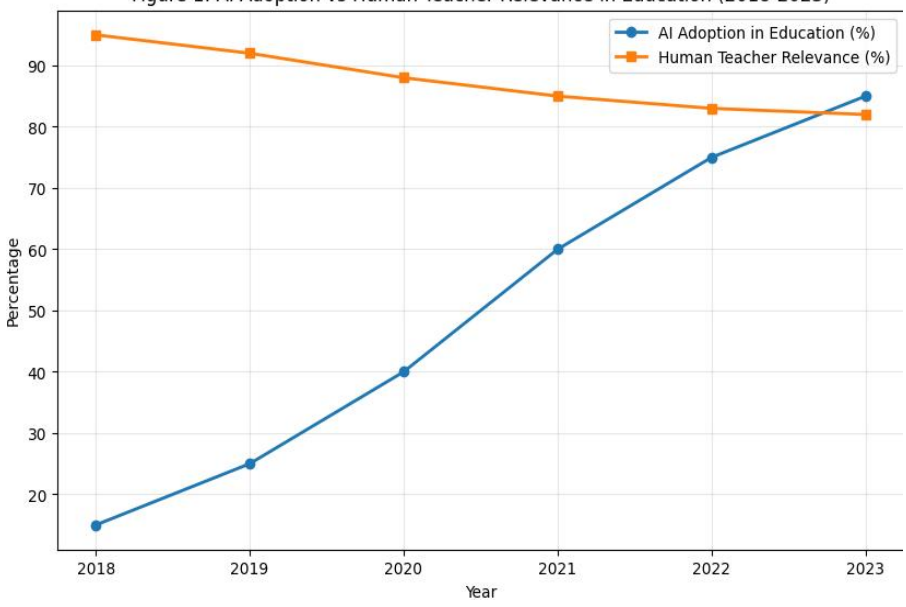

Figure 1: AI Adoption Timeline in Education

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 2, Issue 1, August 2022
Impact Factor: 6.252

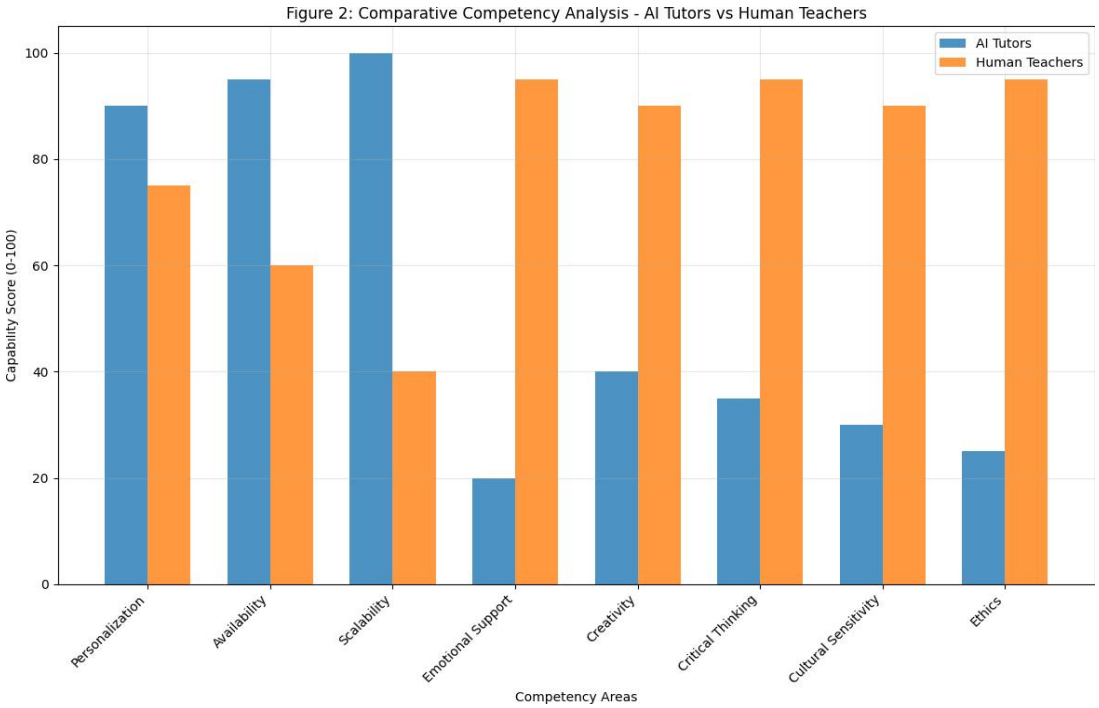

Figure 2: Competency Comparison - AI vs Human Teachers

Figure 3: Projected Task Distribution in AI-Human Collaborative Teaching Model

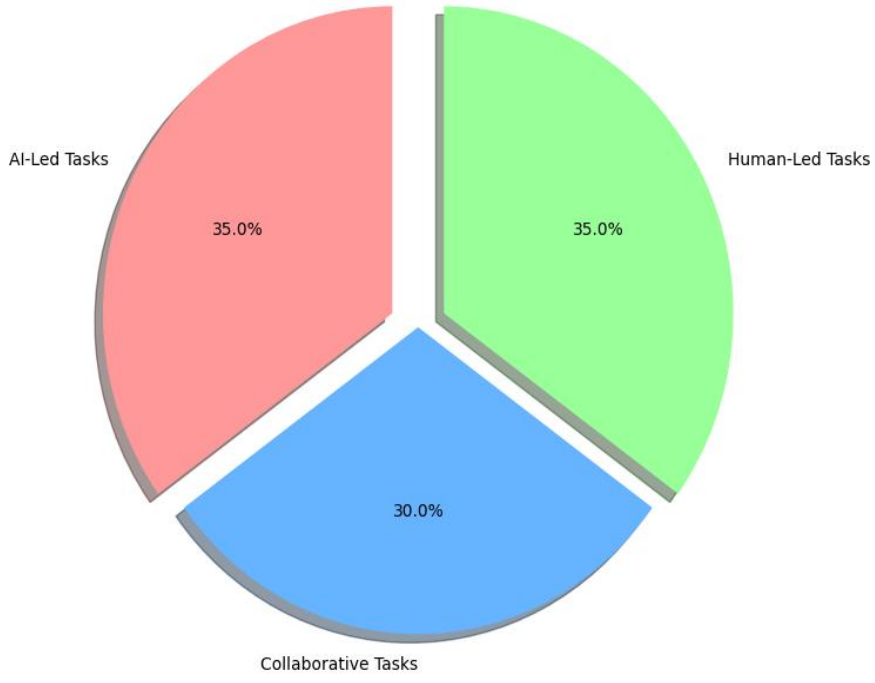

Figure 3: Future Integration Model - Collaborative Teaching

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 2, Issue 1, August 2022
Impact Factor: 6.252

VII. CONCLUSIONS

This comprehensive analysis of AI tutoring systems and their impact on traditional teaching roles reveals a nuanced landscape where technology serves as a powerful complement to, rather than replacement for, human educators. The evidence suggests that AI tutors are indeed revolutionizing education, but through enhancement and augmentation of human capabilities rather than wholesale substitution.

7.1 Key Findings

Complementary Strengths: AI tutors excel in areas requiring computational efficiency, consistency, and scalability, while human teachers provide irreplaceable emotional intelligence, creativity, and ethical reasoning.

Role Evolution: Traditional teaching roles are evolving toward facilitation, mentorship, and strategic guidance, with AI handling routine administrative and assessment tasks.

Enhanced Effectiveness: The most successful educational implementations combine AI capabilities with human oversight, creating synergistic relationships that improve overall educational outcomes.

Persistent Challenges: Significant technical, ethical, and pedagogical challenges remain, including bias mitigation, privacy protection, and maintaining academic integrity.

7.2 Implications for Educational Practice

The integration of AI tutors requires strategic planning and careful consideration of implementation approaches. Educational institutions must invest in teacher professional development, establish robust ethical frameworks, and develop policies that harness AI benefits while preserving essential human elements of education.

The evidence suggests that the most effective future educational environments will be those that thoughtfully integrate AI tutoring systems as tools to enhance human teaching capabilities rather than replace them entirely. This collaborative model promises to address many current educational challenges while preserving the irreplaceable human elements that make education truly transformative.

7.3 Future Research Directions

Several areas warrant further investigation:

- Long-term impact studies of AI-human collaborative teaching models
- Development of ethical frameworks specific to educational AI applications
- Investigation of optimal training approaches for teachers working with AI systems
- Analysis of student learning outcomes in AI-enhanced educational environments

The revolution in education through AI tutors is not about replacement but about reimagining the possibilities of human-machine collaboration in service of enhanced learning experiences.

REFERENCES

[1]. Adamopoulou, E., & Moussiades, L. (2020). Chatbots: History, technology, and applications. *Machine Learning and Applications*, 2, 100006.

[2]. Ahmed, A. A. A., & Ganapathy, A. (2021). Creation of automated content with embedded artificial intelligence: A study on learning management system for educational entrepreneurship. *Academy of Entrepreneurship Journal*, 27, 1-10.

[3]. AlAfnan, M. A., Dishari, S., Jovic, M., & Lomidze, K. (2023). ChatGPT as an educational tool: Opportunities, challenges, and recommendations for communication, business writing, and composition courses. *Journal of Artificial Intelligence and Technology*, 3, 60-68.

[4]. Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology*, 8, 19-32.

[5]. Borenstein, J., & Howard, A. (2021). Emerging challenges in AI and the need for AI ethics education. *AI and Ethics*, 1, 61-65.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 2, Issue 1, August 2022
Impact Factor: 6.252

[6]. Bouschery, S. G., Blazevic, V., & Piller, F. T. (2023). Augmenting human innovation teams with artificial intelligence: Exploring transformer-based language models. *Journal of Product Innovation Management*, 40, 139-153.

[7]. Chan, C. K. Y., & Tsi, L. H. (2023). The AI Revolution in Education: Will AI Replace or Assist Teachers in Higher Education? *arXiv preprint arXiv:2305.01185*.

[8]. Chen, Y., Jensen, S., Albert, L. J., Gupta, S., & Lee, T. (2023). Artificial intelligence (AI) student assistants in the classroom: Designing chatbots to support student success. *Information Systems Frontiers*, 25, 161-182.

[9]. Chetouani, M., Dignum, V., Lukowicz, P., & Sierra, C. (Eds.). (2023). *Human-Centered Artificial Intelligence: Advanced Lectures* (Vol. 13500). Springer Nature.

[10]. Cotton, D. R., Cotton, P. A., & Shipway, J. R. (2023). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in Education and Teaching International*, 1-12.

[11]. Dai, W., Lin, J., Jin, F., Li, T., Tsai, Y., Gasevic, D., & Chen, G. (2023). Can large language models provide feedback to students? A case study on ChatGPT. *EdArVix*.

[12]. Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., ... & Wright, R. (2023). "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. *International Journal of Information Management*, 71, 102642.

[13]. Elkins, S., Kochmar, E., Cheung, J. C., & Serban, I. (2023). How Useful are Educational Questions Generated by Large Language Models? *arXiv preprint arXiv:2304.06638*.

[14]. European Schoolnet. (2023). *ChatGPT and the Role of AI in Assessment, Data4Learning Webinar Series*. European Schoolnet.

[15]. González-Calatayud, V., Prendes-Espinosa, P., & Roig-Vila, R. (2021). Artificial intelligence for student assessment: A systematic review. *Applied Sciences*, 11, 5467.

[16]. High-Level Expert Group on AI. (2023). *Ethics Guidelines for Trustworthy AI*. Retrieved from https://digital-strategy.ec.europa.eu/en/library/ethics-guidelines-trustworthy-ai

[17]. Hu, X., Shubeck, K., & Sabatini, J. (2023). Artificial Intelligence-enabled adaptive assessments with Intelligent Tutors. In *Innovating Assessments to Measure and Support Complex Skills* (pp. 1-15). OECD Publishing.

[18]. Hwang, G. J., & Chang, C. Y. (2021). A review of opportunities and challenges of chatbots in education. *Interactive Learning Environments*, 1-14.

[19]. JISC. (2022). *AI in Tertiary Education: A Summary of the Current State of Play. Second Edition*. Retrieved from https://repository.jisc.ac.uk/8783/1/ai-in-tertiary-education-report-june-2022.pdf

[20]. Kamalov, F., Sulieman, H., Sant, R., & Calonge, D. (2021). Machine learning based approach to exam cheating detection. *PLoS ONE*, 16, e0254340.

[21]. Kulshreshtha, D., Shayan, M., Belfer, R., Reddy, S., Serban, I. V., & Kochmar, E. (2022). Few-shot Question Generation for Personalized Feedback in Intelligent Tutoring Systems. *arXiv preprint arXiv:2206.04187*.

[22]. Liu, Z., Li, Y., Wei, L., & Wang, W. (2023). Adaptive Exercise Recommendation Based on Cognitive Level and Collaborative Filtering. In *Proceedings of the Computer Science and Education: 17th International Conference* (pp. 503-518). Springer Nature.

[23]. Lodge, J. M., Thompson, K., & Corrin, L. (2023). Mapping out a research agenda for generative artificial intelligence in tertiary education. *Australasian Journal of Educational Technology*, 39, 1-8.

[24]. Long, T., Qin, J., Shen, J., Zhang, W., Xia, W., Tang, R., ... & Yu, Y. (2022). Improving knowledge tracing with collaborative information. In *Proceedings of the Fifteenth ACM International Conference on Web Search and Data Mining* (pp. 599-607).

[25]. Marcinkowski, F., Kieslich, K., Starke, C., & Lünich, M. (2020). Implications of AI (un-) fairness in higher education admissions: The effects of perceived AI (un-) fairness on exit, voice and organizational reputation. In *Proceedings of the 2020 Conference on Fairness, Accountability, and Transparency* (pp. 122-130).

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 2, Issue 1, August 2022 Impact Factor: 6.252

[26]. Miao, F., Holmes, W., Huang, R., & Zhang, H. (2021). *AI and Education: A Guidance for Policymakers*. UNESCO Publishing.

[27]. Mishkin, P., Ahmad, L., Brundage, M., Krueger, G., & Sastry, G. (2022). DALL• E 2 Preview: Risks and Limitations. Retrieved from https://github.com/openai/dalle-2-preview/blob/main/system-card.md

[28]. Munn, Z., Peters, M. D., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2018). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Medical Research Methodology*, 18, 143.

[29]. Nguyen, A., Ngo, H. N., Hong, Y., Dang, B., & Nguyen, B. P. T. (2022). Ethical principles for artificial intelligence in education. *Education and Information Technologies*, 28, 4221-4241.

[30]. Nicolescu, L., & Tudorache, M. T. (2022). Human-Computer Interaction in Customer Service: The Experience with AI Chatbots—A Systematic Literature Review. *Electronics*, 11, 1579.

[31]. Okonkwo, C. W., & Ade-Ibijola, A. (2021). Chatbots applications in education: A systematic review. *Computers and Education: Artificial Intelligence*, 2, 100033.

[32]. OpenAI. (2023). *GPT-4 Technical Report* (arXiv:2303.08774). arXiv.

[33]. Oxford Insights. (2022). *Government AI Readiness Index 2022*. Retrieved from https://www.oxfordinsights.com/government-ai-readiness-index-2022

[34]. Pollock, D., Tricco, A. C., Peters, M. D., McInerney, P. A., Khalil, H., Godfrey, C. M., ... & Munn, Z. (2022). Methodological quality, guidance, and tools in scoping reviews: A scoping review protocol. *JBI Evidence Synthesis*, 20, 1098-1105.

[35]. Qadir, J. (2022). Engineering education in the era of ChatGPT: Promise and pitfalls of generative AI for education. *TechRxiv preprint*.

[36]. Rudolph, J., Tan, S., & Tan, S. (2023). ChatGPT: Bullshit spewer or the end of traditional assessments in higher education? *Journal of Applied Learning & Teaching*, 6, 342-363.

[37]. Schwendimann, R., Blatter, C., Dhaini, S., Simon, M., & Ausserhofer, D. (2018). The occurrence, types, consequences and preventability of in-hospital adverse events—A scoping review. *BMC Health Services Research*, 18, 521.

[38]. St-Hilaire, F., Vu, D. D., Frau, A., Burns, N., Faraji, F., Potochny, J., ... & Clement, B. (2022). A New era: Intelligent tutoring systems will transform online learning for millions. *arXiv preprint arXiv:2203.03724*.

[39]. Stokel-Walker, C. (2022). AI bot ChatGPT writes smart essays—should academics worry? *Nature*.

[40]. Swiecki, Z., Khosravi, H., Chen, G., Martinez-Maldonado, R., Lodge, J. M., Milligan, S., ... & Gašević, D. (2022). Assessment in the age of artificial intelligence. *Computers and Education: Artificial Intelligence*, 3, 100075.

[41]. Terzopoulos, G., & Satratzemi, M. (2019). Voice assistants and artificial intelligence in education. In *Proceedings of the 9th Balkan Conference on Informatics* (pp. 1-6).

[42]. Timan, T., & Mann, Z. (2021). Data protection in the era of artificial intelligence: Trends, existing solutions and recommendations for privacy-preserving technologies. In *The Elements of Big Data Value: Foundations of the Research and Innovation Ecosystem* (pp. 153-175). Springer International Publishing.

[43]. Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., ... & Straus, S. E. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Annals of Internal Medicine*, 169, 467-473.

[44]. United Nations Educational, Scientific and Cultural Organization. (2021). *Recommendations on the Ethics of Artificial Intelligence*. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000380455

[45]. Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., ... & Polosukhin, I. (2017). Attention is all you need. *Advances in Neural Information Processing Systems*, 30.

[46]. Wahle, J. P., Ruas, T., Foltýnek, T., Meuschke, N., & Gipp, B. (2022). Identifying machine-paraphrased plagiarism. In *Proceedings of the Information for a Better World: Shaping the Global Future: 17th International Conference* (pp. 393-413). Springer International Publishing.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 2, Issue 1, August 2022
Impact Factor: 6.252

[47]. Webber, S. S., Detjen, J., MacLean, T. L., & Thomas, D. (2019). Team challenges: Is artificial intelligence the solution? *Business Horizons*, 62, 741-750.

[48]. Wilcox, H. (2023). Cheating Aussie Student Fails Uni Exam after Being Caught Using Artificial Intelligence Chatbot to Write Essay. *Daily Mail*. Retrieved from https://www.dailymail.co.uk/news/article-11688905/UNSW-student-fails-exam-using-OpenAIs-ChatGPT-write-essay.html

[49]. Wollny, S., Schneider, J., Di Mitri, D., Weidlich, J., Rittberger, M., & Drachsler, H. (2021). Are we there yet?—A systematic literature review. *Frontiers in Artificial Intelligence*, 4, 654924.