

Integrating Artificial Intelligence in Micro Teaching: The Role of ChatGPT for Customized Feedback and Interactive Learning

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Abstract: The integration of Artificial Intelligence (AI) in teaching has transformed conventional teacher training methods, offering AI-driven feedback systems, interactive simulations, and adaptive learning environments. This study explored the role of AI, particularly generative models like ChatGPT, in enhancing lesson delivery, instructional feedback, and teacher engagement in micro-teaching. AI-powered platforms provide real-time, systematic, and personalized feedback, analyzing verbal communication, lesson structuring, and classroom engagement techniques to improve teaching effectiveness. Additionally, AI-driven simulations enable pre-service teachers to practice classroom management, respond to diverse learning scenarios, and develop adaptive instructional strategies in a risk-free virtual environment. Despite these advancements, AI in micro-teaching presents significant challenges, including bias in AI-generated feedback, lack of emotional intelligence, data privacy concerns, and the potential over-reliance on automation. Research highlights that while AI offers consistency and efficiency, it lacks the depth of human evaluation, particularly in assessing creativity, socialization, student engagement, and emotional responsiveness. A hybrid feedback model that integrates AI-driven analytics with human mentoring is recommended to balance structured feedback with contextual and personalized insights. This literature review synthesizes theoretical frameworks, such as Constructivist Learning Theory, Feedback and Learning Theories, and the Artificial Intelligence in Education (AIED) Framework, to explain AI's role in micro-teaching. Findings suggest that AI-enhanced micro-teaching can complement conservative evaluation methods, leading to a more engaging, individualized, and efficient teacher training experience. However, ethical considerations and responsible AI integration must be prioritized to ensure fair, unbiased, and effective use of AI in education. This study contributes to the ongoing discourse on AI's impact in teacher education, offering insights into its potential, limitations, and future directions.

Keywords: micro-teaching, Artificial intelligence, AI-generated feedback, AI-powered simulations, Hybrid AI-human evaluation.

I. INTRODUCTION

Micro-teaching is a structured teacher training technique designed to help educators develop and refine their instructional skills in a controlled, low-risk environment. Originally conceptualized in the 1960s by Dwight Allen at Stanford University, micro-teaching breaks down the teaching process into smaller, manageable components, allowing pre-service teachers to

practice lesson delivery, classroom management, and communication techniques in short sessions, typically lasting between 5 to 10 minutes (Allen & Eve, 1968). After these sessions, trainees receive feedback from peers, mentors, or instructors, enabling them to make iterative improvements to their teaching methodologies (Amobi, 2005).

Conventional micro-teaching activities depends largely on human evaluation, where experienced educators provide qualitative assessments based on observed teaching performance. While this method has been effective in enhancing instructional techniques, it also has several limitations, such as subjective biases, delays in feedback, and logistical challenges in organizing multiple review sessions (Kpanja, 2001). Additionally, providing consistent, individualized feedback to a large number of trainees can be difficult due to resource constraints and time limitations (Bell, 2007). These challenges highlight the need for innovative approaches to teacher training, particularly in enhancing the efficiency and accessibility of feedback mechanisms.

With advancements in Artificial Intelligence (AI) and Natural Language Processing (NLP), micro-teaching is undergoing a technological transformation. AI-powered systems, particularly generative models like ChatGPT, offer the potential to enhance micro-teaching by providing real-time, objective, and personalized feedback. AI-driven platforms assess teaching performance by analyzing verbal communication, lesson structuring, and engagement strategies, offering data-driven suggestions to improve clarity, coherence, and instructional effectiveness (Wang et al., 2023). Additionally, AI-powered tools support interactive learning by simulating classroom environments, where trainee teachers engage with AI-generated learner responses and realistic teaching scenarios. These AI-driven simulations allow educators to practice handling different types of learners, manage classroom disruptions, and refine their instructional approaches without the pressures of a real-world classroom setting (Johnson & Lee, 2022).

Despite its potential benefits, the integration of AI in micro-teaching is faced with a number of challenges. Concerns regarding the accuracy of AI-generated feedback, the absence of human emotional intelligence, and ethical issues such as AI bias and data privacy risks must be addressed (Zhang et al., 2024). While AI can enhance efficiency and accessibility, it should be used to complement human mentorship rather than a replacement of expert guidance. Ensuring a hybrid model that integrates AI-driven feedback with human evaluation is critical for maintaining contextual understanding, adaptability, and individualized mentoring in teacher training (Brown et al., 2023). This literature review delves into the role of ChatGPT and other generative AI models in micro-teaching, with a particular emphasis on their influence on teacher training and instructional design. The study examines the ways in which AI contributes to enhancing educational practices and teacher development.

One of the primary areas explored is the personalized feedback that AI models provide on lesson delivery, clarity, and structure. AI-powered tools are capable of analyzing a teacher's instructional style, language usage, and engagement techniques. By offering targeted feedback, these tools help improve teaching effectiveness and facilitate more dynamic lesson planning (Li et al., 2024). Additionally, the review looks into the impact of AI-driven simulations on interactive learning. These simulations generate student interactions, allowing trainee teachers to practice responding to a wide range of classroom scenarios. This fosters adaptability and sharpens problem-solving skills, making AI a valuable resource for developing effective teaching strategies (Relay Graduate School of Education, 2024).

However, the review also acknowledges the challenges associated with automation in teacher training (Lund et. al, 2023). Despite the many advantages of AI, there are notable limitations, such as potential biases in training data and the absence of human empathy in AI interactions. These challenges must be addressed to ensure that AI is integrated into education in a responsible and ethical manner (Annenberg Institute, 2023). By reviewing existing research on AI-driven micro-teaching, this study aims to provide insights into the effectiveness, limitations, and future potential of AI-powered instructional feedback. Ultimately, the goal is to explore how AI can complement traditional teaching methodologies, leading to a more efficient, engaging, and personalized teacher training experience.

II. LITERATURE REVIEW

2.1 Theoretical Framework

The integration of Artificial Intelligence (AI) in micro-teaching is supported by several educational and technological theories that explain its potential to enhance teacher training and professional development. These theories provide a foundation for understanding how AI-driven tools can improve teaching strategies, provide adaptive feedback, and create

immersive learning environments. The key theoretical perspectives underpinning AI's role in micro-teaching include Constructivist Learning Theory, Feedback and Learning Theories, and the Artificial Intelligence in Education (AIED) Framework.

2.1.1 Constructivist Learning Theory

Constructivist learning theory asserts that learners construct knowledge through active participation and experiential learning. In the context of AI-enhanced micro-teaching, AI-powered platforms simulate realistic classroom interactions, allowing teacher trainees to engage in hands-on, experiential learning. Through AI-driven simulations, educators can practice delivering lessons, refine instructional strategies, and experiment with different teaching methods in a risk-free environment. This iterative process aligns with constructivist principles by enabling teachers to build their expertise through direct engagement and reflection. For instance, AI-driven virtual classrooms provide pre-service teachers with immediate feedback on their lesson delivery, classroom management, and engagement techniques, fostering an interactive and student-centered learning environment (Semantic Scholar, 2023).

2.1.2 Feedback and Learning Theories

Feedback plays a critical role in learning and skill development. AI-powered feedback systems align with established feedback and self-regulated learning theories. These theories emphasize the importance of timely, personalized feedback in helping learners monitor their progress, adjust their strategies, and achieve continuous improvement. AI-driven micro-teaching platforms can analyze teaching performance, identify areas of strength and weakness, and provide actionable recommendations based on real-time data. By offering data-driven, targeted feedback, AI enhances self-regulation among educators, allowing them to make informed adjustments to their teaching approaches (Wiley Online Library, 2024). This approach encourages reflective practice, helping trainee teachers develop adaptive and evidence-based teaching methods.

2.1.3 Artificial Intelligence in Education (AIED) Framework

The Artificial Intelligence in Education (AIED) framework explores how AI technologies support adaptive learning, instructional design, and assessment in educational settings. Within micro-teaching, AI analyzes teacher behaviors, student interactions, and lesson structures, offering adaptive feedback tailored to individual teaching styles. AI-driven systems can assess questioning techniques, engagement levels, and instructional clarity, providing real-time suggestions for improvement. For example, AI can detect patterns in a teacher's lesson delivery and recommend strategies to encourage higher-order thinking skills among students (Sciendo, 2024). This adaptability ensures that teacher training remains individualized and responsive to educators' needs, ultimately enhancing the effectiveness of learning experiences.

2.2 AI-Powered Feedback in Micro-Teaching

Feedback is an important part of the learning process (Johnson, 2023). Its role ensures there is progress both for the teacher and the learner. It is meant to be immediate, appropriate and consistent. In micro-teaching, immediate appropriate feedback improves a teacher trainees understanding of the teaching process. With the need to improve efficiency and effectiveness of the feedback process, embracing AI would be a major boost. These improvements are as discussed in the following sections.

2.2.1 Customized Feedback through ChatGPT

Advancements in Artificial Intelligence (AI) have transformed micro-teaching, particularly with AI-driven feedback systems like ChatGPT. These tools analyze teaching performance by assessing both linguistic and pedagogical parameters, providing constructive feedback to enhance communication, engagement, and clarity. One of the key advantages of AI-generated feedback is its immediacy, which reduces the reliance on human evaluators and allows teachers to make real-time adjustments to their instructional strategies. By offering structured, data-driven insights, AI-powered feedback systems have become valuable assets in teacher training programs.

A study conducted by Wang et al. (2023) found that AI-generated feedback was comparable to expert evaluations, demonstrating its potential to improve lesson planning and instructional delivery. The research highlights that AI tools like ChatGPT can identify areas for improvement, suggest refinements, and assist educators in optimizing their teaching techniques (Wang et al., 2023). This supports the argument that AI-powered feedback can enhance the professional development of teachers, particularly by offering consistent and unbiased evaluations (Stanford News, 2023).

However, while AI provides systematic and immediate feedback, it has certain limitations. Unlike human evaluators, AI lacks contextual understanding, adaptability, and emotional intelligence, which are essential for assessing creativity, engagement, and student-teacher interactions. This limitation suggests that AI feedback should be complemented with human evaluation to ensure comprehensive and effective teacher training. A balanced approach, where AI-generated insights are integrated with human expertise, can maximize the benefits of both AI efficiency and personalized human mentorship (Open Letter, 2023).

2.2.2 Comparing AI Feedback with Human Feedback

The integration of Artificial Intelligence (AI) in educational feedback mechanisms has been a major area of research, particularly in evaluating how AI-generated feedback compares with established human evaluation. AI feedback systems offer systematic, consistent, and immediate assessments, making them particularly effective for providing structured, data-driven insights. However, human evaluators bring nuanced, contextual understanding and emotional intelligence, which are critical for assessing creativity, engagement, and personal development. The debate over AI vs. human feedback has led researchers to explore which approach is more effective, or whether a combination of both would be optimal.

A study conducted by Xiong et al. (2023) investigated student perceptions of AI vs. human feedback, revealing that while students valued AI's objectivity and immediacy, they still preferred human feedback for its authenticity and depth. This preference highlights the fact that AI-generated responses, though efficient, may lack the emotional connection and personalized mentoring that human evaluators provide (Xiong et al., 2023). This finding reinforces the argument that human evaluators remain essential for assessments that require a deep understanding of individual learning styles, creativity, and motivation (OSF, 2023).

Additionally, Zhang et al. (2024) observed the effectiveness of AI-generated feedback in writing instruction, demonstrating that while AI feedback is highly systematic and easily accessible, it lacks the personalized touch that human evaluation provides. The study concluded that the most effective approach is a hybrid feedback model, where AI-generated insights are combined with human mentoring, allowing for both structured, analytical assessment and customized, context-sensitive guidance (Zhang et al., 2024). This hybrid model ensures that students benefit from AI's efficiency while still receiving the individualized, adaptive support that only human evaluators can provide (Taylor & Francis, 2024).

Li et al. (2024) examined the role of AI feedback in reducing student anxiety. Their findings indicated that students who received AI-generated feedback experienced a greater reduction in writing anxiety compared to those who received human feedback. This seems to suggest that AI can create a less intimidating feedback environment, as students may feel less judged and more open to critique when receiving automated feedback (Li et al., 2024). However, while AI may ease students' anxiety, it cannot fully replace the human ability to provide encouragement, motivation, and emotionally supportive feedback, which are key to long-term student development (IRRODL, 2024).

2.3 Interactive Learning with AI in Micro-Teaching

Interactive learning is defined as learning that encourages independent study through the use of computer technology and electronic media (Haque, 2023). Haque further indicates that, it is a technique that seeks to get students actively engaged in the learning process, often through the use of technology. Interactive learning allows for self-learning and self-discovery which are important aspects for teacher trainees. It allows the teacher trainees to have feel of the real world teaching and try to tackle challenges encountered.

2.3.1 AI-Driven Simulations for Classroom Scenarios

The integration of Artificial Intelligence (AI) into micro-teaching has transformed teacher training, particularly through AI-driven simulations that replicate realistic classroom environments (Liang, 2022). These advanced platforms allow trainee teachers to engage in virtual role-playing with AI-generated student interactions, practice responding to various classroom challenges in a risk-free setting, and receive instant feedback on their teaching techniques. By using AI-powered simulations, educators can develop effective instructional strategies, improve their decision-making skills, and enhance student engagement techniques before stepping into actual classrooms (Hinton, 2023).

A notable example of such technology is the "Teaching with Grace" platform, which provides AI-powered teaching simulations similar to how pilots or medical professionals use simulations to hone their skills. This simulated classroom environment offers teachers personalized opportunities to practice their instructional approaches, helping them deliver more equitable feedback and engage meaningfully with students (Learning Forward, 2023). These AI-enhanced simulations enable educators to refine their teaching methods, improve lesson delivery, and develop adaptive instructional techniques.

The Relay Graduate School of Education has also pioneered the use of AI-powered teacher simulators, blending AI technology with human coaching to enhance professional development. These simulators provide real-time, data-driven feedback to early-career teachers, enabling them to refine their teaching practices and adjust based on AI-generated insights (Relay Graduate School of Education, 2024). The combination of AI feedback with human coaching ensures that trainee teachers receive both structured, analytical evaluations and contextual, experience-based mentoring.

Furthermore, AI-driven teaching simulators are becoming increasingly responsive and realistic, incorporating generative AI models that adapt dynamically to teachers' actions and provide context-sensitive feedback. This enhanced realism mimics real-world classroom interactions, making AI-powered simulations more effective in preparing teachers for handling diverse student behaviors, classroom disruptions, and differentiated learning needs (Education Week, 2024). As AI technology continues to evolve, these simulations are expected to become even more customized and adaptive, further enhancing teacher readiness and instructional effectiveness.

2.3.2 Enhancing Engagement through AI-Generated Scenarios

The integration of Artificial Intelligence (AI) into teacher training has led to the development of AI-driven simulations, which significantly enhance teacher preparedness and engagement. These advanced systems offer dynamic and interactive learning experiences, allowing trainee teachers to engage with AI-generated students, practice in case-based teaching scenarios, and refine their instructional methods through AI-assisted self-evaluation. AI-powered tools create a safe, controlled environment where educators can experiment with different teaching strategies, receive immediate feedback, and adapt to various classroom challenges before entering real-world teaching settings (Kleinman, 2024).

A systematic review conducted by Johnson and Lee (2022) highlights the transformative potential of Virtual Reality (VR) and Augmented Reality (AR) as immersive tools in education. Their research emphasizes that when combined with AI, these technologies create realistic classroom simulations that provide teachers with practical experience in managing diverse student behaviors and instructional challenges (Johnson & Lee, 2022). These AI-enhanced VR and AR tools allow teachers to practice decision-making, classroom management, and lesson delivery in virtual spaces that mimic actual classrooms. The findings suggest that such simulations can increase teacher trainees' confidence and preparedness, ensuring that they develop adaptive teaching techniques before stepping into real-world educational environments (Mendeley Data, 2022).

Further research indicates that AI-powered tutoring systems, such as chatbots and adaptive learning platforms, offer personalized learning experiences and immediate feedback to trainee teachers. These systems support active learning methodologies, including problem-based learning and interactive case simulations, which have been shown to increase student engagement and deepen understanding of complex pedagogical concepts (ResearchGate, 2023). AI-based tutoring platforms adjust learning content based on an individual's progress and specific needs, providing customized recommendations to enhance teacher learning and professional growth.

Moreover, AI-driven tools have been utilized to generate reflection prompts in self-directed learning activities. By leveraging generative AI and large language models, these tools automatically create personalized prompts that guide learners in reflecting on their experiences, evaluating their teaching effectiveness, and identifying areas for improvement. This form of AI-assisted self-evaluation encourages deeper learning, critical thinking, and professional growth among educators (MIT-GenAI, 2024).

2.3 Challenges and Ethical Considerations

The integration of Artificial Intelligence (AI) into micro-teaching presents significant advantages in providing structured feedback and interactive learning experiences. However, it also raises critical challenges and ethical concerns that must be addressed to ensure fair, responsible, and effective implementation. Issues such as bias in AI algorithms, over-reliance on AI feedback, and data privacy concerns are among the key factors that educators and policymakers must consider when incorporating AI-driven assessment tools in teacher training.

Bias in AI Algorithms

AI models used in micro-teaching are trained on large datasets, which may contain inherent cultural, gender, or socioeconomic biases. When these biases exist in the training data, AI-powered feedback systems risk perpetuating and even amplifying them in evaluations. This is particularly concerning in educational assessment, where unbiased and fair

feedback is essential for teachers' professional development. A study published by the National Center for Biotechnology Information (NCBI) highlights that AI-driven educational tools can inadvertently reinforce existing biases present in the data they are trained on, potentially leading to unfair evaluations of trainee teachers (NCBI, 2024). Addressing this issue requires continuous refinement of AI models, implementation of bias-detection mechanisms, and diverse, representative datasets to ensure that AI-generated feedback is equitable and inclusive.

Over-Reliance on AI for Feedback

One of the potential drawbacks of integrating AI into micro-teaching is the risk of over-reliance on AI-generated feedback, which could diminish critical thinking and self-reflection among trainee teachers. AI feedback provides systematic and immediate responses, but an excessive dependence on AI evaluations may limit educators' ability to critically assess their own teaching performance. Research from the Annenberg Institute at Brown University indicates that while AI can improve efficiency in teacher evaluations, it should not replace human judgment or the reflective practices necessary for professional growth (Brown et al., 2023). Balancing AI assistance with human oversight ensures that teachers remain actively engaged in evaluating their instructional methods, identifying areas for improvement, and adapting their approaches based on personal judgment rather than solely relying on automated feedback.

Ethical Concerns: Data Privacy and AI Transparency

The ethical implications of AI integration in education extend beyond bias and over-reliance, particularly concerning data privacy and the opacity of AI decision-making. AI-powered teaching assessment tools collect, analyze, and process sensitive personal data, which raises concerns about data security, transparency, and accountability. Without stringent data protection policies, there is a risk of unauthorized access or misuse of teachers' performance data. Furthermore, the lack of transparency in AI-generated decisions makes it difficult for educators to understand how AI assessments are formulated, leading to potential trust issues. A report from the Annenberg Institute at Brown University emphasizes the necessity of establishing clear ethical frameworks to guide AI implementation in micro-teaching, particularly focusing on privacy safeguards and the need for human oversight in AI-based assessments (Annenberg Institute, 2023).

The Need for a Hybrid AI-Human Approach

Researchers advocate for a hybrid AI-human approach in teacher training to address the biases that arise with AI use. This approach allows AI to serve as an assistive tool rather than a replacement for human expertise. Brown et al. (2023) argue that combining AI-driven analytics with human evaluation allows educators to leverage AI's efficiency while maintaining the critical elements of human judgment, creativity, and contextual understanding. This hybrid model aligns with broader ethical guidelines, emphasizing that AI should augment, rather than supplant human capabilities in teacher training (Brown et al., 2023).

III. METHODOLOGY

This study adopted a systematic literature review to explore the role of artificial intelligence (AI) in micro-teaching, particularly focusing on AI-powered feedback, AI-driven classroom simulations, ethical challenges, and future directions. The review synthesizes empirical studies, theoretical perspectives, and expert analyses to provide a comprehensive understanding of AI's impact on teacher training.

The data collection process involved a structured search across multiple academic databases and institutional sources, including Google Scholar, Springer Open, Taylor & Francis Online, ScienceDirect (Elsevier), IEEE Xplore, ResearchGate, and educational technology journals. Additionally, official reports from the U.S. Department of Education and research publications from institutions like the Annenberg Institute and the Relay Graduate School of Education were reviewed. To ensure relevance, Boolean search operators (AND, OR, NOT) were applied, refining the search results. The search strategy included specific keywords such as "AI in micro-teaching," "AI-powered feedback in teacher training," "AI-generated classroom simulations," "ChatGPT in teacher education," "AI vs. human feedback in teaching," "Bias in AI-generated feedback," and "Future directions of AI in micro-teaching."

To maintain the credibility and relevance of the review, a set of inclusion and exclusion criteria was established. The review focused on studies published between 2020 and 2024, ensuring that the findings reflect the latest advancements in AI integration in micro-teaching. Only peer-reviewed studies, empirical research, case studies, and systematic reviews

discussing AI in teacher training, AI-based feedback mechanisms, interactive simulations, ethical considerations, and future recommendations were included. Studies were excluded if they lacked empirical evidence, were published before 2020 (unless foundational), or focused on AI applications outside micro-teaching.

The data analysis was conducted using a thematic approach, categorizing the findings into four key themes. The first theme, AI-powered feedback in micro-teaching, examined the role of AI-driven tools in assessing teaching performance, improving lesson delivery, and providing systematic feedback compared to human evaluators. The second theme, AI-driven simulations for classroom scenarios, analyzed the effectiveness of AI-generated student interactions, role-playing exercises, and self-evaluation mechanisms in preparing teachers for real-world classroom environments. The third theme, challenges and ethical considerations, explored concerns related to bias in AI training data, over-reliance on AI-generated feedback, and issues of data privacy and transparency. The fourth theme, future directions and recommendations, focused on hybrid AI-human feedback models, the expansion of AI capabilities beyond text-based analysis to include voice and gesture recognition, and the need for ethical AI development in educational settings.

To ensure quality assessment and validation, several measures were applied. The credibility of sources was verified through cross-checking studies from multiple databases to ensure consistency in findings. Triangulation of data was used by incorporating perspectives from journal articles, institutional reports, and policy guidelines, reducing the risk of bias. Additionally, research insights from leading educational organizations and AI policy experts were considered to enhance the reliability of conclusions.

While this literature review offers a comprehensive analysis of AI's role in micro-teaching, it acknowledges several limitations. First, the study focused primarily on English-language publications, which may exclude relevant research conducted in other languages. Second, not all databases were included, meaning some relevant studies might have been missed. Lastly, the rapid advancement of AI technologies means that newer research may emerge post-review, requiring continuous updates to maintain accuracy.

The review also adheres to ethical considerations by ensuring transparency in research methods, proper attribution of sources, and an objective interpretation of findings. Ethical research practices are upheld by avoiding misrepresentation of data and prioritizing studies that emphasize fairness, inclusivity, and responsible AI implementation in education.

IV. FINDINGS

The literature review on AI in micro-teaching has provided valuable insights into the role of AI-powered feedback, interactive learning through AI-driven simulations, ethical concerns, and future directions. The findings highlight the growing role of artificial intelligence in teacher training, demonstrating its advantages in providing immediate feedback, engaging teachers in realistic simulations, and supporting reflective practice. However, these benefits come with significant challenges, including bias in AI-generated assessments, concerns over data privacy, and the potential over-reliance on AI at the expense of human judgment.

AI-Powered Feedback in Micro-Teaching

One of the key findings of this study is that AI-driven feedback systems, such as ChatGPT and other generative AI models, offer immediate and structured feedback to trainee teachers. These systems analyze linguistic and pedagogical elements, providing constructive suggestions that help improve communication, engagement, and clarity in teaching. AI feedback is particularly useful because it is systematic and unbiased, ensuring that evaluations are consistent across different users. Additionally, AI-generated feedback has been found to be comparable to expert evaluations, reinforcing its credibility as a viable tool for teacher training (Wang et al., 2023).

Despite these advantages, AI feedback has limitations. Unlike human evaluators, AI lacks deep contextual understanding and emotional intelligence, making it difficult to assess creativity, adaptability, and the nuanced aspects of teaching (Xiong et al., 2023). As a result, human involvement remains crucial to ensure that teacher trainees receive holistic feedback that includes not just technical performance but also creativity and engagement. The findings suggest that a hybrid approach combining AI-generated feedback with human mentoring would be the most effective strategy for enhancing teacher training.

AI-Driven Simulations for Classroom Scenarios

The increasing role of AI-powered simulations in teacher training, where AI-generated classroom environments provide interactive and immersive learning experiences are the future. These simulations allow trainee teachers to engage in virtual role-playing, interact with AI-generated students, and practice responding to diverse classroom situations in a controlled, risk-free environment. Studies indicate that AI-driven simulations are particularly beneficial for preparing teachers to handle classroom challenges, providing opportunities for immediate feedback and skill improvement.

Research suggests that integrating AI with virtual reality (VR) and augmented reality (AR) makes these simulations more realistic and effective, enhancing trainee engagement and preparedness (Johnson & Lee, 2022). Additionally, AI-generated case-based teaching scenarios encourage self-reflection and adaptive learning, helping teachers refine their instructional techniques (Kirk et al., 2023).

However, the study also highlights certain limitations in AI simulations. While these tools replicate classroom interactions to some extent, they lack the unpredictability and emotional complexity of real student behavior. Teachers may find that AI-generated student interactions are too structured or predictable, making it less effective in preparing them for the complexities of real-world classroom dynamics. Despite this, AI simulations remain a valuable supplement to traditional teacher training, particularly for building confidence and refining pedagogical skills before engaging with real students.

Challenges and Ethical Considerations

While AI offers numerous benefits for micro-teaching, the study identifies several challenges and ethical concerns that must be addressed to ensure responsible and fair AI integration in education. One of the primary concerns is bias in AI algorithms. Because AI models are trained on pre-existing datasets, they can inherit and amplify biases present in the data, leading to potentially unfair assessments in teaching evaluations (NCBI, 2024). Ensuring fairness in AI-generated feedback requires continuous monitoring and refinement of training data to eliminate bias and promote inclusivity.

Another major concern is over-reliance on AI-generated feedback, which could diminish the ability of trainee teachers to critically assess their teaching performance without AI assistance. While AI provides structured, data-driven feedback, it may limit the development of self-reflective skills and independent critical thinking (Brown et al., 2023). A balance must be struck between leveraging AI as a supportive tool while still encouraging human judgment and self-assessment in teacher training.

Additionally, data privacy and security risks remain a major ethical issue. AI-powered educational tools collect and process sensitive personal data, raising concerns over privacy, transparency, and consent. Institutions must implement strict data protection policies to prevent unauthorized access and misuse of teacher performance data (U.S. Department of Education, 2024). Ethical AI development must prioritize transparency, fairness, and responsible data handling to build trust and safeguard users.

Future Directions

The study highlights several future directions and recommendations to enhance the integration of AI in micro-teaching. One of the most promising approaches is the development of hybrid AI-human feedback systems, where AI-generated insights complement human mentoring and qualitative assessment. This combination ensures that teachers receive both structured feedback from AI and deeper, contextual insights from experienced educators (Zhang et al., 2024).

Another important area of future research is AI for multimodal feedback. Current AI evaluation systems primarily rely on text-based analysis, but future models could expand to include voice recognition, gesture analysis, and non-verbal communication cues. This would provide a more holistic assessment of a teacher trainees' instructional style and classroom presence, leading to more individualized and meaningful feedback (Arxiv, 2024).

Furthermore, ethical AI development must remain a top priority. AI-powered education tools should be designed with transparency, fairness, and inclusivity in mind, ensuring that they do not reinforce existing biases or undermine human autonomy. Developers and educational institutions should establish clear ethical guidelines for AI implementation, emphasizing accountability, explainability, and user privacy (Brown et al., 2023).

Lastly, personalized AI training for teachers could improve AI adoption in education. AI models should be adaptive to individual teacher needs, providing recommendations tailored to each teacher's strengths, weaknesses, and unique teaching style. This would ensure that AI serves as a customized learning assistant rather than a one-size-fits-all evaluation tool.

V. CONCLUSION AND RECOMMENDATION

Conclusion

The findings of this study suggest that AI has the potential to transform micro-teaching by providing structured feedback, engaging simulations, and innovative teaching support. However, AI integration must be carefully managed to address ethical challenges, bias, data security, and the risk of over-reliance on technology.

The most effective approach to AI in micro-teaching is a hybrid model, where AI complements human evaluation. Future advancements should focus on multimodal AI feedback, ethical AI governance, and personalized teacher training to maximize AI's benefits while ensuring fair and responsible implementation. Ultimately, AI can be a powerful tool for enhancing teacher education. However, its success depends on how well it is designed, integrated, and regulated within the educational ecosystem.

Recommendation

The integration of AI in micro-teaching presents significant opportunities, particularly in AI-powered feedback and interactive simulations. AI tools like ChatGPT provide immediate, systematic, and data-driven feedback, helping teachers refine their instructional strategies. AI-driven simulations further enhance training by offering risk-free, immersive classroom experiences, allowing teachers to engage in realistic role-playing scenarios. However, AI lacks emotional intelligence and deep contextual understanding, making human mentoring an essential complement to AI-generated insights.

Despite these benefits, AI in micro-teaching faces ethical challenges, including bias in AI algorithms, over-reliance on AI feedback, and data privacy concerns. AI models can perpetuate biases from training data, leading to unfair assessments, while excessive dependence on AI could weaken teachers' self-reflection and critical thinking skills. To mitigate these issues, strong AI governance frameworks are necessary, ensuring fairness, transparency, and accountability in AI-powered education tools.

Future research should focus on hybrid AI-human feedback models, multimodal AI assessments (voice, gesture, engagement analysis), and ethical AI development. Institutions should train educators on AI literacy, develop personalized AI-driven learning strategies, and enforce data protection policies. By balancing AI efficiency with human expertise, AI can serve as a transformative tool in teacher training, enhancing professional development while preserving ethical and pedagogical integrity.

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