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Posthumanist Challenges and Opportunities for Teachers in the Era of Artificial Intelligence

Hailong Zhang[1], Xinzhi Xiong[2], Lisha Guo[3], Xue Wang[4], Ting Ye[5], Xiaoyue Wang[6], Shuai Ma[7]

Abstract

The rapid integration of artificial intelligence in education is reshaping teaching and learning, presenting both opportunities and challenges for educators. This study examines the posthumanist implications of AI adoption, focusing on how teachers negotiate their professional identities, pedagogical practices, and ethical responsibilities in AI-mediated classrooms. While AI offers transformative potential—such as personalized learning, administrative automation, and data-driven insights—it also introduces challenges, including teachers' limited understanding of AI systems, their exclusion from AI design processes, insufficient professional development, and unresolved ethical dilemmas.

Keywords: *Artificial Intelligence, Teacher Identity, Posthumanism, Ethical Challenges, Professional Development, AI In Education.*

Introduction

Artificial Intelligence (AI) is rapidly transforming the education, introducing innovative tools and methodologies that enhance both teaching and learning experiences (Zhai et al., 2021). Recent developments underscore this trend, such as Beijing's initiative to mandate AI education across all school levels, ensuring students from elementary to high school receive at least eight hours of AI instruction annually (Song et al., 2023). This policy aims to equip students with essential AI competencies from an early age. Similarly, in the United States, school districts like Houston ISD are integrating AI-generated content into their curricula (Holmes et al., 2022). Houston ISD's collaboration with Prof Jim Inc has resulted in over 2,200 AI-created reading passages tailored to align with students' reading levels and curriculum objectives, thereby enhancing engagement and comprehension.

The surge in AI adoption within education has garnered significant scholarly attention, leading to extensive research into its applications and implications. Studies have explored the integration of AI into Intelligent Tutoring Systems (ITS), highlighting how generative AI models like GPT-4 can create personalized and adaptive learning environments (Liu et al., 2024; Vujinović et al., 2024; Guettala et al., 2024). These systems offer real-time feedback (Fuchs, 2023; Li et al., 2025)

[1] Shanghai Zangjin Intellectual Property Co., Ltd. Shanghai, China, Email: hailong.zhang@knlu.edu.ua. (Corresponding Author)
[2] The Hong Kong University of Science and Technology, Hong Kong, China, Email: 954099996@qq.com.
[3] The Hong Kong University of Science and Technology, Hong Kong, China, Email: sharedemali@outlook.com.
[4] The Hong Kong University of Science and Technology, Hong Kong, China, Email: 664612251@qq.com.
[5] The Hong Kong University of Science and Technology, Hong Kong, China, Email: 17603751893@163.com.
[6] Macau University of Science and Technology, Macau, China, Email: 992169236@qq.com.
[7] Beijing Normal University, Beijing, China, Email: 1243308517@qq.com.

and customized learning pathways (Kikalishvili, 2024; Abas et al., 2023), thereby enhancing educational outcomes. Additionally, AI's role in automating administrative tasks has been examined, revealing its potential to streamline operations and reduce educators' workloads, allowing them to focus more on instruction (Chukhlomin, 2024; Rasul et al., 2023).

In the rapidly evolving educational landscape reshaped by AI, the role and identity of teachers require particular attention (Fitria, 2023; Celik et al., 2022). Teachers are not merely facilitators or passive implementers of technology; they are active, reflective practitioners whose professional identities encompass pedagogical expertise, ethical judgment, and relational engagement with students. As AI-driven tools increasingly take on instructional and administrative tasks, educators are called upon to redefine their roles as critical interpreters and informed co-creators rather than passive recipients of technological solutions (Kim, 2024). This shift prompts educators to develop new competencies—such as technological fluency(Hava & Babayiğit, 2025; Ousiali & Housni, 2024), data literacy (Olari & Romeike, 2021), and ethical discernment (Adams et al., 2022; Sperling et al., 2024)—while simultaneously reinforcing their essential human-centered attributes (Fu & Weng, 2024; Li & Gu, 2024). Thus, the successful integration of AI demands that institutions and policymakers explicitly recognize, protect, and support the evolving identity and agency of teachers.

This paper aims to critically explore how the integration of AI in education impacts teachers' professional identities, pedagogical practices, and ethical responsibilities from a posthumanist perspective. Central to this inquiry is understanding how teachers negotiate their roles in classrooms increasingly mediated by AI, maintaining their identities as knowledgeable, ethical, and relational professionals rather than passive users of automated systems.

Application of AI in education

In recent years, the application of artificial intelligence (AI) in the field of education has become more and more extensive, attracting great attention from academia and practitioners. Zawacki-Richter et al. (2019) reviewed the mainstream research on AI in higher education, pointing out that AI can extract individual learning characteristics from big data, thereby achieving precise teaching. However, the application of AI in education is also accompanied by new issues such as data ethics and the transformation of teachers' roles, which deserve systematic discussion.

One of the core applications of AI in education is to achieve personalized learning, which is specifically reflected in the development of intelligent tutoring systems (ITS) and recommendation systems. Such systems can collect students' learning trajectory data in real time, analyze their cognitive level and interest preferences, and dynamically adjust teaching content and strategies. For example, the Classroom Orchestrator system developed by Holstein et al. (2020) combines AI algorithms with teacher feedback mechanisms to enable teachers to fully perceive students' learning status and effectively improve the efficiency of classroom interaction. Another study led by Nazare et al. (2022) focused on the interpretability of AI personalized learning platforms, emphasizing that the system should be based on user transparency to promote teacher trust and adoption.

In addition, empirical research by Lu et al. (2021) showed that AI-driven personalized systems significantly improved students' test scores in mathematics and science. These systems model students' knowledge status through deep learning and provide customized exercises and feedback. Nevertheless, some studies have pointed out that students' long-term reliance on AI systems may reduce their ability to learn independently (Zhai et al., 2024; Stojanov et al., 2024),

suggesting that we should pay attention to the concept of "human-computer collaboration" in technology design and give full play to the key role of teachers in cognitive guidance and emotional support.

Learning Analytics and automated assessment are another key direction in AI education applications. Researchers try to assess students' engagement, understanding and emotional state by collecting behavioral data during the learning process (such as mouse trajectory, answering time, and video viewing rhythm). For example, Pabba and Kumar (2022) designed a real-time facial emotion recognition system based on convolutional neural networks, which can judge students' attention levels in remote learning environments and provide teachers with immediate intervention suggestions.

In terms of automatic scoring, AI's performance in essays, programming questions and open-ended mathematical questions is becoming more mature. The natural language scoring system designed by Tzeng et al. (2022) achieved a similar consistency rate with manual scoring in multiple fields, greatly improving the evaluation efficiency of massive online courses (MOOCs). In addition, Shoaib et al.'s research proposed that combining AI with learning management system log data analysis can predict the risk of students dropping out of classes and provide decision support for precise intervention in colleges and universities.

However, there are also controversies in this field. On the one hand, AI scoring systems may have biases(Van Busum & Fang, 2024), especially in tasks with strong subjectivity such as language expression and emotion recognition. On the other hand, over-reliance on behavioral data while ignoring "hidden variables" such as learning motivation and background knowledge may lead to one-sided evaluation results (Trivedi, 2023). Therefore, current research is moving towards the combination of multimodal data fusion and human review mechanism.

Opportunities

AI introduces new possibilities for instructional innovation by supporting adaptive and differentiated teaching. Teachers can respond more effectively to diverse learner needs, promoting inclusive and equitable instruction. For instance, AI applications can detect students' emotional states or cognitive difficulties through multimodal data (Tonguç & Ozkara, 2020), enabling educators to adjust their approaches proactively. Such systems serve as decision-support tools that can augment teachers' capacity to personalize instruction at scale, particularly in large or heterogeneous classrooms.

Another significant opportunity lies in reducing administrative and cognitive workload. AI systems can automate routine tasks such as attendance tracking, assignment distribution, grading of objective assessments, and feedback delivery (Ahmad et al., 2022). This automation not only improves operational efficiency but also mitigates teacher burnout by relieving them of repetitive and time-consuming responsibilities. During the COVID-19 pandemic, for example, AI-supported platforms were particularly valuable in facilitating the transition to online learning, helping teachers manage virtual classrooms, monitor participation, and maintain instructional continuity under pressure (Karakose et al., 2023). In this sense, AI can function as a powerful assistant, streamlining backend operations so teachers can invest more time in student engagement and instructional design (Kamruzzaman et al., 2023).

Furthermore, AI presents a new frontier for pedagogical insight and self-reflection. Learning analytics platforms can capture detailed data on student behavior, engagement patterns, and learning outcomes, providing teachers with actionable insights into instructional effectiveness

(Jaboob et al., 2025; Li et al., 2023). AI can offer diagnostic feedback on classroom interactions, questioning strategies, and even pedagogical content knowledge, supporting professional development in a data-driven manner (Chen et al., 2021). For novice educators, these tools can serve as scaffolds for developing competence and confidence; for experienced teachers, they can support reflective practices and innovation (Celik et al., 2022). Moreover, AI-mediated feedback tends to be perceived as more neutral or objective, which can reduce defensiveness and enhance receptivity to improvement, particularly when used for peer observation or coaching (Watson et al., 2024).

Nevertheless, realizing these opportunities is contingent upon systemic support and targeted capacity building. Teachers require accessible training on the principles and practicalities of AI tools, as well as opportunities to co-design educational technologies that reflect classroom realities. Institutions must foster a culture of collaboration between educators, technologists, and researchers to ensure that AI solutions are pedagogically sound and contextually appropriate. Policy frameworks should prioritize professional agency, transparency, and equity to mitigate concerns about de-skilling, surveillance, or algorithmic bias.

Challenges

Lack of Understanding of AI Technologies

One of the most pressing challenges teachers face in the era of AI-enhanced education is their limited understanding of how these technologies function—technically, pedagogically, and ethically (Baidoo-Anu & Ansha, 2023). While AI holds promise for transforming teaching and learning, its opaque nature often alienates educators who are unfamiliar with its inner workings. This lack of understanding manifests in several interconnected ways: conceptual confusion, pedagogical disconnect, technical barriers, and professional disempowerment.

At the conceptual level, many educators are unclear about what "AI" actually entails (Sperling et al., 2024). Terms like machine learning, natural language processing, and predictive analytics may be used in edtech marketing or policy discourse, but they are rarely demystified for practitioners. As a result, AI is often perceived as a monolithic or futuristic phenomenon rather than a set of current, practical tools that can support specific educational goals. This conceptual ambiguity undermines teachers' confidence and contributes to skepticism or resistance, particularly among those who lack a background in technology or data science (Fatima, 2025).

Pedagogically, the gap widens when AI applications are introduced without adequate explanation of how they align with sound teaching principles. AI systems that recommend content, monitor student behavior, or deliver feedback may do so based on data patterns that are invisible to educators. Without understanding the rationale behind these decisions, teachers may find it difficult to trust AI tools or integrate them meaningfully into their instruction. This leads to the "black box" problem—AI systems that produce outputs (e.g., task suggestions, risk alerts) without revealing their reasoning (Bearman & Ajjawi,2023). Teachers are then forced to either accept these outputs passively or reject the tools altogether, both of which limit their agency and professional judgment.

Technical barriers compound the problem. While many AI systems are designed to be "user-friendly," they still require a baseline of digital literacy and confidence in navigating new platforms. Teachers who lack this foundation may struggle to implement AI tools in real-time classroom environments, particularly under time constraints or without access to reliable infrastructure (Teig et al., 2019). Furthermore, AI technologies are constantly evolving. A tool

used one year may be replaced or updated the next, placing a burden on educators to engage in continuous upskilling without institutional support.

This lack of understanding also has professional implications. This is especially concerning when AI begins to encroach on traditionally human domains such as evaluation, content delivery, and even emotional support. When teachers are unable to interpret or critique AI-driven decisions, their role risks being reduced to that of a classroom facilitator, rather than an informed, autonomous professional. This erosion of pedagogical authority can negatively impact teachers' sense of efficacy, job satisfaction, and willingness to innovate.

Addressing this challenge requires systemic efforts. Pre-service teacher education programs must begin to incorporate AI literacy—not simply as a technical module, but as a cross-cutting theme integrated into pedagogy, ethics, and educational theory. In-service training should provide practical, hands-on exposure to AI tools, alongside critical discussions of their limitations, assumptions, and implications. Moreover, AI tools themselves should be designed with transparency and explainability in mind, allowing teachers to understand not just what the system recommends, but why.

Limited Role in AI System Design and Implementation

Despite being the primary end-users and pedagogical decision-makers in classrooms, teachers are rarely involved in the early stages of conceptualizing, designing, or testing AI tools (Lawrence et al., 2024). This disconnect between the creators of AI technologies—typically computer scientists, data engineers, and developers—and the practitioners who are meant to use them has led to tools that often lack contextual sensitivity, pedagogical relevance, and classroom usability. The design of most educational AI systems is rooted in a technological push rather than an educational pull. That is, AI solutions are frequently developed based on what is technologically feasible or innovative from an engineering standpoint, not what is pedagogically needed or practical in diverse classroom environments. This results in AI tools that may be algorithmically impressive but poorly aligned with curriculum goals, teacher workflows, or student learning needs (Chinta et al., 2024). For instance, a predictive analytics dashboard that flags students "at risk" may be of limited use if teachers are not consulted about what indicators are meaningful, what interventions are realistic, or how the data should be interpreted within their local context.

Furthermore, the absence of teacher input during the design phase means that many AI systems fail to accommodate real classroom dynamics. Teachers often deal with issues such as multilingual classrooms, socio-emotional learning, cultural diversity, or learners with special needs—factors that rarely figure into the logic of AI models trained on generic or decontextualized datasets. As a result, AI systems risk reinforcing biases, making flawed assumptions, or offering suggestions that are impractical or even detrimental in certain educational contexts (Bhavana et al., 2025). For example, a system trained to recommend reading levels based on standardized test data may overlook linguistic, cultural, or motivational factors crucial to effective reading instruction in a multicultural classroom.

The implementation phase also tends to marginalize teachers. When AI tools are introduced, they are often rolled out as packaged solutions, with teachers expected to adapt to the system rather than vice versa. Training, if provided, tends to focus on surface-level functionality—how to navigate the interface or use basic features—rather than pedagogical integration or critical evaluation. This one-way model of technology diffusion diminishes teacher agency and treats

them as passive consumers of technology rather than active co-creators (Koah et al., 2023). In contrast, when teachers are involved in participatory design processes—contributing to design decisions, offering iterative feedback, and shaping implementation—they are more likely to adopt and meaningfully integrate the tools into their practice.

Research from the field of human-centered design and participatory design in education underscores the importance of involving stakeholders—including teachers, students, and administrators—in the development lifecycle of educational technologies (Sanusi et al., 2024). Co-design approaches, where teachers collaborate directly with developers to define goals, shape features, and test prototypes, have been shown to result in more usable, acceptable, and impactful tools. These methods also surface crucial insights that developers may overlook, such as ethical concerns, emotional labor, relational dynamics, and informal teaching strategies that are hard to quantify but central to the learning process.

To move forward, education systems and technology developers must institutionalize mechanisms for teacher involvement in AI development. This can take the form of teacher advisory boards, pilot programs with educator feedback loops, long-term partnerships between schools and research labs, or funding models that require co-design as a condition for innovation grants. Moreover, teachers should be equipped with foundational knowledge about AI—not to become coders, but to act as informed collaborators who can articulate classroom realities, challenge flawed assumptions, and advocate for ethical and pedagogically sound design choices.

Insufficient Support for Professional Development

The successful integration of AI in education depends not only on the availability of innovative tools, but critically on the readiness of teachers to use these tools effectively, ethically, and creatively. However, one of the most systemic and persistent barriers to this readiness is the insufficient support for professional development. As AI rapidly evolves, many teachers are left without the necessary training, resources, or institutional structures to engage with these technologies confidently or meaningfully (Druga et al., 2022). This professional development gap threatens to widen the divide between technological potential and classroom practice, leaving many educators underprepared for a changing educational landscape.

Professional development opportunities related to AI in education remain sporadic, fragmented, and unevenly distributed. In many educational systems, teacher training still prioritizes traditional pedagogical methods, with only cursory attention given to emerging technologies—let alone the deeper conceptual and ethical dimensions of AI (Kakhkharova & Tuychieva, 2024). Where AI is addressed at all, the focus tends to be on superficial tool use—how to click through a dashboard or operate a chatbot interface—rather than on pedagogical strategy, curriculum integration, or critical evaluation. This limits teachers' ability to adapt AI tools to their specific educational goals, student needs, or cultural contexts. It also reinforces a view of teachers as mere operators of technology rather than informed designers and decision-makers.

Moreover, the lack of structured, sustained professional learning around AI exacerbates existing disparities across schools and regions (Ma, 2022). Educators in well-resourced schools may have access to tech coaches, early exposure to pilot programs, or partnerships with edtech companies, while those in underfunded or rural areas are often excluded from such opportunities. This not only reinforces inequity in educational outcomes but also deepens the digital divide in the teaching profession itself. Teachers who lack access to quality training may avoid using AI altogether, or worse, may misuse it in ways that unintentionally harm students—such as over-

relying on algorithmic assessments or neglecting critical reflection on bias in AI-generated content.

Professional development is also insufficient in duration and depth. One-off workshops or webinars are common formats, but they rarely offer the long-term, practice-based learning that leads to meaningful change in instructional habits. Teachers need ongoing, iterative, and collaborative forms of professional learning that support experimentation, peer feedback, and critical reflection (Kim, 2024). They also need professional development that is embedded in real-world teaching challenges—not abstract discussions disconnected from classroom realities. For example, a teacher working with English language learners may need specific training on how to use AI to scaffold vocabulary and reading comprehension in multilingual settings, rather than generic sessions on educational technologies.

Additionally, professional development must go beyond the technical and engage with the ethical, social, and pedagogical implications of AI. Teachers are increasingly being asked to interpret student data, make decisions based on algorithmic outputs, and navigate ethical dilemmas related to privacy, surveillance, and digital fairness. Without guidance, many educators feel ill-equipped to address these concerns or to advocate for responsible AI practices in their institutions. This creates a power imbalance where administrators or technology providers dictate the terms of AI use, leaving teachers voiceless in decisions that profoundly affect their classrooms.

Importantly, many teachers express a willingness to learn about AI and to incorporate it into their pedagogy—but only if the training is relevant, respectful of their expertise, and aligned with their professional values. Surveys and qualitative research have shown that teachers are not resistant to AI by default; rather, they are resistant to poorly designed, top-down implementations that ignore their needs and lived experiences. When teachers are given time, resources, and professional autonomy, they are often enthusiastic about experimenting with AI to enrich student learning, enhance formative assessment, or personalize instruction (Duan & Zhao, 2024).

To address these gaps, education systems need to reimagine professional development for the AI age. This includes integrating AI literacy into both pre-service teacher education and in-service training; developing interdisciplinary programs that bridge pedagogy, ethics, and data science; and creating professional learning communities where teachers can collaborate, share practices, and co-develop AI-informed lesson plans. Institutions must also value professional development as an ongoing, job-embedded process—not a compliance exercise or box-ticking requirement. Time for meaningful learning, access to mentorship, and recognition of AI-related teaching expertise should be built into school structures and career advancement pathways.

Ethical Ambiguity and Responsibility in AI Use

As AI systems become more embedded in educational settings—informing everything from assessment to behavioral tracking—teachers are increasingly confronted with complex ethical questions that they are often unprepared to answer (Slimi & Carballido, 2023). Unlike traditional teaching tools, AI technologies can collect, analyze, and act upon sensitive student data in ways that are opaque, automated, and sometimes biased. Teachers find themselves on the frontlines of implementing these systems, yet they receive little guidance on how to navigate the moral and professional dilemmas that emerge. For instance, AI-powered surveillance tools may conflict with teachers' commitments to student dignity, trust, and privacy (Espinoza et al., 2020). Predictive analytics tools might label students as "at-risk" based on historical data, potentially

reinforcing stereotypes or bias, without transparent explanations of how these predictions are made. Teachers are left to decide whether to trust the system, how to act on its recommendations, and how to explain these decisions to students and parents—all without a clear ethical framework or institutional support.

This challenge is compounded by asymmetric responsibility (Korkmaz, 2024). While AI decisions may be made by algorithms, accountability for their consequences often falls on the teacher. If a student is unfairly penalized by an AI system or if sensitive data is misused, the teacher—rather than the developer—is typically the one who must handle the fallout. This raises serious questions about informed consent, data governance, and the distribution of accountability in AI-supported learning environments. Moreover, the lack of ethical education in teacher training programs means that most educators are ill-equipped to critically interrogate the values, assumptions, and limitations embedded in AI systems. They may not know how to assess bias in algorithms, question the fairness of automated assessments, or resist the normalization of surveillance. Without a foundation in digital ethics, teachers may unintentionally participate in practices that undermine student rights or perpetuate inequities—despite their best intentions.

To address this, there is a growing need for ethics-centered AI literacy in education. Teachers should be empowered not only with technical knowledge but also with the ethical frameworks needed to evaluate AI tools critically. This includes understanding issues such as algorithmic bias, data privacy, consent, transparency, and the social consequences of automation. Institutions, meanwhile, must provide clearer policies, protocols, and support systems that help teachers act ethically without bearing the burden of responsibility alone.

Conclusion

The integration of AI in education presents both transformative opportunities and significant challenges for teachers, reshaping their professional identities, pedagogical practices, and ethical responsibilities. On one hand, AI offers tools for personalized learning, administrative efficiency, and data-driven insights, enabling educators to address diverse student needs and enhance instructional outcomes. On the other hand, the rapid adoption of AI raises critical issues such as teachers' limited understanding of AI technologies, their marginalization in AI system design, insufficient professional development support, and unresolved ethical dilemmas.

From a posthumanist perspective, this study underscores the need to reimagine the role of teachers in AI-mediated classrooms—not as passive implementers of technology but as active, reflective practitioners who balance technological fluency with human-centered values. To harness AI's potential while mitigating its risks, systemic efforts are essential. These include integrating AI literacy into teacher education, fostering participatory design processes that prioritize pedagogical relevance, and providing ongoing, ethics-focused professional development. Policymakers and institutions must also establish frameworks that safeguard teacher agency, ensure transparency in AI tools, and address equity concerns.

The successful coexistence of teachers and AI in education hinges on a collaborative approach that respects teachers' expertise, empowers them as co-creators of technology, and upholds their irreplaceable role in fostering critical thinking, empathy, and ethical discernment among students. By navigating these challenges thoughtfully, the education sector can leverage AI to augment—rather than replace—the human elements that lie at the heart of meaningful teaching and learning.

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