

**Ambivalent Readiness: A Qualitative Inquiry into Perspective Teachers'
AI Integration in Education**

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Abstract

The rapid advancement of artificial intelligence (AI) in education has necessitated a critical examination of how prospective teachers are prepared to integrate these technologies into their future classrooms. This qualitative study explores the perspectives, readiness, and perceived challenges of perspective teachers regarding AI integration in educational settings. Drawing upon semi-structured interviews with 24 pre-service teachers enrolled in teacher education programs, this research employs thematic analysis to uncover the multifaceted nature of AI integration. The findings reveal three overarching themes: (a) ambivalent readiness characterized by enthusiasm tempered by uncertainty, (b) pedagogical concerns regarding the displacement of humanistic teaching elements, and (c) the imperative for comprehensive AI literacy within teacher education curricula. The study underscores the necessity for teacher education programs to move beyond technical training toward holistic preparation that addresses ethical, pedagogical, and emotional dimensions of AI integration. Implications for curriculum design, policy formulation, and future research are discussed.

Keywords: Artificial intelligence, perspective teachers, teacher education, AI literacy, qualitative research, pedagogical integration

Introduction

The integration of artificial intelligence (AI) into educational contexts represents one of the most significant technological transformations in contemporary education (Zawacki-Richter, Marín, Bond, & Gouverneur, 2019). As AI applications proliferate across K-12 and higher education settings, the role of teachers in mediating these technologies becomes increasingly critical (Holmes & Tuomi, 2022). Yet, despite the growing body of research on AI in education, there remains a paucity of studies examining how prospective or perspective teachers perceive, prepare for, and navigate the complexities of AI integration (Celik, 2023; Sperling et al., 2024). The preparation of teachers for the digital age has been a persistent concern in educational research (Starkey, 2020). However, the advent of generative AI tools such as ChatGPT, Midjourney, and other large language models has introduced unprecedented challenges and opportunities that extend far beyond traditional notions of technological competence (Chiu,

2023; Kohnke, Moorhouse, & Zou, 2023a). These technologies not only automate routine tasks but also possess the capacity to generate content, provide feedback, and engage in pedagogical dialogue, functions traditionally reserved for human teachers (Hwang & Chen, 2023).

For perspective teachers, those currently enrolled in teacher education programs and preparing to enter the profession, the question of AI integration is not merely theoretical but profoundly practical. They will enter classrooms where AI tools are increasingly ubiquitous, and their ability to meaningfully integrate these technologies will significantly influence their pedagogical effectiveness (Ayanwale et al., 2024; Guan, Zhang, & Gu, 2024). Understanding their perspectives, concerns, and aspirations is therefore essential for designing teacher education programs that adequately prepare them for this reality.

This study addresses the following research questions:

1. How do perspective teachers conceptualize AI and its role in education?
2. What are the perceived challenges and barriers to AI integration in their future classrooms?
3. What competencies and support do perspective teachers identify as necessary for effective AI integration?
4. How do perspective teachers envision the relationship between AI and their professional identity as educators?

Literature Review

AI in Education: Definitions and Applications

AI in education (AIEd) encompasses a broad range of technologies and applications designed to support teaching, learning, assessment, and administration (Zawacki-Richter et al., 2019). These include intelligent tutoring systems, adaptive learning platforms, automated assessment tools, chatbots, and generative AI systems (Luckin et al., 2016). The field has evolved from early expert systems to sophisticated machine learning applications capable of personalizing learning experiences and providing real-time feedback (Holmes & Tuomi, 2022).

Recent developments in generative AI have expanded the possibilities for AI in education, enabling the creation of customized learning materials, the simulation of pedagogical scenarios, and the facilitation of collaborative learning (Chiu, 2023; Kohnke et al., 2023a). These technologies have the potential to transform educational practices, but they also raise significant ethical, pedagogical, and social questions (Akgun & Greenhow, 2022; Karan & Angadi, 2024).

Teacher Preparation for AI Integration

The preparation of teachers for AI integration is a multifaceted challenge that extends beyond technical training (Celik, 2023; Ding et al., 2024). Research suggests that effective AI integration requires teachers to possess not only technical skills but also pedagogical knowledge, ethical awareness, and critical reflection capabilities (Long & Magerko, 2020; Miao & Shiohira, 2024). The concept of AI literacy has emerged as a framework for understanding the competencies teachers need to effectively and ethically integrate AI into their practice (Long & Magerko, 2020; Sperling et al., 2024).

Despite the growing recognition of AI's importance in education, teacher education programs have been slow to adapt their curricula to address AI integration (Cervera & Caena, 2022;

Starkey, 2020). Many programs continue to focus on traditional educational technology, failing to adequately prepare teachers for the unique challenges posed by AI (Farjon, Smits, & Voogt, 2019). This gap between preparation and practice has significant implications for both teachers and students (Backfisch et al., 2021).

Perspectives on AI Integration

Research on teacher perspectives on AI integration reveals a complex picture of enthusiasm, anxiety, and ambivalence (Cheng & Wang, 2023; Molefi et al., 2024). Some teachers view AI as a valuable tool that can enhance their teaching and reduce workload, while others express concerns about job displacement, loss of pedagogical autonomy, and the dehumanization of education (Karan & Angadi, 2024; Tan, Cheng, & Ling, 2024).

Perspective teachers' perspectives are particularly important because they represent the future of the profession. Research suggests that pre-service teachers' attitudes toward AI are shaped by their experiences with technology, their beliefs about teaching and learning, and the messages they receive in their teacher education programs (Guan et al., 2024; Moorhouse, 2024). Understanding these perspectives is essential for designing effective preparation programs (Ding et al., 2024).

Theoretical Framework

This study is grounded in the theoretical framework of self-directed learning (SDL) and the Technological Pedagogical Content Knowledge (TPACK) framework (Garrison, 1997; Knowles, 1975; Kramarski & Michalsky, 2010). Self-directed learning provides a lens for understanding how perspective teachers take responsibility for their own learning about AI, while TPACK offers a framework for examining the knowledge domains teachers need to effectively integrate AI into their practice.

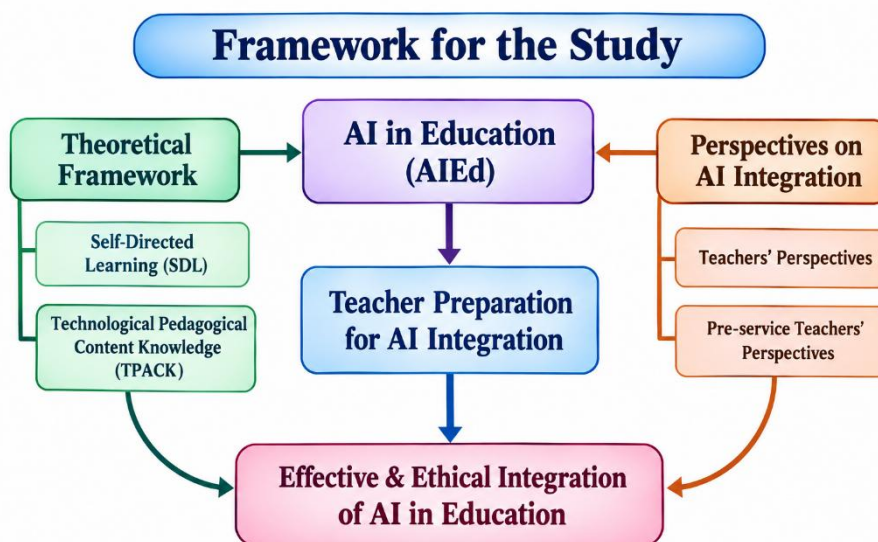


Figure 1: Theoretical Framework of the Study

The concept of intelligent-TPACK (Celik, 2023) extends the traditional TPACK framework to address the unique demands of AI integration, emphasizing the ethical and pedagogical

considerations that arise when AI is incorporated into teaching and learning. This framework guides the analysis of how perspective teachers conceptualize and prepare for AI integration.

Methodology

Research Design

This study employed a qualitative research design to explore the perspectives, readiness, and perceived challenges of perspective teachers regarding AI integration in education. Qualitative approaches are particularly suited to exploring complex, context-dependent phenomena and capturing the nuanced perspectives of participants (Merriam & Tisdell, 2016). The study adopted an interpretive paradigm, seeking to understand how participants make sense of AI and its implications for their future practice.

Participants

Participants were recruited from teacher education programs at three universities in India. Purposive sampling was used to select 24 pre-service teachers who were in their final year of teacher preparation and had completed at least one course related to educational technology. The sample included 14 female and 10 male participants, ranging in age from 22 to 28 years. Participants represented diverse disciplinary backgrounds, including science, mathematics, social studies, and language education.

Inclusion criteria required that participants: (a) were enrolled in a recognized teacher education program, (b) had completed coursework related to educational technology, and (c) expressed willingness to participate in in-depth interviews about AI in education. Exclusion criteria included prior professional teaching experience, as the study focused specifically on perspective teachers preparing to enter the profession.

Data Collection

Data were collected through semi-structured interviews conducted between September and December 2024. The interview protocol was developed based on the research questions and reviewed by three experts in educational technology and qualitative research. The protocol included open-ended questions exploring participants' conceptualizations of AI, their perceptions of AI's role in education, their perceived preparedness for AI integration, and their visions for the future of teaching in an AI-rich environment.

Interviews were conducted in person or via video conferencing, depending on participant preference and availability. Each interview lasted between 45 and 75 minutes and was audio-recorded with participant consent. Interviews were conducted in English, with occasional use of Hindi for clarification purposes. The interview guide was flexible, allowing the researcher to probe emerging themes and follow participants' leads (Kvale & Brinkmann, 2009).

Data Analysis

Interview transcripts were analyzed using thematic analysis, following the six-phase process outlined by Braun and Clarke (2006): (1) familiarization with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. The analysis was conducted inductively, allowing themes to emerge from the data rather than imposing predetermined categories.

Two researchers independently coded the first five transcripts to establish coding consistency. Discrepancies were discussed and resolved through consensus. The remaining transcripts were coded by the first author, with regular meetings to discuss emerging themes and ensure analytical rigor. Member checking was employed to enhance the credibility of the findings, with participants invited to review and comment on the preliminary findings.

Findings

The thematic analysis followed Braun and Clarke's (2006) six-phase approach. Below is a tabulated representation of how the three overarching themes emerged from the data, showing the progression from initial codes to sub-themes (collapsed) to final themes.

Table 1: Thematic Analysis: Codes to Themes

Theme	Key Codes	Theme Essence
Theme 1: Ambivalent Readiness	AI as powerful tool; personalized learning; time-saving; not ready; superficial training; figure it out alone; fear of replacement; uncertainty; opportunity for growth; focus on human strengths	Enthusiasm for AI's potential coexists with deep uncertainty about competence and future role
Theme 2: Pedagogical Concerns	Teaching as relationships; AI cannot read emotions; losing human connection; making a difference; machine teaching; dehumanization; loss of art; creative vs. programmed; privacy; bias; equity	Fear that AI may diminish the irreplaceable human and ethical dimensions of teaching
Theme 3: Comprehensive AI Literacy	Beyond tool usage; understand how AI works; critical thinking; evaluate outputs; hands-on practice; learn from mistakes; real classroom experiments; theory-practice gap; ethical implications; social impact; responsible use; prepare students	Effective AI integration demands holistic preparation, technical, pedagogical, ethical, and critical

Theme 1: Ambivalent Readiness—Enthusiasm Tempered by Uncertainty

The first theme captures the paradoxical attitudes of perspective teachers toward AI integration, characterized by genuine enthusiasm for AI's transformative potential coexisting with deep uncertainty about their ability to effectively and ethically integrate these technologies. This finding aligns with recent research indicating that pre-service teachers hold generally positive views of generative AI while simultaneously expressing significant hesitation and concern (Kaplan-Rakowski et al., 2023). Participants consistently acknowledged AI's capacity to enhance educational practices, identifying applications including personalized learning, automated assessment, and content generation as valuable tools for teaching. As one participant expressed: "I see AI as a powerful tool that can help me reach every student at their level." This recognition mirrors findings from Kaplan-Rakowski et al. (2023), who reported that teachers

generally hold positive views of generative AI and that use correlates with positive attitudes. Another participant highlighted ChatGPT's utility for lesson planning: "Tools like ChatGPT can help me create lesson plans, generate examples, and design activities." Recent research confirms that pre-service teachers recognize GenAI's benefits for content knowledge, technical knowledge, and pedagogical knowledge development (Celik, 2023).

Despite enthusiasm, participants expressed significant uncertainty about their readiness. Many felt teacher education programs had not adequately prepared them for AI complexities. One participant noted: "We talked about AI in one class, but it was very superficial. We didn't really learn how to use it in teaching." This finding is consistent with research showing that AI literacy has been slow to gain traction in initial teacher education, with limited empirical research on how pre-service teachers perceive and develop AI literacy skills (Sperling et al., 2024).

Studies indicate that many prospective educators are unprepared to work with AI-driven educational applications, lacking technological skills necessary for data analysis or automating assignments (Ding et al., 2024). Furthermore, some participants expressed anxiety about potential job displacement. One participant questioned: "Sometimes I wonder if I'm preparing for a job that won't exist." This anxiety resonates with research on teacher identity tensions in AI-enhanced environments, where teachers struggle with new roles and expectations (Guan et al., 2024). However, others viewed this as an opportunity for professional growth: "I don't think AI will replace teachers, but it will change what we do." This perspective aligns with findings that teachers who conceptualize AI as a collaborative partner rather than competing force demonstrate higher adaptability and professional fulfillment (Seo et al., 2024).

Theme 2: Pedagogical Concerns—Preserving the Human Element

The second theme encompasses participants' concerns about AI's impact on the pedagogical relationship and the essential human elements of teaching. These concerns reflect broader debates about maintaining human-centered education in an increasingly technological landscape. Participants consistently emphasized human connection as central to teaching. One participant stated: "Teaching is not just about transmitting information. It's about relationships, about understanding students as people." This aligns with research emphasizing that teachers' relational and ethical roles—mentoring, inspiring, and providing emotional support—remain uniquely human (Holmes & Tuomi, 2022). Another participant questioned: "How do I connect with students if a machine is doing the teaching?" Studies confirm that pre-service teachers express caution regarding risks of over-reliance on automated tools potentially diminishing teacher-student interactions (Karan & Angadi, 2024).

Participants also worried that over-reliance on AI could reduce learning to algorithmic processes. One noted: "Education is not just about knowledge and skills. It's about developing as a person, learning to think critically." This concern echoes research cautioning that AI could obscure the complexity of education and reduce teaching to technical transactions (Zawacki-Richter et al., 2019). Another participant observed: "I worry that if we use AI too much, we'll lose the art of teaching." Scholars have argued that instrumental rationality may replace the humanistic core of education, sidelining empathy and care (Holmes & Tuomi, 2022).

Additionally, participants raised concerns about privacy, bias, and equity. One participant questioned: "AI systems collect huge amounts of data about students. Who has access to that data?" This reflects research identifying ethical and data privacy concerns as one of three consistent challenges in AI integration (Akgun & Greenhow, 2022). Another noted: "AI is only as good as the data it's trained on. If the data is biased, the AI will be biased." Research confirms that biased systems can reproduce or amplify inequalities, creating what O'Neil calls "weapons of math destruction" (Karan & Angadi, 2024). Studies recommend that programs must cultivate critical AI literacy so future teachers interrogate rather than accept algorithmic outputs (Long & Magerko, 2020).

Theme 3: The Imperative for Comprehensive AI Literacy

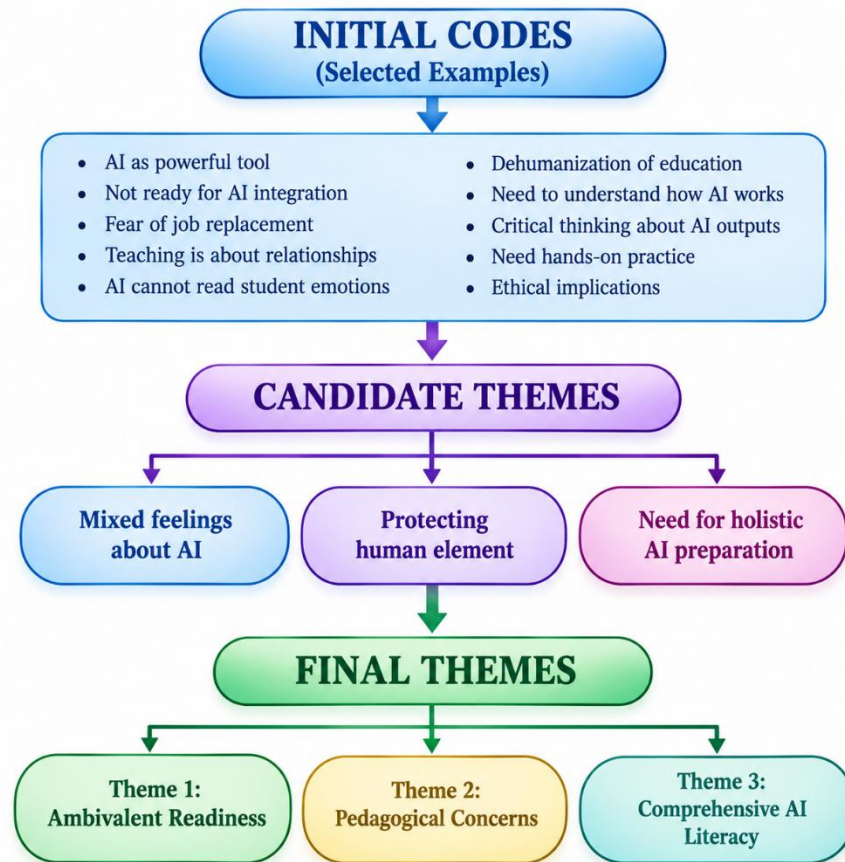
The third theme captures participants' recognition that effective AI integration requires comprehensive preparation extending beyond technical skills to encompass critical, ethical, and pedagogical dimensions. This aligns with emerging frameworks defining AI literacy as encompassing technical understanding, critical appraisal, and practical applications (Long & Magerko, 2020). Participants emphasized that AI literacy involves understanding AI's capabilities, limitations, and implications.

One stated: "It's not enough to know how to use ChatGPT. We need to understand how it works, what it can and can't do, and how to use it responsibly." This reflects research defining AI literacy as "a set of competencies that enables individuals to critically evaluate AI technologies; communicate and collaborate effectively with AI; and use AI as a tool" (Long & Magerko, 2020). Another participant noted: "AI literacy is about critical thinking. We need to be able to evaluate AI outputs, question them." UNESCO's guidance underscores equipping both teachers and students with ability to critically assess GenAI-generated content (Miao & Shiohira, 2024).

Participants expressed desire for more practical experience with AI tools. One noted: "I've read about AI, but I haven't really used it in a teaching context. I need to practice with it, make mistakes, learn from them." Research indicates that pre-service teachers felt limited by lack of comprehensive training, highlighting need for teacher education to address both technical and ethical dimensions (Ding et al., 2024). Studies recommend embedding AI literacy into curricula not merely as technical skill but as component of pedagogical and ethical competence (Celik, 2023). Structured opportunities for collaborative exploration where educators and pre-service teachers engage with AI together may foster shared understanding (Sperling et al., 2024). Participants also emphasized the importance of ethical and critical perspectives.

One stated: "AI literacy isn't just about skills. It's about understanding the ethical implications, the social impact, the potential for bias." This aligns with research identifying ethical frameworks and data governance policies addressing algorithmic bias, transparency, and data privacy as essential (Akgun & Greenhow, 2022). Research confirms that without formal AI training, pre-service teachers may be ill-equipped to assess biased outputs, protect student data, or understand opaque decision-making in GenAI systems (Moorhouse & Kohnke, 2024). The AI literacy framework proposed by Laupichler et al. (2023) addresses critical appraisal,

technical understanding, and practical applications—dimensions directly relevant to pre-service teachers.



Synthesis: Interconnection of Themes

These three themes are deeply interconnected. Ambivalent readiness (Theme 1) reflects the tension between recognizing AI's potential and feeling inadequately prepared. Pedagogical concerns (Theme 2) represent the value-based resistance to AI integration rooted in commitment to human-centered education. The imperative for comprehensive AI literacy (Theme 3) emerges as the necessary response to both enthusiasm and concern—a pathway toward confident, ethical, and pedagogically sound AI integration. Together, these themes suggest that effective AI preparation must address technical skills, pedagogical applications, ethical considerations, critical perspectives, and emotional dimensions of professional identity (Celik, 2023; Sperling et al., 2024).

Discussion

The findings of this study reveal a complex picture of perspective teachers' readiness for AI integration. While participants recognized AI's transformative potential and expressed enthusiasm for its possibilities, they also expressed significant uncertainty, concern, and a desire for more comprehensive preparation. These findings align with previous research on teacher perspectives on AI (Cheng & Wang, 2023; Molefi et al., 2024; Tan et al., 2024) while also highlighting unique dimensions of the perspective teacher experience.

The theme of ambivalent readiness reflects the tension between enthusiasm and uncertainty that characterizes many teachers' attitudes toward AI (Celik, 2023; Kohnke et al., 2023a). Perspective teachers in this study were excited about AI's potential to enhance their teaching but felt inadequately prepared to realize this potential. This finding underscores the need for teacher education programs to provide more comprehensive preparation for AI integration (Ding et al., 2024; Sperling et al., 2024).

The pedagogical concerns expressed by participants reflect broader debates about the role of technology in education and the importance of preserving human elements of teaching (Holmes & Tuomi, 2022; Karan & Angadi, 2024). Participants' emphasis on human connection, creativity, and responsiveness highlights the importance of framing AI as a tool that complements rather than replaces human teaching (Holstein & Alevén, 2022; Seo et al., 2024). This finding aligns with research on the complementary role of AI in education (Holstein & Alevén, 2022) and the need to maintain human agency in AI-enhanced learning environments (Cheng & Wang, 2023).

The theme of comprehensive AI literacy reflects the growing recognition that effective AI integration requires more than technical skills (Long & Magerko, 2020; Miao & Shiohira, 2024). Participants' desire for hands-on experience, ethical understanding, and critical perspectives aligns with emerging frameworks for AI literacy in teacher education (Sperling et al., 2024; Celik, 2023). This finding suggests that teacher education programs need to adopt holistic approaches to AI preparation that address technical, pedagogical, ethical, and critical dimensions (Ding et al., 2024; Moorhouse & Kohnke, 2024).

Implications

The findings of this study carry significant implications for teacher education programs, policymakers, and future research, emphasizing the need for comprehensive AI preparation that addresses technical, pedagogical, ethical, and emotional dimensions.

Table 2: Implications of the Study for stakeholders

Stakeholder	Implication	Key Actions	Supporting References
Teacher Education Programs	Move beyond superficial AI coverage toward comprehensive preparation	Address technical skills, pedagogical applications, ethical considerations, and critical perspectives; provide hands-on experience with AI tools in authentic teaching contexts	Celik (2023); Sperling et al. (2024); Ding et al. (2024)
Teacher Education Programs	Address emotional and identity dimensions of AI integration	Acknowledge concerns about job displacement and dehumanization; frame AI as enhancing,	Holstein & Alevén (2022); Seo et al. (2024)

		not replacing, human teaching	
Teacher Education Programs	Foster critical AI literacy	Enable teachers to evaluate AI tools, understand limitations, and make informed decisions; address privacy, bias, and equity	Long & Magerko (2020); Akgun & Greenhow (2022); Karan & Angadi (2024)
Policy Makers	Recognize importance of AI preparation in teacher education	Provide resources and support for comprehensive AI curricula; fund AI tools; support professional development for teacher educators; develop standards and guidelines	Miao & Shiohira (2024); Cheng & Wang (2023)
Future Research	Examine long-term impact of AI preparation	Conduct longitudinal studies following perspective teachers into careers; assess how preparation translates into practice	Tan et al. (2024)
Future Research	Identify effective strategies for developing AI literacy	Design learning experiences integrating technical, pedagogical, and ethical dimensions	Ding et al. (2024); Sperling et al. (2024)

Conclusion

This study provides valuable insights into the perspectives, readiness, and perceived challenges of perspective teachers regarding AI integration in education. The findings reveal a complex picture of ambivalent readiness, pedagogical concerns, and the imperative for comprehensive AI literacy. As AI continues to transform educational landscapes, teacher education programs must rise to the challenge of preparing future teachers for effective, ethical, and human-centered AI integration. This requires moving beyond technical training to embrace holistic approaches that address the technical, pedagogical, ethical, and emotional dimensions of AI integration. By doing so, we can ensure that perspective teachers are not only prepared for the AI age but also positioned to shape its trajectory in ways that enhance rather than diminish the human elements of teaching and learning.

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Declaration of Generative AI Use (If Required by Journal)

During the preparation of this work, the author(s) used large language models to assist with language editing, transcription and initial coding. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Conflict of Interest Statement (If Applicable)

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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