International Journal of Teacher Education and Professional Development
Volume 8 • Issue 1 • January-December 2025

Generative AI in Chinese Early Childhood Education:

Teachers' Usage Patterns, Perceptions, and Factors Influencing Pedagogical Applications

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ABSTRACT

While generative artificial intelligence (GenAI) applications in secondary and higher education have been widely studied, their adoption in early childhood education remains underexplored. This study investigates Chinese preschool teachers' (N = 10) GenAI adoption patterns, perceptions, and determinants through surveys and semi-structured interviews, framed by expectancy-value theory and the Technological Pedagogical Content Knowledge model. Key findings reveal: moderate to high adoption rates despite varying artificial intelligence literacy, with strong perceived utility, achievement value, and intrinsic motivation outweighing minimal implementation barriers; institutional supports, especially organizational culture, peer collaboration, and curriculum-aligned customization were pivotal adoption drivers; and teachers emphasized the need for culturally and developmentally appropriate GenAI tools, stressing contextual relevance for effective integration. The results highlight the necessity for teacher training and ethical guidelines to facilitate responsible GenAI implementation in early childhood education settings.

KEYWORDS

Generative Artificial Intelligence (GenAI), Early Childhood Education (ECE), Teacher Perceptions, Professional Development

INTRODUCTION

In recent years, generative artificial intelligence (GenAI) has become a transformative force in the field of education. Unlike traditional artificial intelligence (AI) that focuses mainly on prediction, classification, or recommendation, GenAI excels at autonomously generating humanlike content based on large datasets, including text, images, audio, and code. Popular tools such as ChatGPT, Deepseek, and Doubao have demonstrated GenAI's ability to create adaptive, personalized, and interactive learning materials. These advancements have made educators increasingly interested in

DOI: 10.4018/IJTEPD.382379

integrating GenAI into classrooms due to its great potential to improve instructional design, simplify management tasks, and provide personalized feedback.

Early childhood education (ECE) constitutes a critical foundation for lifelong development (Carey, 2001). Longitudinal research indicates that high-quality early education correlates significantly with both improved academic trajectories and enhanced socioeconomic outcomes in later life (Heckman, 2011). Although GenAI demonstrates the potential to enhance pedagogical methodologies and administrative efficacy in higher education, its application in early childhood stages requires careful consideration. This caution is warranted by developmental research consistently affirming the primacy of play-based learning and peer interactions in early cognitive and social development (Chen et al., 2020). Consequently, the pedagogical integration of AI technology should be conceptualized as complementary rather than substitutive in nature.

GenAI, as a natural language processing tool, has been trained on a wide range of datasets to perform various language tasks (Kimondo et al., 2023; OpenAI, 2023). Scholarly research has documented GenAI's efficacy in facilitating curriculum design and personalized learning (Papamitsiou & Economides, 2014). Nevertheless, the incorporation of generative AI technologies in ECE contexts poses significant pedagogical and operational challenges, particularly in maintaining cultural relevance, ensuring developmentally appropriate content, and complying with ethical standards regarding data privacy (Baker et al., 2016; Jeon et al., 2022). These multifaceted considerations demand systematic investigation for a profound understanding of the benefits of GenAI while effectively mitigating its limitations and associated risks.

Although AI in education has been extensively researched, existing scholarship has focused predominantly on secondary and higher education (Crompton & Burke, 2023); relatively few studies have explored how preschool teachers perceive and utilize GenAI tools (Kamalov et al., 2023). Early childhood represents a distinct developmental stage characterized by play-based learning, socio-emotional development, and culturally responsive practices as essential components of holistic growth. Therefore, existing GenAI applications designed primarily for adult learning contexts demonstrate limited capacity to effectively simulate or support pedagogical practices for preschool children (Boxleitner, 2023).

Recognizing the above critical gap, this study adopts a mixed-methods approach combining surveys and semi-structured interviews to investigate Chinese preschool teachers' adoption and perceptions of GenAI in educational practice as well as the contextual factors that shape their usage patterns and attitudes toward this emerging technology. The analysis specifically focuses on four critical domains: curriculum design and adaptation, learner engagement strategies, parent–teacher communication dynamics, and ethical implications of technology integration in the ECE context.

LITERATURE REVIEW

Introduction to AI in Education

AI in education encompasses computer systems designed to simulate human intelligence and enhance learning processes. The field traces its origins to Carbonell's (1970) pioneering Intelligent Tutoring Systems, which were constrained by limited computational power and contextual adaptability. Significant advancements emerged in the 1990s when researchers such as Anderson et al. (1995) and Koedinger and Anderson (1998) integrated cognitive learning theories into AI architectures, leading to sophisticated adaptive learning platforms. The 21st century witnessed expanded applications, with Woolf (2008) emphasizing AI's potential to replicate both cognitive and socio-emotional aspects of human mentorship. Contemporary scholars, including Luckin et al. (2016) and Baker and Inventado (2014), demonstrated AI's effectiveness in creating interactive, personalized learning environments.

GenAI represents a transformative leap beyond traditional analytical systems (Ong et al., 2024). Since 2019, advanced tools such as GPT-3/4 and Midjourney have enabled dynamic content creation and narrative generation. Zawacki-Richter et al. (2019) documented GenAI's growing role in teaching