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Research Article

From Tool to Partner: Value Reconstruction and Boundary Preservation of AI Integration into Preschool Aesthetic Education

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Abstract: The swift advancement of artificial intelligence (AI) technology is revolutionizing the practice of preschool aesthetic education. Drawing on theoretical and practical perspectives from 2023 to 2025, this paper conducts a systematic exploration of the application value, practical approaches, and boundary considerations of AI in preschool aesthetic education. Our research reveals that AI assumes a threefold role in preschool aesthetic education: as a creativity stimulator, a creative collaborator, and a facilitator of process evaluation. It effectively inspires children's motivation for musical creation, broadens their auditory aesthetic experiences, and supports personalized learning. Nevertheless, the integration of AI also presents challenges, including diminished sensory experiences, ambiguous role delineation for teachers, and concerns regarding data privacy. This paper advocates for the application principle of "balancing instrumental rationality with humanistic values," underscoring that AI should function as a "collaborator" rather than a "replacement" for teachers, striving for a dynamic equilibrium between technological innovation and the essence of education.

Keywords: Artificial intelligence; Preschool aesthetic education; Human-robot collaboration; Music education;

I. Introduction

Aesthetic education constitutes a pivotal element of preschool education, holding irreplaceable significance in fostering young children's aesthetic perception, emotional expression, and creative abilities. [2]In ecember 2023, the Ministry of Education promulgated the "Notice on the Comprehensive Implementation of the School Aesthetic Education Infiltration Initiative," explicitly advocating for the integration of aesthetic education into students, teachers, and the broader school environment, as well as embedding it throughout all facets of educational and instructional practices. Concurrently, the exponential growth of generative artificial intelligence is substantially transforming the landscape and boundaries of education. Zhu Yongxin and Yang Fan (2023) highlighted that generative artificial intelligence, exemplified by ChatGPT, presents unprecedented opportunities and challenges for educational innovation.[3] From AI-powered music composition tools to intelligent voice interaction systems, and from personalized learning platforms to immersive virtual reality experiences, technology is intervening in children's learning and daily lives in ways previously unimaginable.

This transformation has ignited fervent debates within the realm of preschool education: Can AI instruct children in singing? Can algorithms supplant the auditory guidance provided by teachers? As music creation transitions from sound to algorithms, will the essence of children's aesthetic education be undermined? These inquiries not only pertain to the efficacy of technological application but also delve into the fundamental question of aesthetic education—in the era of intelligence, what specific type of aesthetic literacy are we striving to cultivate? It is imperative to acknowledge that preschool aesthetic education encompasses a diverse array of domains, including music, art, dance, and drama, with the application logic of AI technology exhibiting both commonalities and distinctions across these fields[1]. Considering that AI's application in music education is currently the most developed, boasting a wealth of practical cases, and given that music, as a temporal art form, inherently possesses a dialogue space with AI's generative mechanisms in its creative and perceptual processes, this paper selects music education as its focal point of research, concentrating on the role and boundaries of AI in preschool children's music composition, auditory experiences,

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and process evaluations. The discussion of "preschool aesthetic education" in this paper primarily draws upon music education as an empirical foundation. Its analytical framework and core principles offer valuable references for other artistic domains, yet specific implementations necessitate adjustments tailored to the unique characteristics of each art form. This paper endeavors to systematically review the current state of AI application and theoretical advancements in preschool aesthetic education, analyze its merits and limitations, and propose practical guidelines and ethical boundaries, thereby providing theoretical insights and practical guidance for preschool aesthetic education in the age of intelligence.

II. The Transformation of AI's Role in Preschool Music Aesthetic Education

（1）Idea Stimulator: Lowering the Technological Barrier and Safeguarding Creative Motivation

Preschool children are at a transitional phase from rhythm perception to melody composition, and their musical expressions are frequently constrained by their intonation control abilities and music theory knowledge. In conventional music education, the frustration stemming from inaccurate singing and erratic rhythms can stifle young children's creative impulses. The integration of AI tools has effectively mitigated this predicament.

The self-determination theory, proposed by American psychologists Deci and Ryan (1985), asserts that the activation of intrinsic motivation hinges on the fulfillment of three basic psychological needs: competence, autonomy, and relatedness. In the context of AI-assisted music creation, competence is demonstrated through AI's assumption of intricate technical tasks, thereby sparing young children from self-doubt induced by skill limitations; autonomy is reflected in the ample choice space provided by the diverse options generated by AI; and relatedness is sustained through collaborative discussions and emotional exchanges between teachers and young children centered around the AI-generated content. Lei Dan (2025) discovered in a systematic review that generative AI effectively alleviates learners' technological anxiety and boosts their creative initiative by offering instant feedback and a variety of options. This finding is consistent with the discourse on competence and autonomy in self-determination theory.[4]

During the creative conception phase, teachers can guide young children in utilizing AI to generate melodic fragments or rhythmic patterns in diverse styles, thereby swiftly achieving the auditory realization of their sonic concepts. For instance, when a child expresses, "I wish to compose a song about little stars," AI can promptly produce an array of melodic progressions and accompaniment textures themed around stars, offering auditory references and stimulating inspiration for the child. This iterative cycle of idea → soundification → recreation liberates young children's creativity from the limitations imposed by singing or instrumental performance skills, enabling them to concentrate more on unleashing their musical imagination.

In the "AI Little Composer" initiative implemented in frontline kindergartens (based on action research conducted by a normal university in 2024), teachers employ AI composition tools by inputting descriptive keywords such as "happy," "slow," and "like a bird flying," among others, to generate multiple musical segments embodying different emotions as "musical seeds." Subsequently, they guide young children through listening, selecting, humming, and modifying these segments, ultimately culminating in the creation of musical phrases imbued with personal emotional expression. Throughout this process, AI assumes the arduous task of technical execution, while young children channel their energy into musical perception and creative expression, exemplifying the ideal division of labor in human-machine collaboration.

(2) Creative collaborators: Expanding auditory experiences and supporting personalized expression

AI is not only a tool for idea inspiration, but also a collaborator in music creation, enabling joint completion of works with young children. Research indicates that generative AI can significantly enhance the efficiency and quality of music composition by providing dynamic creative scaffolding and a diverse sound library.

In the practical research on teacher-child collaborative music creation, researchers found that AI-supported creation forms a spiral interactive chain of "proposing ideas → AI generation → joint evaluation → re-creation".(5)For example, a child proposes "I want a piece of music like rain", AI generates a preliminary sound sample, and the teacher and child jointly discuss and revise the plan ("Can the rain sound be louder? " "Would it be good to add some thunder sound?"), and then input it into AI for optimization. This process not only leverages AI's rapid generation capability but also retains human aesthetic judgment and cultural choice, achieving an organic combination of technology empowering subjective development.

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(3) Process evaluation enabler: from experience-driven to evidence-driven

The core of aesthetic education is not whether the work sounds pleasant or not, but the development process of children's aesthetic psychology. However, in traditional teaching, teachers' observation of young children's musical behavior is often limited by time and energy, making it difficult to achieve continuous and systematic recording and analysis. The intervention of AI tools provides a new solution to this problem.

Practices in some kindergartens have shown that AI tools can serve as "intelligent collaborators" for teachers. Chen Lin et al. (2024) conducted a systematic analysis of the current application of digital technology in preschool education. Based on a study of 199 kindergarten cases, their research indicated that AI-assisted observation can effectively enhance the objectivity and systematicness of teacher behavior analysis.[1] In a music game activity themed "Forest Concert", teachers utilized AI text analysis tools to analyze children's behavioral performances in rhythm imitation, instrument selection, and collaborative playing, assessing their developmental needs in areas such as music perception and social collaboration. This, in turn, generated progressive themes for music activities. Through mind mapping tools, core objectives such as rhythm training, tone identification, and group ensemble playing were clearly outlined. As the activity progressed, AI tools were continuously utilized for real-time review, analyzing the stimulating effects of music games on children's auditory aesthetic abilities. This full-process AI assistance, encompassing needs analysis, activity design, and effect evaluation, has shifted teachers' support from being experience-driven to evidence-driven.

It is worth noting that the application of AI in observation is not to replace the professional judgment of teachers, but to provide them with data support and an analytical framework.[6] As researchers have pointed out, AI tools only analyze brief snippets of gameplay, whereas observing young children is a continuous and multifaceted process. Regardless of which tool is used, teachers need to first understand the game scene. AI serves as a "cognitive offload" function, freeing teachers from tedious recording tasks and allowing them to focus more on meaning construction and emotional response. Its value lies in improving observation efficiency and accuracy, rather than replacing educators' professional intuition and humanistic care.[7]

III. Challenges and Boundaries: The Insurmountability of Technological Intervention

(1) The irreplaceability of sensory experience

The advantage of AI lies in its efficient generation and intelligent adaptation, but its virtual nature also constitutes a fundamental limitation. Preschool children's learning exhibits the characteristics of embodied cognition - cognitive processes are rooted in the interaction between the body and the environment. Children "embody" musical meaning through their bodies, and real sensory experiences form the physical foundation of aesthetic experience.[8] Playing real instruments, feeling the vibration of sound waves, and experiencing the natural resonance of human voices - these multi-sensory synchronous stimuli can form deeper physical memories than pure digital input.

Music teaching practice provides strong evidence. In traditional Orff instrumental ensemble activities, children experience rich sensory stimulation that digital tools cannot provide: the wooden resonance of xylophone bars, the granular friction sensation of shakers, and the elastic feedback of hand drum skins. These real sounds and tactile sensations together form a profound musical memory. The most moving case comes from a usually introverted child: during a group performance activity, he spontaneously used a triangle to add simple rhythmic embellishments to his peers' singing. When the teacher affirmed his creativity with a glance, the child's face broke into a confident smile. The overtone of the triangle became a medium for the child to express himself and establish connections. This non-verbal emotional communication achieved through real instruments is an educational effect that digital tools cannot replicate.

This case reminds us that aesthetic education is not only about aesthetic training, but also a channel for emotions and a dialogue between hearts. Authentic material experience, physical participation, and emotional interaction between teachers and children constitute educational dimensions that AI cannot replace.

(2) Re-positioning of the teacher's role

The intervention of AI is transforming the structure of teacher-child interaction. In the traditional model, teachers are the

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primary source of knowledge and direct instructors of activities; however, in AI-assisted classrooms, the sources of knowledge have become diverse, and the role of teachers is also undergoing transformation. Research indicates that interactions supported by AI are shifting from a binary structure of "teacher-child" to a ternary synergy of "teacher-child-AI". Song Huan and Lin Min (2023) point out that the transformation of teachers' work in the ChatGPT era involves opportunities, challenges, and responses. Teachers need to transition from being knowledge transmitters to learning guides and gatekeepers of technology use.[9]

In this new structure, the functional roles of the three parties need to be clarified: teachers are the guides of aesthetic significance, the gatekeepers of technology use, and the guardians of emotional interaction; AI is the assistant of technological implementation, the generator of multiple possibilities, and the supporter of data processing; children are the subjects of aesthetic experience, the initiators of creative expression, and the participants in human-machine collaboration. This means that teachers need to possess new professional abilities: understanding the principles and limitations of AI tools (technical comprehension), screening the aesthetic appropriateness of AI-generated content (value discernment), and maintaining high-frequency teacher-child interaction with technological assistance (emotional connection).

The 5th China Annual Conference on Early Childhood Aesthetic Education in 2024 will have the theme of "Empowerment, Integration, and Creativity: Reflections and Practices on Early Childhood Aesthetic Education in the AI Era". The participating experts generally emphasized that education is an art of "slowness" and aesthetic education is a process of "nourishment". In the era of artificial intelligence, it is even more important to adhere to the original intention of educating people.[10]

(3) Data privacy and technology dependency risks

The operation of AI systems relies on the collection and analysis of vast amounts of data, which raises privacy protection issues in the context of preschool education. Once the voice information, behavioral data, and creative content of young children are improperly collected or used, it constitutes an infringement on their privacy rights. The EU's "Artificial Intelligence Act" (AI Act, 2024) has listed educational AI as a high-risk application and requires the establishment of strict data protection mechanisms. China's "Interim Measures for the Administration of Generative Artificial Intelligence Services" also clearly stipulates that providers should take effective measures to prevent minors from becoming addicted and protect their personal information security. Feng Yuhuan (2023) further points out that the application of ChatGPT in the field of education requires attention to potential ethical risks and governance paths.[11]

Furthermore, over-reliance on AI may lead to a "capability trap": when creation becomes too convenient, will young children still be willing to put in the effort to practice intonation and hone their sense of rhythm? Lei Dan (2025) points out that the essence of artificial intelligence is computation based on big data, lacking human consciousness, emotions, and will.[4] The uniqueness of humans is precisely reflected in the limitations of AI - human consciousness encompasses rationality, emotions, and will, including inspiration, imagination, and creativity that machines lack. In the face of the unstoppable trend of AI, aesthetic education should consider how to cultivate these unique qualities of humans.

IV . Principles of Practice and Suggestions for Pathways

Based on the aforementioned analysis, this article proposes three core principles for the application of AI in preschool aesthetic education:

First, the principle of prioritizing embodied experience: using real perception as the anchor.

AI should be positioned as a "scaffold" for expanding aesthetic experiences, rather than a "shortcut" to replace genuine artistic perception. In technological applications, we should adhere to focusing on young children's embodied experiences, ensuring that digital tools serve, rather than replace, genuine auditory exploration and emotional interaction.(12) Specifically, it is recommended to establish a "digital-physical dual-track system": any AI music activity must be accompanied by real instrument exploration time, and the duration of AI assistance should be limited to less than one-third of the total class time (based on the estimation of young children's attention characteristics and sensory development needs), ensuring that young children have sufficient time for physical instrument operation and body movement; follow the teaching sequence of "body first, screen later" - body movement → instrument exploration → AI expansion → return to physical performance. Before introducing AI tools, teachers should first examine a value question: Does this technology application help expand young children's aesthetic

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experience, or does it instead weaken their opportunity to directly perceive artistic materials? Only through such reflection can we avoid the formalism tendency of technology for technology's sake.

Second, the principle of collaboration between teacher-led instruction and AI assistance.

AI can undertake tasks such as tone generation, rhythm arrangement, and pattern recognition, but the setting of educational goals, the guidance of activity processes, and the interpretation of work meanings must be led by teachers. Teachers should become the "director" of human-machine collaboration, rather than the "supporting role" driven by technology.(5) Specifically, teachers need to play a leading role in three key aspects: firstly, goal selection before the activity, judging which links are suitable for introducing AI and which should retain traditional experiences; secondly, meaning guidance during the activity, based on AI-generated content, helping young children establish aesthetic understanding through questioning, demonstration, empathy, and other methods; finally, reflection and integration after the activity, connecting the creative achievements assisted by AI with traditional music experiences to form a complete aesthetic cognitive schema.

Third, the principle of data minimization and algorithmic transparency: with ethical norms as the bottom line.

While embracing the technological dividend, we should establish a sound data privacy protection mechanism, carefully assess the long-term impact of AI applications on the development of young children, and avoid the alienation of education due to technological supremacy.(13) When introducing AI tools into kindergartens, a tiered review system should be established: conduct a child-friendliness assessment of the proposed AI tools, including content safety, data collection scope, privacy protection measures, etc.; at the same time, parents should be clearly informed of the usage scenarios and data purposes of the AI tools, and informed consent should be obtained to form a technology governance mechanism for home-school collaboration.

At the practical level, it is recommended to establish a teaching model of "AI inspiration + traditional practice + comprehensive expression": during the creative conception stage, AI can be utilized for musical inspiration and rapid soundification; during the skill practice stage, real instruments and body movements should be returned to for deep experience and emotional expression; during the work completion stage, digital tools can be used for display and sharing. This "dual-track parallel" model not only leverages the efficiency advantages of technology but also preserves the humanistic essence of aesthetic education.

V. Conclusion

Returning to the music education scene, AI is reshaping the landscape of preschool art education. It can be a catalyst for creativity, a connector across modalities, and an enabler of evaluation. It opens up a broader music world for young children and provides teachers with more accurate support tools. However, the intervention of technology must be cautious and restrained. The essence of aesthetic education is not the dazzling technology, but the touching of the soul; Not the improvement of efficiency, but the unfolding of life.

When young children strike the xylophone to feel the resonance of wood, when the overtones of the triangle iron echo in the classroom, when the teacher's gaze meets the child's smile - these incalculable moments precisely constitute the essence of education that AI cannot reach. In the era of intelligence, what is needed for preschool art education is not the rough grafting of "AI+education", but the original intention of "using art education to protect people". Technology should become a boat to expand aesthetic experience, rather than a shortcut to replace real perception; teachers should become the helmsman of human-machine collaboration, rather than passengers driven by algorithms. In the era of intelligence, what we need is not the anxiety of AI replacing people, nor the fanaticism of AI saving education, but the wisdom to maintain the necessary tension between technological innovation and the essence of education - to make technology a bridge of beauty, rather than the endpoint of beauty.

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Data Availability Statement

Data will be made available on request.

Conflicts of Interest

The author(s) declare no conflicts of interest.

Ethical Approval and Consent to Participate

Not applicable.

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