Mini Review of Piano Proficiency Course for Early Childhood Education Program

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ABSTRACT

Piano proficiency has become an essential component of early childhood education (ECE) teacher training, serving a dual function in supporting children's developmental outcomes and enhancing pedagogical competence among pre-service educators. This mini review synthesizes recent empirical research and pedagogical innovations related to piano instruction within ECE programs. The findings indicate that structured piano training contributes to improvements in children's auditory discrimination, pitch processing, and executive functions, while concurrently strengthening pre-service teachers' musical self-efficacy and instructional confidence. Curriculum reforms that incorporate collaborative piano learning, layered instruction, and integrated theory–performance approaches demonstrate potential in addressing diverse learner needs. In parallel, digital technologies and AI-enhanced platforms are increasingly reshaping piano pedagogy by enabling personalized learning experiences and reducing instructional demands. Despite these advances, persistent challenges, including inconsistent teaching quality and limited curriculum integration, remain evident. Addressing these issues requires coordinated efforts in teacher support, curriculum design, and equitable technological access. This mini review aims to inform evidence-based practices for cultivating musically proficient and pedagogically capable ECE educators.

Keywords: Early childhood education; teacher trainee; music pedagogy; piano proficiency.

INTRODUCTION

Piano proficiency has become a cornerstone in early childhood education (ECE) programs, particularly in the training of pre-service preschool educators. As music education is increasingly recognized for its role in fostering cognitive, linguistic, and socio-emotional development, structured piano instruction is now viewed not only as a musical skill but also as a pedagogical tool that enhances teaching effectiveness and child development outcomes (Kim, 2017; Nan et al., 2018; You et al., 2025).

Many pre-service educators enter teacher training programs with limited musical experience, often resulting in low self-efficacy and underdeveloped piano skills (Santos Silva & Marinho, 2024). This gap can hinder their ability to effectively integrate music into early learning environments. Research has shown that teacher support plays a pivotal role in improving piano proficiency, mediated by increased musical self-efficacy and learning engagement (Bruin, 2025; Feliu et al., 2025; You et al., 2025). The "Support–Feedback–Reflection" (SFR) model has been particularly effective in fostering musical growth among pre-service teachers (You et al., 2025).

Curriculum design and instructional strategies are equally critical. Innovative approaches such as group instruction, layered teaching, and collective piano courses have been developed to address individual learning differences and enhance overall teaching quality (Ma, 2022; Zhao & Zheng, 2021). For example, a newly designed collective piano playing and singing course has demonstrated significant improvements in students' piano proficiency and overall music literacy, emphasizing practical teaching and performance abilities (Wan et al., 2025). These findings align with broader reforms in music education that advocate for integrated curricula

combining piano performance, music theory, solfeggio and vocal training to cultivate comprehensive musical and pedagogical competencies (Yue, 2021).

The integration of piano training into ECE programs also supports broader developmental goals for children. Studies have shown that musical training, including piano instruction, enhances pitch perception, auditory discrimination, and speech-sound processing, skills that are foundational for language development (Nan et al., 2018; Yucel et al., 2009). In Mandarin-speaking children, piano training has been linked to improved consonant-based word discrimination and enhanced neural processing of pitch, suggesting a strong cross-domain transfer between music and language (Nan et al., 2018). Similarly, piano lessons have been shown to improve executive functions such as working memory and inhibitory control in preschool-aged children, supporting the mediation hypothesis between music training and cognitive development (Hernández Campos et al., 2024).

Technological advancements have further enriched piano education. Recent studies on online piano proficiency courses further highlight how virtual delivery reshapes instructional dynamics, learner autonomy, and pedagogical adaptation in music education contexts (Zhuang & Wong, 2023, 2024). The use of multimedia tools and artificial intelligence in piano instruction has been shown to enhance children's musical perception and aesthetic sensitivity by providing personalized feedback and adaptive learning experiences (Liu, 2023). These tools also reduce instructional burdens on teachers and increase student engagement. A knowledge-based system for evaluating digital piano courses has also been proposed to improve teaching quality and align instruction with student needs (Li & Tian, 2020).

Despite these advantages, several challenges persist. Many programs still struggle with outdated teaching methods, lack of individualized instruction, and insufficient integration of comprehensive music content (Yue, 2021; Zhao & Zheng, 2021). Addressing these issues requires a multifaceted approach, including the adoption of scientific evaluation methods, enhanced teacher support systems, and the integration of technology to personalize instruction (Liu, 2023; You et al., 2025; Zhao & Zheng, 2021).

This mini review synthesizes selected recent research on piano proficiency courses within early childhood education programs, drawing from empirical studies and pedagogical innovations. Rather than providing an exhaustive mapping of the field, the review adopts a focused analytical lens on three intersecting dimensions: (1) cognitively relevant outcomes for young children, (2) piano proficiency and self-efficacy among pre-service teachers, and (3) curriculum and technology-mediated instructional design. By prioritizing conceptual integration over comprehensive coverage, this review aims to inform evidence-informed practices for developing musically competent and pedagogically effective early childhood educators.

METHODS

This mini review employed a structured literature search strategy to identify relevant empirical and theoretical studies on piano proficiency courses in early childhood education (ECE) programs. Six academic databases were consulted: Scopus, ScienceDirect, SpringerLink, MDPI, IGI Global, and Google Scholar. The search was conducted between February and April 2025 using a Boolean keyword strategy combining the following terms:

("piano" OR "keyboard" OR "music instrument") AND ("proficiency" OR "skill" OR "competence" OR "ability") AND ("early childhood" OR "preschool" OR "infant" OR "toddler") AND ("education" OR "learning" OR "development" OR "instruction") AND ("music education" OR "musical training" OR "music pedagogy" OR "music curriculum").

Studies were screened by title and abstract, and full texts were reviewed for eligibility (Mazlan et al., 2025; Ramdan et al., 2024). Both qualitative and quantitative research articles were considered, including original research papers, literature reviews, case studies, and meta-analyses.

Inclusion Criteria

This review included peer-reviewed studies that addressed core dimensions of piano proficiency and music education within early childhood education contexts. Eligible studies met the following criteria:

- Peer-reviewed journal articles published in English between 2024 and 2025.
- Research focusing on piano or keyboard instruction in early childhood or pre-service teacher education settings.
- Studies addressing outcomes related to cognitive development, pedagogical effectiveness, curriculum design, or teacher self-efficacy.
- Studies examining digital, multimedia, or AI-assisted piano instruction in ECE contexts.

Exclusion Criteria

Studies were excluded based on the following criteria:

- Studies focus solely on adult or professional piano learners.
- Articles that addressed early childhood education without specific reference to piano proficiency or music training.
- Grey literature, including conference abstracts, unpublished manuscripts, and non-peer-reviewed reports.
- Studies without clear outcomes related to proficiency, pedagogy, or developmental impact.

RESULTS

This mini review synthesizes recent empirical findings and pedagogical innovations related to piano proficiency courses within early childhood education (ECE) programs. Rather than providing an exhaustive account, the results are organized thematically to highlight convergent patterns and recurring challenges across cognitive, pedagogical, curricular, and technological dimensions.

Cognitive and Developmental Benefits

Piano instruction in ECE contexts has demonstrated measurable benefits on children's cognitive and linguistic development. Studies show enhancements in auditory discrimination, pitch perception, working memory, and speech-sound processing (Bayanova et al., 2024). These effects are particularly pronounced in tonal language environments such as Mandarin, where musical training supports phonological awareness and neural encoding of pitch (Han et al., 2024; Howe et al., 2024; Li et al., 2024; S. Yang et al., 2024). Additionally, improvements in executive functions, including inhibitory control and attention regulation, have been linked to structured piano exposure in preschool settings (Jamey et al., 2024; Schellenberg & Lima, 2024; Xue et al., 2024; Zhang et al., 2024). However, most studies rely on short-term interventions, limiting conclusions about sustained developmental impact.

Teacher Proficiency and Self-Efficacy

Many pre-service educators enter ECE programs with limited musical background, resulting in low self-confidence in using music pedagogically. Targeted piano proficiency courses significantly improve their musical self-efficacy, teaching engagement, and readiness to integrate music into classroom activities (Feliu et al., 2025; Gill et al., 2024; You et al., 2025). Models such as Support–Feedback–Reflection (SFR) foster both technical skill and reflective practice, reinforcing positive attitudes toward music teaching (You et al., 2025). Nevertheless, variations in instructional quality and mentoring practices suggest that gains in self-efficacy are highly context-dependent and may not generalize across institutional settings.

Curriculum and Instructional Innovation

Innovative curriculum models, including collective piano classes and layered teaching methods, address diverse learner needs and promote collaboration. These approaches emphasize practical teaching skills alongside

traditional music theory, resulting in more holistic musical training (Normatovich, 2024; Wang & Webb, 2024; Zheng et al., 2024). The integration of vocal training, solfeggio, and improvisation further enhances pedagogical flexibility (Pengtao & Somtrakool, 2024; Xiao & Mazlan, 2024; Žnidaršič & Trčko, 2025). Despite their promise, these approaches often require substantial institutional support and instructor expertise, which may limit scalability in resource-constrained ECE programs.

Technological Integration

Digital platforms and AI-assisted learning tools have transformed piano education, particularly during the shift to online instruction. These technologies offer real-time feedback, adaptive pacing, and personalized learning trajectories, increasing both student motivation and instructional efficiency (Isaeva et al., 2025; Safian et al., 2024; Song et al., 2024; Spaho et al., 2025). However, disparities in access and instructor training remain ongoing challenges (Al-Mansouri, 2024; Rodriguez et al., 2023). Qualitative evidence from online piano proficiency courses suggests that while digital platforms enhance accessibility and flexibility, the absence of physical guidance and uneven technological infrastructure may constrain skill acquisition and instructional effectiveness (Zhuang & Wong, 2023, 2024).

Implementation Challenges

Despite the benefits demonstrated, several challenges persist. These include inconsistent teaching quality, lack of individualized instruction, and insufficient curriculum integration (Chang & Wang, 2024; Pratiwi et al., 2025; Zickafoose et al., 2024). Addressing these issues requires professional development for instructors, updated teaching resources, and institutional support for incorporating music education as a core component of teacher training (Bautista et al., 2024; Kong, 2025; Olatokun et al., 2024; Rahimi & Oh, 2024; West, 2024; Y. Yang & Zhang, 2023). Consistent with findings from qualitative investigations of online piano proficiency courses, students frequently report challenges related to limited individualized feedback, unstable internet connectivity, and reduced physical demonstration, underscoring the need for adaptive instructional models in digital piano pedagogy (Zhuang & Wong, 2023, 2024).

Limitations and Future Directions

While this mini review offers a comprehensive synthesis of current research on piano proficiency in early childhood education, several limitations must be acknowledged. First, the scope was limited to English-language, peer-reviewed sources, which may exclude relevant findings published in other languages or formats. Second, there is variability in methodological rigor across the reviewed studies, with some relying on small sample sizes or self-reported data, limiting generalizability. Third, the rapid evolution of digital tools in music education introduces a temporal constraint; newer technologies or post-2025 data may not be fully captured. Lastly, most studies focus on specific cultural or institutional contexts, which may limit the transferability of results across diverse educational settings. Future research should prioritize large-scale, longitudinal studies that evaluate the sustained impact of piano training on both teacher preparedness and child outcomes, as current evidence predominantly reflects short-term cognitive gains.

CONCLUSIONS

This mini review critically examines the role of piano proficiency courses in early childhood education (ECE) teacher training programs, focusing on cognitive, curricular, and technological perspectives. Drawing from empirical studies and pedagogical innovations, the review identifies five major themes: cognitive benefits for children, enhanced musical self-efficacy among pre-service teachers, curriculum innovation, integration of digital tools, and persisting implementation challenges. Piano instruction not only enriches early childhood learning through improved auditory and executive functions but also empowers educators with essential pedagogical competencies. Innovative models such as the Support–Feedback–Reflection (SFR) framework, multimedia-enhanced group classes, and hybrid auditory-visual teaching strategies are shown to improve outcomes. However, disparities in access, quality, and instructor preparedness highlight the need for systemic support and curriculum reform. This review contributes to a growing body of research advocating comprehensive, integrated, and adaptive music training in ECE teacher preparation.

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