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Research Article

Integrating digital tools in early childhood music education: Pedagogical strategies for enhancing teacher development and preschoolers' engagement

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This study explores the integration of digital tools in early childhood music education in China, focusing on their impact on teaching practices, preschoolers' engagement, and parents' perceptions. The purpose of the research is to assess how digital tools influence educational outcomes and to identify effective strategies for their implementation in early childhood settings. Employing a qualitative approach, the study conducted 27 semi-structured interviews with early childhood educators and parents, analyzing the data through a three-step thematic analysis to identify key themes and patterns. Findings reveal that teachers perceive digital tools as beneficial for enhancing engagement and providing diverse musical resources, though they face challenges such as technical issues and resistance to change. The study also highlights that digital tools positively impact preschoolers' engagement by fostering increased interest and participation, while parental perceptions are mixed, with concerns about screen time and content quality. The originality of this research lies in its focus on early childhood music education within the context of digital tool integration, contributing valuable insights to the field. The study's findings have significant implications for educators, policymakers, and developers, providing recommendations for effective digital tool use and professional development.

Keywords: Digital tools; Early childhood; Music education; Pedagogical practices; Preschoolers' engagement; Teacher perceptions; Parental perspectives

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1. Introduction

Early childhood education prepares children for learning and socialization. Early childhood organisations are using digital tools to improve outcomes as educational paradigms change (Albar & Southcott, 2021). Interactive, multimedia, and flexible learning aids for young children have been introduced thanks to rapid technological advancement. To engage toddlers in active learning, more educational applications, interactive whiteboards, and multimedia content are being deployed. These devices have been shown to engage students better than traditional techniques. Since children are growing up in a digital environment, it is important for early education to

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incorporate digital technology. Newborn cognitive, language, and social-emotional development may be aided by digital technology. Background research reveals that digital tools in early childhood education are not a fad but a substantial shift towards a more interactive and technologically integrated approach (Sungurtekin, 2021). Education games and apps help students practice reading in fun and engaging ways. Interactive narratives and films can be adapted to different learning styles and needs, making education more inclusive (Wan et al., 2022). The expanding importance of technology and the need to prepare students for a digital world drive education improvement. Thus, digital tools in early childhood education foster social, emotional, literacy, and numeracy skills.

Several empirical studies have shown the pros and cons of digital tools in early childhood education. Digital technology improves preschoolers' learning and engagement (Männikkö et al., 2020). Hoel and Tønnessen (2019) found that interactive digital games increase cognitive and language skills in children while engaging them in learning. Müller-Brauers et al. (2020) found that multimedia storytelling apps help young children learn and remember stories. The investigation found that integrating digital resources into early childhood education is difficult. Technology overuse may damage conventional abilities like physical activity and social interaction. Männikkö et al. (2020) found that excessive screen time harms children's social-emotional development and physical health, underlining the importance of ethical technology use. Technical issues and inadequate teacher training may hinder integration. Due to lack of training and support, Fořtová et al. (2021) claim that instructors typically fail to implement digital technology into the classroom.

To meet learning needs, digital technologies have been extensively studied. Digital technology can be utilized to adapt learning to diverse styles and phases (Shorey et al., 2021). Digital technologies are essential to inclusive education because they can be customized for each student. The findings are promising, but more research is needed to establish the best ways to use digital technologies to benefit early childhood education and development (Peng & Chuang, 2020). Previous research has provided valuable insights, but some major gaps remain. The absence of longitudinal research on digital gadgets and children's learning and development is concerning (Ngoc & Tuyen, 2022). Many studies have focused on immediate results like engagement and skill acquisition, but few have examined long-term implications on educational and developmental trajectories (Gonzalez-Barrero et al., 2021; Spencer & Pierce, 2022). Longitudinal research can show how early digital tool use affects later success.

Digital instruments' efficacy, interactive media and instructional apps work, according to research. These strategies have not been thoroughly tested in many educational settings and sectors (Ginsburg et al., 2019). Comparative comparison can assist instructors pick the best technologies for student growth and learning. More study is needed to understand teachers' digital tool issues. Little is known about how these difficulties impact teachers' daily routines and coping. These pragmatic skills may help instructors use digital tools and solve problems. Parent opinions are seldom included in early childhood education and digital tool studies. Understanding how parents utilize digital resources may help us understand their impacts and find methods to incorporate families in education (To et al., 2022). Analysis of parental digital technology attitudes, concerns, and recommendations may assist integrate home and school environments holistically.

This study examines how digital resources in early childhood music education affect instruction, preschoolers' participation, and parents' perspectives. The study examines these characteristics to understand how digital technologies are used in early childhood music instruction and propose effective implementation techniques. The study examines teachers' perceptions of digital tools and their effects on teaching, preschoolers' engagement and learning outcomes, and parents' views on digital tools in their children's education.

This study improves teaching using technology. The study's advantages and downsides might help schools choose digital technologies. Understanding academic achievement and engagement may improve education and digital resources. Analysis of parents' perspectives can also improve communication and cooperation between educators and families, ensuring that digital tools are

used to meet educational goals and resolve concerns. This research fills gaps in early childhood education literature, improving the field. By examining digital technologies in music education, this study adds to the growing body of information on technology in several fields. The findings can influence policy and practice by suggesting professional development, resource selection, and classroom management. This research aims to improve early childhood education and encourage the efficient use of digital resources to help young learners and their families.

2. Literature Review

2.1. Early Childhood Music Education

Early childhood music education is essential to children's development. Early music exposure improves cognitive development, specifically language learning, memory, and spatial-temporal aptitude (Zollo, 2019). Music instruction helps pupils notice patterns and sequences, which can be employed in music (Vazou et al., 2019). Music education also helps kids develop social skills, self-confidence, and creative expression through collaboration (Suteja et al., 2022). Singing, dancing, and playing instruments encourage creativity and a positive outlook on schooling in young people. Early educational music exposure fosters lifetime learning and music appreciation. Early childhood music instruction uses many methods influenced by educational philosophies and cultures. Grindheim and Grindheim (2021) emphasize active learning and experience in music education. Improvisation, singing, and dancing help young learners acquire music. These methods highlight the necessity for a supportive and enjoyable setting where kids can learn musical concepts at their own pace. The method uses folk melodies and hand gestures to teach musical literacy, while the Orff method integrates music, dance, speech, and theatre (Lee, 2022). Modern music teaching uses digital tools and technologies as well as conventional methods. Apps and interactive software let kids interact with music in new ways. These technologies personalize and adapt children's learning (Grindheim & Grindheim, 2021). These instruments can give kids more tools to practice and learn music. Early childhood music education offers many benefits, but it must overcome some obstacles to be successful. A key issue is the dearth of music instructors with the musical and pedagogical skills to work with young children (Sungurtekin, 2021). Professional development and assistance are essential for music educators to provide quality instruction. Since socioeconomic status might affect children's music participation, fair and equal access to music education is necessary (Marciano & Camerini, 2021). Schools and communities must collaborate to provide inclusive and accessible music education to all students. Digital technologies in music education require careful monitoring of screen time against hands-on musical practices (He et al., 2023). Digital technologies are useful, but a developmentally appropriate approach that promotes active, hands-on learning is essential. Early childhood music education may thrive and improve young children's growth by addressing these issues and using both traditional and digital approaches.

2.2. Digital Tools in Education

With the arrival of digital tools, education has undergone a considerable revolution, enabling the development of creative solutions to improve learning for all pupils. Technology-integrated education allows teachers to tailor lessons to specific students (Gabbiadini et al., 2023). Dynamic whiteboards, instructional software, and online learning environments help students engage with educational content. These tools help encourage student engagement, communication, and individual learning speeds, creating a more engaging classroom (Cunha et al., 2023). Digital tools also provide educators with statistics on students' learning progress, helping them make better instructional decisions (Renzi & Trifarò, 2023). The widespread use of these tools shows their potential to transform education and boost achievement. Early childhood educators use technology to create engaging learning settings for young children. Education Apps for Children teach reading, math, and problem-solving through engaging games, stories, and animations (Dilekçi & Karatay, 2023). Digital storytelling technologies help children create and share their

own stories, making them crucial in early childhood education. Scientists are also considering integrating AR and VR to create educational environments that allow students to interact with virtual items and scenarios (Laseinde & Dada, 2023). This can help them understand complex issues. These digital tools in early childhood education underline the importance of integrating screen time with hands-on activities for holistic development. Digital resources affect teaching and learning (Wangdi et al., 2021). Music composition software and virtual instruments improve students' technical skills and creativity, according to research. These instruments let kids experiment, create, and collaborate musically (Kwihangana, 2020). Digital Audio Workstations allow students to experiment and compose across genres, according to (dos Santos Gonzaga & Cordeiro, 2019). This enhances music comprehension. Aural training programs and music notation software improve students' auditory skills and music theory knowledge, according to research. Technology has many benefits, but some studies advise against overuse. These results underscore the need to combine traditional and digital music teaching methods for a complete music education (Sungurtekin, 2021). This investigation implies that integrating digital resources into music instruction could transform it. It stresses the significance of carefully assessing their inclusion.

2.3. Teacher Development in Early Childhood Education

Early childhood teacher professional development is essential for high-quality instruction that enhances children's development. Teachers need ongoing professional development to improve their mindset, abilities, and knowledge (Chang et al., 2022). Early childhood educators must understand child development, pedagogy, and curriculum to offer engaging and developmentally appropriate learning experiences. Professional development seminars give instructors current research, teaching methods, and resources to advance (Lee et al., 2021). Teachers share ideas and problems in collaborative learning networks for professional development. These forums encourage self-reflection, criticism, and innovative classroom strategies for instructors. Early childhood educators receive substantial and diversified professional development to fulfil their requirements. Workshops, seminars, and conferences are conventional professional development approaches that offer networking and learning (Luo et al., 2022). Mentorship and coaching programs also provide instructors with personalized feedback and support from experienced educators. Teachers are increasingly embracing online platforms for professional development to access courses, webinars, and virtual communities of practice at their own pace (Gegenfurtner, 2019). By using action research and reflective practice, teachers can assess their methods of instruction and make informed judgments about how to improve. These professional development programs help educators create supportive and enriching learning environments for young children and boost their self-confidence. Digital resources have greatly impacted early childhood education professionals' professional development. Digital tools let instructors innovate, share knowledge, and collaborate. Teachers can benefit from digital libraries and online learning platforms' large selection of educational resources (Reisoğlu & Çebi, 2020). Modern tools like analytic software and video recording allow educators to evaluate their teaching, observe colleagues, and get feedback. These tests assess teaching methods and classroom management more thoroughly (O'Rourke et al., 2021). Online professional forums and social media allow educators worldwide to interact and solve difficulties. International educator cooperation and help are promoted. Digital assets provide customizable, accessible, and engaging learning possibilities for early childhood educators to advance their professions (Gegenfurtner, 2019). Using digital tools, instructors can improve their teaching methods, stay current on early childhood education trends, and improve child outcomes.

2.4. Engagement in Early Childhood Education

Active participation in early childhood education is essential for young children's development. Actively participating in education boosts curiosity, motivation, and perseverance, improving cognitive, social, and emotional growth. Students that actively participate in class and are willing

to investigate learn and remember new concepts better (Freeland et al., 2022). Teachers must foster exploration and discovery in an engaging and supportive learning environment to engage students (Luo & Song, 2022). Positive reinforcement, open-ended inquiry, and hands-on activities engage kids. The classroom's vast choice of accessible and different objects encourages meaningful and active play. Preschoolers' early childhood education involvement depends on many factors. Temperament, development, and prior experiences can influence children's educational involvement (McWayne et al., 2023). Warm, attentive, and supportive teacher-child relationships promote children's engagement and safety. Culturally responsive teaching practices create inclusive environments that celebrate diversity, which increases involvement from people of different cultures and languages (Chung & Sung, 2020). Parental involvement is crucial to a child's education. Parents can improve classroom learning by actively participating in their children's education and creating learning opportunities at home. Curriculum and instructional methods affect engagement, with play-based and child-centered methods engaging young children and encouraging active participation. Digital tools are becoming important in early childhood education engagement. Digital tools including instructional programs, interactive whiteboards, and multimedia materials help engage young children in learning. These apps use challenges and awards to engage kids in learning (Smutny & Saal, 2021). Interactive stories and challenges in educational apps can make reading and arithmetic more fun. Youth can evaluate their performance and improve their education using digital technology, which provides rapid feedback. Children can improve their communication and social skills by working together on projects utilizing interactive whiteboards and tablets. Interactive, screen-based play is crucial for a complete early childhood education.

3. Method

3.1. Research Design

Qualitative research was done to better understand how digital technologies are used in early childhood music education. Qualitative methods were used to gather early childhood educators' opinions and analyze complicated events (Li, 2022). While quantitative methods may not fully quantify the impact of digital technology on teacher development and preschooler participation, they are more thorough. Data was collected through semi-structured interviews to fully understand participants' perspectives and experiences. This adaptable approach reveals deep ideas through inquisitive questioning. Thematic analysis extracted themes and insights from study data to uncover patterns. This strategy ensures a complete understanding of digital tools' purpose and challenges in early childhood music education.

3.2. Participants

As shown in Table 1, early childhood instructors from various preschools participated in the study. Music teachers, classroom teachers, and early childhood education specialists used digital tools. The educator selection process sought diverse perspectives on technology in music education. Parents of preschoolers were also questioned how digital gadgets affect their children's learning and involvement at home. To ensure a complete sample of relevant experiences, participants were selected based on various factors. The following criteria were required of educators: Candidates must have at least one year of experience using digital technologies in early childhood music education, work in a Chinese preschool or early childhood education context, and be prepared to discuss their experiences and opinions during an interview. This ensured that participants could assess digital technology' pros and cons and gain practical experience. Parents had to meet these criteria: Participants must (1) enroll their child in a preschool program that uses digital tools, (2) be able to articulate their ideas and feelings about their child's usage of digital technologies, and (3) be willing to be interviewed. This gave the research vital data on parents' perspectives of digital technology and its influence on their children's learning outside of school.

Table 1
Demographic Profile

ID	*Role*	*Years of Experience*	*Type of Digital Tools Used*	*Type of Institution*
P1	Music Teacher	5	Interactive whiteboards, Music composition apps	Private
P2	Classroom Teacher	8	Educational games, Digital storytelling apps	Public
P3	Music Teacher	3	Tablets, Virtual instruments	Private
P4	Early Childhood Specialist	10	Digital music creation software, eBooks	Public
P5	Classroom Teacher	7	Interactive learning apps, Digital audio tools	Private
P6	Music Teacher	4	Educational apps, Augmented reality tools	Private
P7	Early Childhood Specialist	6	Music notation software, Interactive whiteboards	Public
P8	Classroom Teacher	9	Digital storybooks, Interactive games	Public
P9	Music Teacher	2	Music creation apps, Tablets	Private
P10	Classroom Teacher	5	Interactive whiteboards, educational apps	Private
P11	Early Childhood Specialist	12	Digital music tools, Virtual reality programs	Public
P12	Music Teacher	3	Digital storytelling, educational games	Private
P13	Classroom Teacher	8	Digital audio tools, Interactive whiteboards	Public
P14	Music Teacher	6	Virtual instruments, Digital music creation tools	Private
P15	Early Childhood Specialist	9	Interactive learning apps, eBooks	Public
P16	Classroom Teacher	4	Educational games, Digital storybooks	Private
P17	Music Teacher	5	Tablets, Music composition apps	Public
P18	Classroom Teacher	7	Digital storytelling apps, Interactive whiteboards	Private
P19	Early Childhood Specialist	11	Music notation software, Augmented reality tools	Public
P20	Music Teacher	2	Digital audio tools, Virtual instruments	Private
P21	Classroom Teacher	6	Interactive learning apps, Educational games	Public
P22	Music Teacher	8	Digital music creation software, eBooks	Private
P23	Early Childhood Specialist	7	Digital storytelling, Interactive whiteboards	Public
P24	Classroom Teacher	9	Music composition apps, Digital storybooks	Private
P25	Music Teacher	4	Virtual reality programs, educational games	Public
P26	Early Childhood Specialist	5	Interactive whiteboards, Digital music tools	Private
P27	Classroom Teacher	10	Digital audio tools, Interactive learning apps	Public

Participants were recruited directly and through recommendations. Professional networks, schools, and early childhood education associations recognized educators. The research, interview method, and participant involvement were explained in the email or personal invitations. Professional development seminars, educational conferences, and local educator recommendations connected educators. Parents preferred preschools that collaborated on digital technology. Preschools distributed leaflets and invited interested parents. Education professionals advised cascade sampling with parents who are eager to share the experience. Participants were contacted to schedule interviews after expressing interest in the study. Depending on availability and preference, educators were interviewed in person at their schools or remotely. Parents were interviewed by phone or video conferencing at their convenience. Participants were informed of the study's goals, confidentiality measures, and interviewing methods during recruiting. This strategy kept participants informed and comfortable. The interviews were flexible, allowing participants to freely express their thoughts and experiences while meeting study goals.

3.3. Data Collection

This study used 27 semi-structured interviews with preschool parents and early childhood education experts. Semi-structured interviews were chosen because they can provide detailed and perceptive information and are flexible in exploring participants' experiences and perspectives. Semi-structured interviews used open-ended questions. These studies examined digital tools in early childhood music instruction. The protocol addresses critical issues such digital technology' impact on teacher training, preschooler involvement, and implementation hurdles. These subjects match the study goals and literature review findings. Interviews were conducted face-to-face or by videoconferencing, depending on participant availability and preference. Complete responses and follow-ups are included in each 45-60 minutes session. Participants agreed to utilize audio technologies to record their interview responses for future research. Transcribed interviews were used for analysis to create a complete textual dataset. Transcription was performed by skilled research assistants to assure accuracy. The study team assessed and familiarized themselves with the data after transcribing it before theme analysis (Braun & Clarke, 2006). This method uses themes and iterative coding to find research goals-related patterns. This qualitative study's data was complete and credible due to careful transcribing and semi-structured interviews (see Table 2).

Table 2
Interview Guidelines

Variable	*Interview Questions*
Integration of Digital Tools	1. How do you incorporate digital tools into your early childhood music education practices? 2. What types of digital tools do you use most frequently, and why? 3. How have digital tools impacted your teaching methods and strategies?
Teacher Development	1. How have digital tools influenced your professional development as an educator? 2. What training or support have you received regarding the use of digital tools in your teaching? 3. How do digital tools contribute to your ongoing learning and skill enhancement?
Preschoolers' Engagement	1. In what ways have digital tools affected preschoolers' engagement during music lessons? 2. Can you provide examples of how digital tools have changed the way children interact with music education? 3. What feedback have you received from preschoolers about their experiences with digital tools?
Challenges and Barriers	1. What challenges have you encountered in integrating digital tools into your teaching? 2. How do you address any issues related to the use of digital tools in your classroom? 3. Are there any limitations or obstacles that affect the effective use of digital tools in music education?
Impact on Learning Outcomes	1. How do you assess the impact of digital tools on preschoolers' learning outcomes in music education? 2. Have you noticed any changes in children's musical abilities or interests since using digital tools? 3. What evidence or observations support the effectiveness of digital tools in enhancing learning outcomes?

3.4. Data Analysis

This study used a three-step thematic analysis method (Braun & Clarke, 2006) to find and explain interview data patterns. The first stage was data familiarity. This required iteratively analyzing

and assessing the transcribed interviews to understand the content and context. It was at this point that early notes and thoughts about prospective themes were recorded for future research. Additionally, the data was encoded precisely (Zaman et al., 2024). This involved identifying and classifying data related to research themes and issues, such as preschoolers' digital technology use and teacher professional development. The final step was content production. Examining and classifying the interview material revealed the main patterns and findings. Topics were assessed and defined to match data and study objectives. The research team had to compare and dispute throughout their iterative effort to maintain topic consistency and validity (Kwihangana, 2020). Thematic analysis organizes qualitative data to produce relevant findings impacted by participant perspectives and experiences.

3.5. Ethical Considerations

Ethics were considered in this study to protect participant rights. Participants were informed of the study's goals, methods, and dangers before the interviews (He & Zaman, 2024). The informed consent requirement was strictly followed. Study participants have to consent in writing (Aktan et al., 2024). All personally identifiable information was removed to ensure data privacy. Data was restricted and participant replies were encoded to ensure privacy. Password-protected transcript and recording folders are only accessible to approved study team members. Participants' identities and sensitive information were protected (Zaman, 2024). A thorough ethical review confirmed that the work followed all research ethics criteria. The research proposal was approved by an IRB or ethical committee. This license assures ethical research and participant rights throughout the project.

4. Findings

Thematic analysis showed several important digital instrument issues in early childhood music instruction (see Table 3). These themes examine how teachers, caregivers, and children use digital

Table 3
Themes and Sub-Themes

Theme	*Sub-theme*
1. Teachers' Perceptions of Digital Tools	1.1 Benefits of Integrating Digital Tools
	Enhanced engagement and interaction
	Improved access to diverse music resources
	1.2 Challenges and Barriers
	Technical issues and lack of training
	Resistance to change and adaptability
2. Effective Pedagogical Strategies	2.1 Professional Development
	Importance of continuous training and support
	Examples of successful professional development programs
	2.2 Classroom Implementation
	Strategies for integrating digital tools effectively
	Impact on teaching practices and student outcomes
3. Impact on Preschoolers' Engagement	3.1 Indicators of Engagement
	Observable signs of increased interest and participation
	Preschoolers’ feedback on digital tools
	3.2 Comparison with Traditional Methods
	Differences in engagement levels
	Parent and teacher observations
4. Parents' Perceptions of Digital Tools	4.1 Perceived Benefits for Children
	Cognitive and emotional development
	Enhanced motivation and enjoyment
	4.2 Concerns and Recommendations
	Screen time and content quality
	Suggestions for improving digital tool use in music education

tools. The issue is instructors' views on digital tools' pros and cons. Teachers were more involved and had more musical resources. They struggled to use these tools in their teaching due to technology restrictions and poor training. The second course analyzes and implements effective teaching approaches, emphasizing professional growth and classroom application. Teachers stressed the significance of ongoing training to integrate digital resources and share effective teaching practices. The impact of technology on student performance and teaching methods emphasizes the significance of professional development in maximizing technology use in education. The final topic is how digital devices affect babies. Digital technology has increased kids' interest and participation in music teaching, as seen by their positive comments and active participation. Digital technology increased engagement more than earlier methods, according to parents and teachers. The fourth topic concludes with parents' digital gadget pros and cons. Parents said digital technology boosts cognitive and emotional development, motivation, and pleasure. However, screen time content and duration were debated. They also proposed improving digital resource use in schooling.

4.1. Teachers' Perceptions of Digital Tools

4.1.1 Benefits of integrating digital tools

The poll revealed that participants had mixed opinions on using digital technologies in early childhood music education, highlighting both its pros and cons. Participants reported that digital tools increased student engagement and interaction. One participant stated, "Digital instruments have revolutionized the manner in which my students interact with music. They are more engaged in class" (P2). Another participant shared that interactive tool made music training more engaging, adding that children are actively investigating and connecting with musical ideas in a new way (P5). Digital technology also improved participation and provided easy access to a variety of musical tools. As one participant explained, "Different digital resources have benefited our music curriculum. We can now use musical instruments and explore genres that were previously unreachable internationally" (P7). Another participant noted that digital tools can considerably widen students' musical horizons by introducing them to new genres and historical contexts (P9).

4.1.2. Challenges and barriers

While digital tools promote access to educational resources and information, participants also identified several challenges in using these technologies. Technology-related issues were often cited as obstacles. One participant *mentioned*, "We often experience technical malfunctions with the software, which interrupt the progression of the lesson and can be exasperating for both educators and learners" (P12). Another participant acknowledged that while the tools are beneficial, the lack of training is a significant concern, stating that participants often had to figure things out on their own (P15). Participants emphasized the need for ongoing training and support to fully exploit digital tools. Resistance to change was another barrier, as one participant explained, "Certain individuals among my peers are reluctant to embrace novel technologies and prefer conventional approaches." This reluctance may prevent full adoption of digital tools (P18).

4.2. Effective Pedagogical Strategies

4.2.1. Professional development

Focusing on professional development and classroom implementation, the study revealed successful digital resource integration options for early childhood music education. Participants emphasized continued training and assistance. One participant said, "Continuous professional development is indispensable. More training makes me more comfortable utilizing digital tools in my classes" (P3). Another participant said attending seminars and getting help from colleagues had improved their classroom technology use (P8). Practical tactics and hands-on experience were equally important for professional development. One participant said, "The training sessions that have been most successful for me have included practical demonstrations and opportunities to

personally experiment with the tools. This pragmatic approach has considerably affected my technology use" (P11). Another participant noted the value of programs that allow colleagues to collaborate on digital tool ideas and experiences (P16). Many classroom digital device integration techniques were provided. One participant said, "I introduce digital tools by conducting clear and engaging exercises that students can easily understand." This incremental approach lets students understand technology without overwhelming them (P5). Digital and conventional teaching approaches work well together to improve learning, according to another participant (P14).

4.2.2. Classroom implementation

Participants shared how they utilized both digital resources and traditional teaching methods to maximize educational outcomes. They indicated that these strategies significantly improved student engagement and instruction. One participant noted that using digital tools has increased student motivation and involvement, saying that "When digital tools are used efficiently, children not only demonstrate heightened interest in learning but also demonstrate improved skills and understanding of musical concepts" (P12). Research findings indicate that integrating digital tools can enhance teaching practices and student learning experiences.

4.3. Impact on Preschoolers' Engagement

4.3.1. Indicators of engagement

The study explored the impact of digital tools on preschoolers' engagement in music instruction, shedding light on how these technologies influence learning, interaction, and interest. Participants observed several indicators of increased curiosity among young children. One participant reported, "There has been a significant rise in the level of enthusiasm and involvement among children following the introduction of digital technologies. The students are more engaged in class and eager to apply their knowledge" (P6). Another participant shared, "Interactive games and applications greatly improve children's involvement. They show interest and attentiveness, which are sometimes absent in traditional teaching techniques" (P10). Participants also highlighted that preschoolers' feedback further confirmed these findings, with one participant stating that children typically express a desire for more time with tablets and apps (P13). Another participant noted, "Students have conveyed their enthusiasm and pleasure in using the digital tools. Access to new technologies always excites them" (P19).

4.3.2. Comparison with traditional methods

Participants noted substantial differences in student engagement between digital and conventional methods. One participant remarked that digital tools are more effective at capturing children's attention than traditional methods, as children focus better during digital-based lessons (P2). Another participant observed, "There is a noticeable difference in the level of involvement that students have with digital tools compared to traditional activities. The former seems to captivate their attention for a longer duration" (P9). Participants also mentioned that parents have noticed their children's increased interest in music education since digital resources were incorporated into the curriculum. As one participant shared, parents have reported that their children talk more about music lessons at home and demonstrate excitement to share their new knowledge (P17). Another participant reiterated this by highlighting the strong link between school engagement and home enthusiasm (P22).

4.4. Parents' Perceptions of Digital Tools

4.4.1. Perceived benefits for children

The study also explored parents' views on the use of digital instruments in early childhood music education, revealing both benefits and concerns. Participants indicated that digital tools have positively influenced their children's cognitive and emotional development. One participant stated, "I've seen my child improve cognitive skills and emotional understanding as a result of the

interactive music apps. They understand musical concepts better and enjoy learning" (P4). Another participant shared, "My child's emotional development has been significantly enhanced by the digital tools. After music activities, they are more expressive and better comprehend their emotions" (P8). Additionally, participants suggested that digital tools increase children's motivation and enjoyment. One participant expressed, "My child is extremely motivated when it comes to music instruction using digital tools. They always enjoy trying new things and using apps" (P12). Another participant mentioned that children frequently discuss their music classes at home and are eager to demonstrate what they have learned (P18). These findings align with evidence suggesting that technology helps engage children in education by making learning more interactive and enjoyable.

4.4.2. Concerns and recommendations

However, participants also voiced concerns about the use of digital tools in the classroom, particularly regarding screen time. One participant stated, "While I see the benefits, I'm concerned about how much screen time my child is getting. It is critical to balance digital activities with other forms of learning" (P7). Another participant stressed the importance of screen time monitoring to avoid distractions (P15). Participants also questioned content quality. A participant questioned the educational usefulness of some applications, emphasizing the necessity to expose children to suitable information (P21). Another participant advised prioritizing educationally beneficial digital technologies (P18). Participants suggested giving parents clear instructions on how to utilize digital technology at home to promote learning when adding digital instruments into music education. One participant proposed that teachers and parents communicate about digital technology's benefits and use to better control children's screen time (P16). These proposals emphasize the need of educator-parent engagement and openness in early childhood technology integration.

5. Discussion

This study evaluated how digital resources impact preschool music education, including teaching approaches, parent and teacher attitudes, and preschooler involvement. The findings suggest digital tools can boost learning and engagement. They provide challenges. The study reveals how digital technologies engage and teach and suggests improvements. Teachers' views on digital technologies in early childhood music instruction are examined in this subject. Instructors believed digital technology will increase student involvement and music materials, according to the poll. It supports studies on the perceived benefits of digital tool integration in the curriculum. Teachers saw that digital materials improved classroom engagement and student attention, boosting learning. Including essential topics illustrates how digital technologies boost resource accessibility and engagement. Teacher observations show that multimedia and interactive music sessions interest students. These findings support prior research indicating digital technology can engage students through engaging and interactive learning experiences (Tuyen, 2022). This advances study on how technology might improve inquiry and learning (Chen et al., 2023).

A range of musical exercises for young children illustrates how digital technology may improve instructional material. Digital tool concerns were found throughout the inquiry. Tech issues and poor training were highlighted as impediments. Software issues and inexperience with digital tools might hinder classroom use, according to teachers. These findings support research that finds technological barriers to digital technology in education (Khamsuk & Whanchit, 2021). Previous research has shown that technical issues and technology integration require adequate training and support (Freeland et al., 2022). Digital technology adoption was influenced by resistance to change and adaptability, demonstrating ongoing challenges in integrating technology into education. Sabiri's (2020) technology adoption study found that resistance to change can limit digital technology integration in education. Comparing our findings to the literature shows that digital technologies have similar pros and cons. Studies have shown that digital technologies improve

resource accessibility and engagement (Loi & Thanh, 2022). Although this study found technical and training issues, earlier research has stressed the importance of professional development and successful implementation. Successful integration required constant professional progress and correct use of digital tools, according to the report. The findings imply instructors need ongoing training and assistance to use digital technologies effectively (Baz, 2016). Teacher professional development improves instructional methods and digital resource use. Professional development programs give educators the skills and knowledge to properly integrate technology. According to Aukerman and Chambers Schuldt (2021), professional development improves teaching and students' achievement. Effective classroom approaches were also shown to be essential. Teacher usage of digital tools was improved by clear and explicit protocols. This study supports the research question on instructional practices and digital technology use. Prior research shows that well-designed implementation methods can considerably improve instructional technology. The findings support past study on professional progress and strategy implementation compared to the literature. Prior research has stressed the need of training and preparation for digital resource use. This study found that these components improve teaching and student outcomes (Cameron et al., 2022). This inquiry documents specific tactics and successful implementations of these methodologies, providing new insights into their practical applications.

The study's findings on preschooler engagement imply that digital technologies significantly affect children's music participation. The study shows that preschoolers' interest increases when they use digital tools. With the use of digital technologies, preschoolers showed increased enthusiasm and involvement in music activities, improving their learning experience. The findings show that digital technologies make learning more fun and participatory for young children. This supports the literature that digital tools can engage youngsters and encourage their participation (Christodoulakis et al., 2021). Preschoolers' increased curiosity and involvement match previous research on how technology makes instruction more appealing to young learners. Digital methods often engage more than traditional ones. This highlights how digital technologies improve education compared to traditional methods. Previous research has indicated that technology can offer new opportunities for interaction and discovery. Digital technologies can boost participation, but conventional techniques are still important (Madariaga et al., 2023). The research acknowledges that digital tools increase involvement, yet there are still challenges and factors. Using these technologies efficiently requires careful management to avoid overreliance on technology. This coincides with academic discussions on balancing traditional learning methods with technology to improve education. Research on parental attitudes towards digital gadgets shows both praise and criticism. Parents believe digital tools help their children's cognitive and emotional development, motivating and enjoying school. The benefits of digital tools from parents' perspectives are examined in this study. According to Adkins and Selkie (2020) that shows technology improves motivation and involvement, parents say digital tools help their children grow and love learning. Parents worried about material quality and screen time, despite the benefits. The study highlights potential drawbacks, which correlate with literature on screen time and baby development and the importance of high-quality instructional content (Pongutta & Vithayarungruangsri, 2023). Parents' concerns about screen time emphasize the need to monitor technology use to avoid harm. Their emphasis on content quality underlines the need to ensure that digital technologies offer age-appropriate and relevant educational experiences. Parents suggest clearer instructions and better administration to improve digital resource use. These ideas suggest that teachers and parents should communicate more about technology in education. The literature highlights the need for clear norms and teamwork to ethically and effectively integrate technology into education. This study examines the pros and cons of digital technologies in early childhood music education from parents' and instructors' perspectives. It emphasizes screen time, content quality, integration, and professional development. The findings support prior studies on digital technology's benefits, but they also highlight the need for more research to assure its efficacy in education.

6. Conclusion

The study's conclusion summarizes the key findings on digital tools in preschool music instruction and their implications on parents, teachers, and preschoolers. The purpose of this study was to examine how digital technologies affect teaching methods, engagement, and attitudes and offer suggestions for their use. The research shows that digital technologies help early childhood music training by increasing interaction and providing a variety of tools. Teachers found that digital tools engaged and excited toddlers, supporting earlier studies on technology's role in engaging learning environments. Digital technology' capacity to give interactive and multimedia information improves educational experiences, boosting student interest and engagement.

However, the inquiry discovered many digital instrument issues. Technical concerns and insufficient training were the biggest barriers to classroom technology integration. These findings underline the necessity for instructors to have technical support and professional training to maximize digital tool use. The awareness of resistance to change and flexibility as characteristics that hinder digital technology implementation in education highlighted the ongoing challenge. Digital technologies work best with well-defined implementation plans and ongoing professional development, according to educational strategy research. Teachers who received ongoing training used digital resources and instructional practices better. Early childhood education technology integration requires strategic planning and well-designed professional development programs. Optimizing digital resources to increase student learning and instruction requires robust support systems and effective classroom technology integration tactics. The increased interest and participation of preschoolers in music sessions shows the impact of digital technologies. This study shows that technology engages young children better than traditional teaching methods. The study stressed the significance of limiting screen usage and viewing high-quality information to avoid negative effects and provide educational opportunities.

Parental views on digital technology differed. Parents saw their children's study motivation increase as they acknowledged digital technology's cognitive and emotional benefits. Concerns were raised about the screen's content and duration. Having robust and comprehensive educational technology standards and continuously monitoring their application is crucial. Parents' ideas for increasing digital tool use emphasize the need for educators and families to work together to utilize technology morally and efficiently.

7. Implications

7.1. Practical Implications

This discovery is significant for child music educators. Before using digital materials, instructors must complete rigorous professional development programs. Training programs should include new technology's technical features and how to integrate them into curriculum to boost learning. Instructors should collaborate and share their best methods. This fosters a learning environment that helps overcome obstacles. Continuous professional development is essential. Instructors should specify digital resources properly. This involves creating clear digital technology goals for courses to meet educational goals, assessing their impact on student engagement and learning, and planning effective integration. Teachers need resources and support to overcome technical issues and change their methods. Strategic use of digital resources can improve instructor effectiveness and complement traditional teaching methods. Music instruction for kids utilizing digital instruments. Digital instruments should be chosen for their ability to improve music education and meet educational goals. Interactive multimedia helps preschoolers learn because they are curious. Helping young children develop requires age-appropriate and well-designed tools. Instructors should also balance digital and non-digital activities. Modern technologies and old methods must be used to provide a complete education. This equilibrium makes technology useful for practice and learning. Finally, educators should let pupils use digital tools and explore. This

strategy boosts student engagement and digital literacy. Teachers should evaluate and adjust their digital technology utilization for student learning depending on feedback and results.

7.2. Implications for Theory and Policy

The report finds five key areas where educational officials can make big changes. Governments should promote digital tool standards in education. These criteria ensure that educational materials for young children are safe, effective, and appropriate. Policies must also encourage the use of digital tools in the curriculum utilizing research-based methods to inform decision-making and implementation. Authorities must also fund professional development courses that emphasize digital resource use. This money should be utilized for workshops, seminars, and joint projects to keep instructors up to date on technology and best practices. To effectively use digital tools in the classroom, teachers must priorities professional development. There is widespread support for digital tools in early childhood education. Policymakers should support technology use with infrastructure and resources (Zaman, 2023). Educational institutions need trustworthy technology, high-quality digital resources, and enough internet access. Policymakers should also encourage educators, technology developers, and academics to collaborate on instructional digital technologies. To make digital technologies realistic instructional aids, governments can collaborate and get instructor input. Digital education rules and best practices must address material quality and screen time in the classroom. The standards should emphasize making digital material suitable for education and development and aligning technology with other learning activities.

8. Limitations and Future Direction

Based on the findings of this study, several critical areas warrant further investigation to deepen our understanding of digital technologies in early childhood music instruction and their broader implications. Future research can address existing knowledge gaps and explore emerging trends to better define the role of technology in early education.

Longitudinal studies are particularly needed to examine the long-term effects of digital tools on preschoolers' development and learning outcomes. While this study provides insight into immediate engagement and perceptions, it is equally important to understand how these technologies influence children's cognitive, social, and emotional development over time. Long-term investigations can reveal how digital tools shape skill acquisition, academic achievement, and attitudes toward learning throughout early childhood.

Comparative studies across diverse educational contexts are also essential. Examining the use of digital technologies in urban versus rural schools, or in public versus private institutions, can help identify setting-specific successes and challenges. Such research would inform the adaptation of digital technologies to varied educational environments and enhance equity in implementation.

Moreover, the integration of digital technologies across different domains of early childhood education—beyond music instruction—deserves further exploration. Investigating their impact on literacy, numeracy, and social-emotional skills can contribute to the development of more comprehensive and cohesive technology integration strategies across the curriculum. Understanding the range and application of digital tools across subject areas may lead to more effective and inclusive learning environments.

Another critical area of inquiry involves identifying effective professional development models that empower educators to adopt digital resources confidently. Research is needed to determine the most impactful training approaches for fostering digital competence and promoting sustained technology use in instructional practices.

Additionally, future research should examine how digital technologies affect academic performance, student participation, critical thinking, and creativity. Identifying the most suitable tools for different educational objectives—both individual and collective—can enhance the strategic use of technology in early learning settings.

Parental perspectives also merit deeper investigation. Future studies could explore how parental behaviors, attitudes, and home monitoring practices influence the effectiveness of digital technologies in supporting children's learning. Understanding the dynamics between home and school technology use may uncover new strategies for fostering productive family-educator partnerships.

Finally, staying abreast of technological advancements is imperative. Ongoing evaluation of innovations such as artificial intelligence, augmented reality, and virtual reality is essential to ensure that early childhood education evolves in alignment with the needs and capacities of young learners. Research in this area can inform the thoughtful and developmentally appropriate integration of cutting-edge technologies in educational settings.

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