The Impact of Training on Professional Development to Integrate Technology into the Classroom among Preschool Teachers.

Izawati Ngadni, You Zhi Cing

Faculty of Education and Humanities, UNITAR International University

DOI: https://dx.doi.org/10.47772/IJRISS.2025.906000421

Received: 15 June 2025; Accepted: 20 June 2025; Published: 21 July 2025

ABSTRACT

This study explores the impact of teacher training programs on the professional development of preschool teachers in integrating technology into classroom practices within the Klang Valley. As technology-enhanced learning becomes increasingly important in early childhood education, evaluating the effectiveness of such training is essential. Adopting a qualitative research design, this study utilizes two methods—interviews and classroom observations—to examine the perceptions, experiences, and outcomes of teacher training initiatives. Three preschool teachers volunteered to participate in this research.

Findings reveal that while teachers encountered challenges and limitations in implementing technology, the training programs significantly enhanced their technological knowledge and skills. This improvement boosted their confidence in integrating digital tools effectively into early childhood classrooms. Additionally, participants demonstrated the ability to apply technology alongside sound pedagogical practices, which positively influenced children's engagement, concentration, and comprehension of lesson content.

The results underscore the importance of well-designed and targeted teacher training programs in supporting preschool teachers' professional growth in technology integration. Based on these findings, the study provides recommendations for education policymakers, institutions, and stakeholders to develop and implement effective and high-quality training programs that address the specific needs of early childhood educators.

Keywords: Teacher training, Integration technologies, preschool teachers, professional development, Classroom

INTRODUCTION

Background of Study

The preschool years represent a critical stage in children's development, where the primary goal is to explore and understand the world around them. During this period, children are naturally curious and eager to engage with their environment, making it important for caregivers and educators to provide meaningful and stimulating interactions. According to Nurdiantami and Agil (2020), caregiver involvement plays a crucial role in promoting children's holistic growth during these early years. However, in the digital age, one of the challenges that arise is the increasing reliance on digital media by parents, who often use it as a stand-in for human interaction—treating digital devices as non-human "actors" in their children's play.

The rapid evolution of technology has greatly affected all sectors of society, including education. Around the world, digital tools are being integrated into early learning environments. For example, Swedish classrooms have used interactive whiteboards to enhance teaching (Bourbour, 2020), while in Turkey, tablets, smartphones, electronic toys and digital machines are increasingly used in early childhood settings (Konca & Erden, 2021). Both U.S. and Malaysian studies (Nurdiantami & Agil, 2020; Nathan et al., 2022) confirm that children are frequently exposed to digital media at home from a very young age, mainly for entertainment and educational purposes.

When used appropriately, technology can support and enrich early childhood development. As Rasmani et al. (2023) point out, digital tools can enhance children's cognitive abilities, including vocabulary growth, hand-eye coordination, and fine motor skills. In addition, technology supports the development of creativity, problem-

solving, digital literacy, and teamwork. It also offers opportunities for collaboration across geographical boundaries, helping children develop essential 21st century skills that prepare them for a globally connected world.

Despite its benefits, excessive or unsupervised use of technology can have adverse effects on young children's development. Prolonged screen time and radiation exposure can lead to health-related issues, such as delayed speech, impaired cognitive development, and conditions such as phantom limb syndrome (Zain et al., 2022). These negative results highlight the importance of balancing digital interactions with traditional forms of learning and ensuring that children's screen time is meaningful, guided, and developmentally appropriate.

In response to the increasing presence of technology in everyday life, the integration of digital tools into preschool classrooms has become increasingly important. Technology can serve as a valuable aid for teachers, enhancing the teaching and learning experience (Altun, 2019). However, successful integration depends on teachers' ability to effectively use and manage digital resources. As emphasized by Ali et al. (2021), preschool teachers must be willing to explore, experiment with, and evaluate the various digital devices used by their students to ensure their suitability for early learning settings.

Given the critical role that teachers play in technology integration, understanding the impact of teacher training on their professional development is essential. Equipping preschool educators with the necessary skills and knowledge enables them to harness the potential of technology to enhance children's learning experiences. High-quality training programs not only increase teachers' confidence in using digital tools but also promote effective and responsible use of technology in early childhood classrooms. Therefore, investing in professional development is a key strategy for fostering meaningful technology integration and maximizing its benefits in early childhood education.

Statement of the problem

In the United States, preschoolers are given the opportunity to engage with a variety of technological devices such as tablets, smartphones, computers, and televisions for educational purposes (Dore & Dynia, 2020). Research shows that U.S. preschool teachers effectively integrate technology into the classroom while responsibly managing screen time by setting daily and weekly limits. In contrast, the situation in Malaysia presents several challenges. Although teachers recognize the value of technology and use it for administrative tasks (Tajuddin & Bakar, 2023), its application in classroom teaching remains limited. This gap is largely due to a lack of equipment, insufficient experience, and insufficient training in using digital tools with children. Studies by Sulistyaningtyas et al. (2023) further reveal that many teachers in Malaysian private preschools shy away from incorporating technology into their curriculum. Findings show that 66.7% of teachers lack the knowledge to use technology effectively, while 62.5% struggle due to limited technical support, time constraints, and inadequate ICT training (Aditya et al., 2022). In addition, many educators have negative attitudes toward the use of digital tools in teaching. These issues highlight the urgent need for structured and ongoing teacher training programs to equip preschool educators with the skills and confidence to integrate technology into their classrooms. As highlighted by Basilotta-Gómez-Pablos et al. (2022), providing adequate support and professional development is essential to fostering effective use of technology in early childhood education. Therefore, this research is important in examining the impact of teacher training on technology integration and raising public awareness of its importance in improving teaching practices.

Objectives of study

1. To assess the impact of the training on teachers' knowledge, skills, and confidence in integrating technology.
2. To evaluate the impact of integration of technology on teachers' pedagogical approaches and student outcomes.

Study Questions

i) How is the impact of training on teachers' knowledge, skills, and confidence in integrating technology?
ii) How is the impact of technology integration on teachers' pedagogical approaches and student outcomes?

Method of Study

To effectively answer the research questions, qualitative data collection techniques were used. The two main techniques used were semi-structured interviews and classroom observations. Interviews provided rich and in-depth insights into teachers' perceptions, experiences, and reflections on how training influenced their understanding and use of technology. Classroom observations were conducted to validate and complement the interview data by documenting how teachers applied what they learned during training into actual teaching practice. These techniques allowed the researcher to explore both the perceived and practical aspects of technology integration in preschool classrooms.

The instruments were carefully designed to ensure alignment with the research questions and the qualitative nature of the study. For the interviews, an interview protocol with open-ended questions was developed based on themes related to pedagogical knowledge, beliefs, and practices. These questions encouraged participants to share their training experiences and describe how they implemented technology in their classrooms. For the observations, an observation checklist was used to systematically record the types of technology used, children's responses, and how the teacher facilitated the activities. Additionally, an audio recorder was used during the interviews to ensure accuracy in transcription, while field notes were taken to capture contextual and behavioral data during the classroom visits.

LITERATURE REVIEW

Technology Integration in Education

In Malaysia, the Malaysia Educational Blueprint 2013 to 2025 (Malaysian Ministry of Education, 2013) set Malaysia's goals and plans for changing its educational system. In this, Malaysian education had planned to adapt and apply technologies in the classroom to increase the accessibility of educational resources, improve administrative tasks, and strengthen teaching and learning processes. In Malaysia, initiatives have been 11 undertaken to upgrade the ICT infrastructure in schools, with the provision of computer laboratories, internet access, and multimedia materials among other things (Ariff, 2021). The 1BestariNet initiative was started in 2011 to provide schools with digital learning tools and high-speed internet connectivity such as 4g connectivity (SoyaCincau, 2016). Moreover, Malaysian education does provide digital learning platforms and digital tools such as FrogVLE and Google Classroom. According to MYGOV (n.d.), Frog VLE is a type of cloud-based system that offers mobility and flexibility outside of classrooms. Anywhere with an Internet connection may access files and data stored in the cloud.

Technology Integration in Preschool Education

A growing body of research highlights the increasing use and importance of a variety of technology tools in early childhood classrooms. Devices such as laptops, tablets, televisions, computers, projectors, smartphones, smart toys, interactive whiteboards, and MP3 players are commonly used to support children's academic development, literacy, social communication, programming skills, real-world understanding, and emotional growth (Paul et al., 2023; Ogegbo & Aina, 2020; Unknown et al., 2020; Rahmat et al. 2021). Technology-based interventions have shown positive effects for children with special needs; for example, tablets have improved outcomes for those with neurodevelopmental disorders, while video modelling has benefited children with autism spectrum disorders (Paul et al., 2023). Despite these advantages, technology integration in preschool settings differs significantly from primary or secondary education due to age-specific considerations, such as appropriate screen time limits. A study in Turkey (Konca & Erden, 2021) found that preschool teachers primarily used computers for music and video activities, with limited use of tablets and video cameras. The same study revealed that teachers were more likely to use technology for lesson preparation than for direct teaching. In Malaysia, a similar trend was observed, with limited use of technology in children's learning due to insufficient resources and a strong relationship between technology use and teaching experience—more experienced teachers tend to integrate technology more effectively (Tajuddin & Bakar, 2023). Furthermore, a recent study by Aldhilan (2024) examining the perceptions of in-service preschool teachers found that while many acknowledged the limitations of current ICT practices, the majority still recognized its effectiveness and potential benefits for children's learning. Collectively, these findings suggest that despite ongoing challenges, there is a growing

recognition among educators of the value of technology in early childhood education.

The Impact of Teacher Training on Teacher's Knowledge and Technological Skills

Recent research highlights the close relationship between teachers' technological knowledge and skills, which are fundamental components of the Technology Pedagogical Content Knowledge (TPACK) framework. This element is essential for effective technology integration in early childhood classrooms. For example, Pérez-Jorge et al. (2020) found that preschool pre-service teachers acknowledged the importance of ICT training and demonstrated the ability to design digital lessons, plan curriculum using online tools, and assess children's progress with technology. Interestingly, these pre-service teachers often demonstrated greater proficiency in using digital tools than their ECE professors, highlighting a shift toward digital native educators who value collaboration and innovation. In a separate study, Leoste et al. (2022) conducted STEAM training with preschool and elementary school teachers, revealing significant improvements in digital skills after training, including the use of educational games, robots, and VR/AR technologies. This suggests that targeted training can elevate teachers from novice to expert in applying technology to pedagogy. Similarly, Zainal and Zainuddin (2020) reviewed 25 Malaysian studies and highlighted that teacher training—through collaborative partnerships, reflective practices, and exposure to global education strategies—enhances educators' understanding and application of technology, supporting quality teaching and student assessment. Diamah et al. (2022) further confirmed this through a TPACK-based online course where pre-service teachers showed a 5.51% increase in post-test scores, reinforcing the effectiveness of structured training in increasing technological competence and confidence. Additionally, Nordin et al. (2023) and Alotaibi (2023) emphasized that teachers' competence in using modern tools such as software and video resources is essential for effective classroom efficiency and planning. They recommended that schools ensure access to reliable digital infrastructure and ongoing support to empower educators to meaningfully integrate technology into their teaching practices. Collectively, these studies highlight that comprehensive teacher training is essential in enhancing technology integration in preschool education, ultimately benefiting both educators and students.

The Impact of technology integration on teachers' pedagogical approaches and student outcomes

Research consistently shows that technology integration significantly improves preschool teachers' pedagogical practices and positively impacts children's learning outcomes. Eleftheriadi et al. (2021) compared two groups of preschool teachers—those who used minimal technology (the TA group) and those who actively integrated digital tools into mathematics instruction (the TB group). The TB group used a variety of educational technologies such as Bee-Bot, Wordwall, and TuxPaint to support exploratory and concept-based learning, leading to greater engagement, motivation, understanding, and even increased self-esteem among children. Similarly, Diamah et al. (2022) highlighted how pre-service teachers, through targeted training and classroom practice, observed that children responded more creatively and interactively when digital tools were used beyond passive content consumption. Bourbour (2020) demonstrated the effectiveness of interactive whiteboards in Swedish preschools, demonstrating how they facilitated whole-group discussion, visible problem solving, and real-time instructional access. However, the study also showed limitations, such as reduced interpersonal interaction and mobility due to the fixed nature of technology. Expanding on a broader trend, Undheim (2021) analyzed 35 studies and found that children in ECCE settings benefit from digital play, open-ended applications, and creative exploration through media such as video making, coding, and photography, especially when guided by knowledgeable teachers. Collectively, these findings illustrate that the type and depth of technology used in preschool classrooms shapes pedagogical approaches and can enrich children's cognitive, social, and creative development when implemented thoughtfully.

FINDINGS AND ANALYSIS

The qualitative data collected were analyzed using thematic analysis, a method that allows for the identification and interpretation of patterns in the data. Following Braun and Clarke's six-step framework, the researcher first familiarized herself with the data through transcription and repeated reading. Next, initial codes were generated to capture meaningful segments of the data, which were then grouped into potential themes. These themes were reviewed and refined to ensure they accurately reflected the data and answered the research questions. Thematic analysis was applied to both the interview transcripts and observation notes to identify consistent themes such

as “confidence in using technology,” “benefits of interactive tools,” and “barriers to implementation" (Naeem et al., 2023).

To manage and analyse qualitative data, a combination of manual and digital tools was used. Microsoft Word and Excel were used to organize interview transcripts, code responses, and create data matrices that aligned emerging themes with each research question and participant.

The impact of the training on teachers' knowledge, skills, and confidence in integrating technology.

Teacher’s Knowledge and skills

Table I Technological Knowledge and Skills

Participants	**Participants’ Technological Knowledge and Skills**	
	Type of training	**Knowledge and Skills learned**
P1	Alilo Robot, Tacobot, Kahoot, and Quiz	Robot: ‘Coding allowed us to communicate with devices such as traffic lights, computers, ATMs, etc’ ‘Kahoot and Quiz training makes my preparation for class more easily as Kahoot and Quiz able to allows me to create interactive quiz games’
	Learn different websites (Wordwall and Quizizz) Master Microsoft applications (Microsoft Word, Microsoft PowerPoint, and Microsoft Excel)	Become a creative teacher by exploring various technology devices and trying out different applications.
P2 P3	Program training (Brand A robot and child coding program training)	Plan developmentally appropriate activities that thoughtfully integrate technology by learning how to select suitable tools and resources, how to use them effectively, and how they support and enhance children’s learning and development.
P4	Microsoft Office (Word, PowerPoint, Excel), Adobe Illustrator, Procreate and Photoshop	Teachers were introduced to software and applications such as Microsoft Office (Word, PowerPoint, Excel), Adobe Illustrator, Procreate and Photoshop. This training focused on helping teachers create interactive slides, multimedia content and digital artwork, which can be integrated into their teaching. This type of training supports the development of technical and creative digital skills.
P5	STEAM (Science, Technology, Engineering, Arts, Mathematics)	These courses include pre- and post-tests, practical activities and opportunities for digital lesson planning. It is a structured and modular form of training delivered virtually, which is useful for flexibility and scalability.

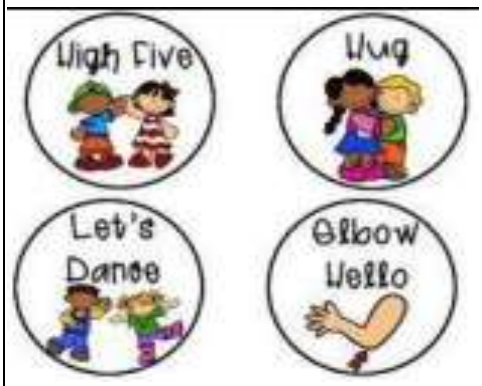
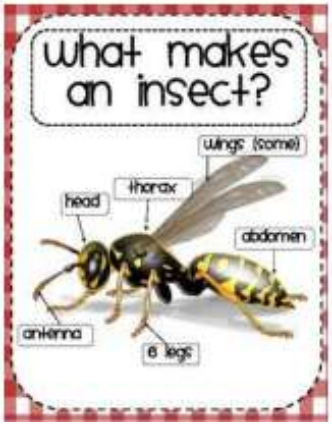
Based on Table 1, all participating teachers gained valuable knowledge and skills in technology through various teacher training programs, demonstrating the positive impact of the training on their professional development. For example, P1 learned to use tools such as Alilo Robot, Tacobot, Kahoot and Quiz during a preschool training session, where the trainer demonstrated how to manipulate these technologies effectively. As a result, P1 recognized the value of learning coding as a way to improve communication with digital devices and appreciated how tools such as Kahoot and Quiz can facilitate lesson planning by enabling interactive games. Similarly, P2 gained skills in Microsoft Office, Adobe Illustrator, Wordwall, Quizziz, Procreate, and Photoshop through university courses, preschool training, and self-exploration during the training. This exposure increased P3’s confidence in using technology creatively in the classroom. Meanwhile, P3 developed a strong foundation in

science, mathematics, and technology at university, which was further strengthened through participation in Brand A robot training and a children's coding program at preschool. With this experience, P3s are now able to design developmentally appropriate technology-integrated learning activities and confidently select appropriate digital tools for young learners.

The Impact of technology integration on teachers' pedagogical approaches and student outcomes.

Table 2 Teacher's Pedagogical Approaches

Participants	**Pedagogical Approaches**	
	Approach	**Knowledge and Skills learned**
P1	Tacobot, Alilo Robot, Kahoot, quiz to create quizzz and let the children to answer.'  Figure 1: Tacobot  Figure 2: How child use Tacobot	In Observation 1, Teacher P1 played a simple game with the children. A large sheet of paper with 9 squares was used, each containing a letter related to a body part. The Tacobot was placed on one of the squares. Teacher C showed pictures of body parts, such as "head," and then each child took turns guiding the Tacobot to spell the word by pressing buttons to move it in different directions—for example, to the letters H, E, A, and D. All the children watched and spelled the word together. When one child made a mistake, another helped by using sign language, and the first child corrected the Tacobot's path. After that, Teacher P1 used Kahoot on the computer to ask questions. Child E used the mouse to select the correct answer, and everyone applauded for him.
	setting up the projector and computer, ensuring the slides and videos run smoothly, and getting the games ready to be used.  Figure 3: Slides Teacher P2 use  Figure 4: Slides of the activities	In Observation 2, Teacher P2 introduced the topic "My Lovely Pet" using animated slides with lively music projected on the screen. The music played automatically with the slides until Teacher C stopped it. After explaining the class rules, Teacher P2 made the lesson interactive by playing the sounds of pets for the children to guess the animals. During the activity, Teacher C also guided Child A on how to use the Procreate app by showing the steps when the child asked for help.

P2 P3	Laptop and Projector  Figure 5: Slides used for greetings  Figure 6: Slides about different insects  Figure 7: Slides about the characteristics of insects	Teacher P3 sets up her laptop and connects it to the projector in a class of five-year-olds. She shows a slide and asks the children to choose how they want to greet her. The children point and greet her in the way they like. Next, she introduces the topic of "Insects" and asks open-ended questions such as "What are insects?" and "What do they eat?" Some children answer correctly, while others make creative guesses. Teacher P3 then plays videos of insects such as ladybugs and butterflies, and discusses their characteristics based on what the children observe. She highlights the characteristics of insects in the enlarged pictures. After summarizing their answers, she shows the next slide. Then, in the park, she asks the children to sit in pairs and explains the rules for using the camera. The children repeat the rules: take turns and handle the camera carefully.
P4	Supports a more dynamic and creative teaching approach.	**Microsoft Word** can be used to create customized worksheets, story templates, and activity sheets tailored to children's developmental levels. **PowerPoint** serves as an interactive visual tool to introduce concepts through colourful slides, animations, and embedded sounds or videos, making lessons more engaging and easier for young children to understand. **Microsoft Excel** allows teachers to track student progress, behavior logs, and daily attendance efficiently, helping to inform planning and differentiation. On the creative side, **Adobe Illustrator and Photoshop** empower teachers to design high-quality visual aids, flashcards, and thematic displays that appeal to visual learners

P5	Integrated, hands-on, and inquiry-based learning that nurtures young children's curiosity, creativity, and critical thinking.	The STEAM teaching approach in early childhood education integrates Science, Technology, Engineering, Arts, and Mathematics through hands-on, inquiry-based activities. Children explore scientific concepts, use age-appropriate digital tools, build and design structures, express creativity through art, and learn math through games and manipulatives. The approach encourages curiosity, creativity, problem-solving, and real-world connections. Teachers guide children as facilitators, promoting active learning and collaboration while preparing them with essential 21st-century skills.

Based on Table 3, all participants integrated technology into their classrooms using similar devices but with different applications. P1 used the Tacobot in the first lesson, encouraging children to physically operate the robot to answer questions and complete activities. P1 also incorporated Kahoot at the end of the lesson to reinforce children's spelling of body parts. P2 utilized projectors, computers, and iPads throughout the lesson, making early preparations to ensure all connections, applications, and slides were ready. The slides included animal sounds and background music to create an engaging classroom atmosphere. Children used their own or borrowed iPads for a digital drawing activity. Similarly, P3 used projectors and computers, integrating slides and video clips to teach about various insects and their characteristics. During activity time, children were given opportunities to take turns using a camera.

Students' Outcomes

Student outcomes improved when teachers integrated technology into the classroom. Based on interviews and observations, children across all participating classrooms demonstrated high levels of participation and engagement. In the P1 classroom, children could answer questions physically using a robot and digitally via a computer. In the P2 classroom, children actively volunteered to answer or ask questions by enthusiastically raising their hands. In the P3 classroom, despite minor problems with limited technology resources, children expressed enjoyment and excitement about the lessons. Overall, at the end of each session, most children were able to effectively remember and retain the lesson content.

Children also showed improvements in their problem-solving skills and critical thinking abilities. P1 observed that children used their existing knowledge to answer questions across different topics. P2 emphasized that open-ended learning plays an important role in improving children's thinking skills. Meanwhile, P3 believed that children develop these skills through a variety of hands-on experiences. Overall, it was evident that when children are exposed to more meaningful and engaging learning opportunities, their critical thinking and problem-solving abilities are strengthened.

According to participants and 5 (P4 and P5), children's learning outcomes from an integrated, hands-on, inquiry-based approach using digital tools such as Microsoft Office, Adobe Illustrator, Procreate and Photoshop include enhanced curiosity, creativity, critical thinking and problem-solving skills. These tools support early digital literacy, encourage visual expression, foster collaboration and build confidence. Overall, children become more engaged, independent and capable learners who are prepared to meet the academic and technological demands of the future.

DISCUSSION AND CONCLUSION

Teachers' Technological Knowledge and Skills

According to Pérez-Jorge et al. (2020), teacher training equips educators with the ability to explore a variety of software and develop digital lessons, activities, and materials that are appropriate for children. This is supported by the experiences of all three participants in the study, who gained valuable knowledge and skills in using

different technology tools through their training. For example, P1 learned to manipulate Alilo Robot, Tacobot, and platforms such as Kahoot and Quiz, which increased understanding of coding and enabled the creation of interactive classroom games. P2 became more creative in using technology after exploring a variety of tools such as Microsoft Office applications, Adobe Illustrator, Procreate, Photoshop, Wordwall, and Quizizz, often learning through self-exploration as encouraged by the trainer. P3, through university- and preschool-based training, acquired basic knowledge in early science and mathematics, participated in Brand A robots and coding exercises, and developed the ability to select appropriate digital tools and plan developmentally appropriate technology-integrated activities. This learning experience is in line with the literature, including Leoste et al. (2022), who emphasized the importance of training in technologies such as educational games, robots, VR, and AR. Furthermore, all participants reported increased confidence in using technology after training. P1, initially preferring traditional teaching, felt more assured after learning to integrate robots; P3 attributed the increased confidence to hands-on teaching practices; and P4 emphasized confidence in choosing the right tools that benefit children's learning. This is consistent with findings by Zainal and Zainuddin (2020) and Diamah et al. (2022), who concluded that teacher training increases educators' confidence and competence in using modern digital resources effectively in the classroom.

Teachers' pedagogical approaches

Based on interviews and observations, all three participants demonstrated effective technology integration in their classrooms, consistent with what they shared during interviews. P1 incorporated Tacobot, Alilo Robot, Kahoot, and Quiz into the lesson. During the observation, P1 used Tacobot as an interactive tool by allowing children to physically operate it to complete activities related to the lesson topic. To reinforce learning, P1 concluded the session with a Kahoot game to help children remember and achieve the lesson objectives. P2 emphasized the importance of advance preparation by providing all necessary devices before class. P2 used AI to design interactive slides, added sound effects to engage children in a guessing game about pets, and gave children the opportunity to make digital drawings using iPads. Similarly, P3 effectively integrated technology by using a projector to present slides on various types of insects and their characteristics. During the hands-on activities, P3 allowed children to use the camera to take pictures of the insects they found. These observations confirmed that all participants actively used the technologies they mentioned during the interviews, demonstrating meaningful and purposeful integration of digital tools in the early childhood classroom.

Students' outcomes

According to Eleftheriadi et al. (2021), a technology-rich learning environment increases children's engagement, focus, and motivation, leading to better understanding of lesson concepts. This is consistent with the student outcomes observed in this study. All three participants—P1, P2, and P3—reported that children were more engaged, attentive, and eager to participate, especially during the closing of the lesson. Observations confirmed that many children actively volunteered to answer questions, with only a small number requiring minimal guidance. This suggests that the integration of technology helps children better understand lesson content and achieve learning objectives. In addition, participants noted an increase in children's problem-solving and critical thinking skills. P2 and P3 emphasized that these outcomes also depend on the way the lesson is conducted, not just the presence of technology. However, the use of open digital tools allows children to explore, interact, collaborate, and create, cultivating critical thinking and creativity, as supported by Undheim (2021). P2 emphasized the importance of open-ended activities in promoting deeper learning and cognitive development.

In addition, according to Lee, B. N. (2023), integrating digital tools like Microsoft Office, Adobe Illustrator, Procreate, and Photoshop into inquiry-based learning practically enhances children's curiosity, creativity, and critical thinking. These tools support digital literacy and self-expression, allowing children to explore concepts through interactive and meaningful activities. They also encourage problem-solving, collaboration, and communication skills, while building confidence and preparing children for the academic and technological demands of the future. Overall, this integrated approach fosters holistic development and makes learning more engaging, relevant, and impactful for young children.

Implications

Based on the findings of this study, preschool teachers face several challenges when integrating technology into

their teaching practices. However, the results also show that teacher training in the use of technology significantly improves their knowledge, skills, and confidence—ultimately improving their pedagogical practices and students' learning outcomes. This highlights the importance of providing targeted and effective training to support teachers in technology integration. Using the TPACK framework in training programs—by combining pedagogical strategies with technological and content knowledge—can help teachers overcome challenges and use digital tools effectively in the classroom. To support this, the government and school leaders should promote lifelong learning opportunities for preschool educators, in line with initiatives such as the KSPK and the Malaysian Education Blueprint 2013–2025. Ongoing and up-to-date training will not only improve teachers' digital literacy but also help them design developmentally appropriate lessons, select appropriate devices, and avoid overexposure to screens among children. In addition, collaboration with communities, such as offering discounts on devices for bulk purchases by preschools, can be mutually beneficial for providers and educational institutions. Producers and policymakers should also work together to develop child-friendly and open digital tools that support learning without compromising children's health, as emphasized by participants P2 and P3.

REFERENCES

1. Aditya, B. R., Andrisyah, Ismiatun, A. N., Atika, A. R., & Permadi, A. (2022). Digital disruption in early childhood education: A qualitative research from teachers' perspective. Procedia Computer Science, 197, 521–528. https://doi.org/10.1016/j.procs.2021.12.169
2. Aldhilan, D. (2024). The incidence of information and communication technologies in early childhood classrooms: A systemic literature review. Pedagogical Research, 9(2), em0190. https://doi.org/10.29333/pr/14147
3. Ali, A., Malik, M. A. & Mei, T. C. (2021). Teachers' perception of technology integration easiness in teaching preschool children. International Conference on Education, 205-214.
4. Alotaibi, M. S. (2023). Factors Influencing early Childhood Educators' use of Digital Educational Aids: A Sequential Explanatory study. SAGE Open, 13(4). https://doi.org/10.1177/21582440231217727
5. Altun, D. (2019). Investigating Pre-Service Early Childhood Education teachers' Technological Pedagogical Content Knowledge (TPACK) competencies regarding digital literacy skills and their technology attitudes and usage. Journal of Education and Learning, 8(1), 249. https://doi.org/10.5539/jel.v8n1p249
6. Ariff, I. (2021, September 6). Investigate the RM3 billion spent on 1BestariNet, says BN man. Free Malaysia Today (FMT). https://www.freemalaysiatoday.com/category/nation/2021/09/06/investigate-therm3-billion-spent-on-1bestarinet-says-bn-man/
7. Basilotta-Gómez-Pablos V., Matarranz M., Casado-Aranda L. A., Otto A. (2022). Teachers' digital competencies in higher education: A systematic literature review. International Journal of Educational Technology in Higher Education, 19(1), 1–16.
8. Bourbour, M. (2020). Using digital technology in early education teaching: learning from teachers' teaching practice with interactive whiteboard. International Journal of Early Years Education, 31(1), 269–286. https://doi.org/10.1080/09669760.2020.1848523
9. Bourbour, M. (2020). Using digital technology in early education teaching: learning from teachers' teaching practice with interactive whiteboard. International Journal of Early Years Education, 31(1), 269–286. https://doi.org/10.1080/09669760.2020.1848523
10. Diamah, A., Rahmawati, Y., Paristiowati, M., Fitriani, E., Irwanto, I., Dobson, S., & Sevilla, D. (2022). Evaluating the effectiveness of technological pedagogical content knowledge-based training program in enhancing pre-service teachers' perceptions of technological pedagogical content knowledge. Frontiers in Education, 7. https://doi.org/10.3389/feduc.2022.897447
11. Dore, R. A., & Dynia, J. M. (2020). Technology and media use in preschool classrooms: Prevalence, purposes, and contexts. Frontiers in Education, 5. https://doi.org/10.3389/feduc.2020.600305
12. Eleftheriadi, A., Lavidas, K., & Komis, V. (2021). Teaching Mathematics in Early Childhood Education with ICT: The Views of Two Contrasting Teachers' Groups. Journal of Digital Educational Technology, 1(1), ep2103. https://doi.org/10.21601/jdet/11117
13. Konca, A. S., & Erden, F. T. (2021). Digital Technology (DT) usage of preschool teachers in early childhood classrooms. JOURNAL OF EDUCATION AND FUTURE, 19, 1–12. https://doi.org/10.30786/jef.627809
14. Lee, B. N. (2023). Digital tools & inquiry-based learning in history education. Muallim Journal of

Social Sciences and Humanities, 78-88.

15. Leoste, J., Lavicza, Z., Fenyvesi, K., Tuul, M., & Õun, T. (2022). Enhancing digital skills of early childhood teachers through online science, technology, engineering, art, math training programs in Estonia. Frontiers in Education, 7. https://doi.org/10.3389/feduc.2022.894142
16. Malaysian Ministry of Education (2013). Malaysia Education Blueprint 2013-2025. Putrajaya: MOE
17. Naeem, M., Ozuem, W., Howell, K., & Ranfagni, S. (2023). A step-by-step process of thematic analysis to develop a conceptual model in qualitative research. International journal of qualitative methods, 22, 16094069231205789.
18. Nordin, M. N., Hamdan, I. F., Rivera, C. G. J., Ali, S. A., Magiman, M. M., Yusof, N., & Sulhadi, S. (2023). The Implementations of Technology in Special Education Classrooms based project. International Journal of Professional Business Review, 8(5), e01444. https://doi.org/10.26668/businessreview/2023.v8i5.1444
19. Nurdiantami, Y., & Agil, H. M. (2020). The Use of Technology in Early Childhood Education: A Systematic Review. https://doi.org/10.2991/ahsr.k.201125.045
20. Ogegbo, A. A., & Aina, A. Y. (2020). Early childhood development teachers' perceptions on the use of technology in teaching young children. South African Journal of Childhood Education, 10(1). https://doi.org/10.4102/sajce.v10i1.880
21. Paul, C. D., Hansen, S., Marelle, C., & Wright, M. (2023). Incorporating Technology into Instruction in Early Childhood Classrooms: a Systematic Review. Advances in Neurodevelopmental Disorders, 7(3), 380–391. https://doi.org/10.1007/s41252-023-00316-7
22. Pérez-Jorge, D., Del Carmen Rodríguez-Jiménez, M., Gutiérrez-Barroso, J., & CastroLeón, F. (2020). Training in digital skills in early childhood education Teachers: the case of the University of La Laguna. International Journal of Interactive Mobile Technologies, 14(20), 35. https://doi.org/10.3991/ijim.v14i20.17339
23. Rahmat, S. T., Muslim, S., & Sukardjo, M. (2023). Multimedia-based learning for early childhood education. In Advances in computer science research (pp. 97–110). https://doi.org/10.2991/978-94-6463-236-1_11
24. Rasmani, U. E. E., Widiastuti, Y. K. W., Agustina, P., Wahyuningsih, S., Nurjanah, N. E., & Mistook. (2023). Simple technologies in early childhood learning: Benefits, advantages and disadvantages. In Advances in social science, education and humanities research (pp. 90–100). https://doi.org/10.2991/978-2- 38476-114-2_9
25. Sulistyaningtyas, R. E., Astuti, F. P., & Yuliantoro, P. (2023). Using Technology for learning in Early Childhood Education : A review of Asian countries. Journal of Education and Teaching Learning (JETL), 5(1), 46–56. https://doi.org/10.51178/jetl.v5i1.1013
26. Tajuddin, S. khairun N., & Bakar, K. A. (2023). Use of Media and Technology among Preschool Teachers. International Journal of Academic Research in Progressive Education and Development, 12(1), 1606–1622. http://dx.doi.org/10.6007/IJARPED/v12-i1/16429
27. Undheim, M. (2021). Children and teachers engaging together with digital technology in early childhood education and care institutions: a literature review. European Early Childhood Education Research Journal, 30(3), 472–489. https://doi.org/10.1080/1350293x.2021.1971730
28. Zain, Z. M., Jasmani, F. N. N., Haris, N. H., & Nurudin, S. M. (2022). Gadgets and their impact on child development. International Academic Symposium of Social Science 2022. https://doi.org/10.3390/proceedings2022082006
29. Zainal, A. Z., & Zainuddin, S. Z. (2020). Technology adoption in Malaysian schools: An analysis of national ICT in education policy initiatives. Digital Education Review, 37, 172–194. https://doi.org/10.1344/der.2020.37.172-194