A Scoping Review: Roles and Research Trends using Technology in Teaching Mathematics for Preschool Students

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ABSTRACT

The use of technology in teaching is a critical concern in education amid technological shifts and paradigm changes. Wide advancements and integrated elements mediating the teaching styles in the education field, including the preschool level. Technological problem-solving can be a powerful tool for eliciting creativity and curiosity in teaching mathematics to preschoolers. This scoping review explores the global research landscape on the use of technology in teaching mathematics to preschool students. Through a systematic analysis of scholarly articles published between 2010 and 2025, this review identifies the roles technology plays in early mathematics education and highlights prevailing research trends. Using Arksey and O'Malley's (2005) framework for scoping reviews, 106 studies were analysed across multiple databases, with 17 main papers studied accordingly. Results reveal four dominant roles of technology, which include: (1) Enhancing Conceptual Understanding, (2) Promoting Engagement and Motivation, (3) Supporting Differentiated Learning, and (4) Facilitating Teacher Instruction and Assessment. Major trends include increased use of digital games, virtual manipulatives, Augmented Reality (AR), and adaptive learning systems. This review underscores the importance of integrating developmentally appropriate technological tools. It suggests directions for future research in pedagogy, equity, and teacher training, especially in teaching mathematics to preschoolers.

Keywords: Technology, Mathematics Education, Preschool, Early Childhood, Scoping Review, Digital Tools, Research Trends

INTRODUCTION

In today's dynamic education landscape, fuelled by the power of information and Digital Technology (DT), the key to steering educational institutions to excellence lies in tech-teaching styles (Hwang et al., 2023). The introduction and expansion of technology in education have tremendously changed the educational environment. It has transformed curricula, educational resources, textbooks, and classroom environment, as well as teacher instructional practices and student learning styles (Molina et.al, 2019).

Abroad and wider approaches in teaching styles have been developed in this era of globalisation. This included the teaching styles in Early Childhood Education (ECE, hereafter), which have been debated throughout the years (Artemis et.al, 2021). Thus, this scoping review will examine the roles and research trends in the use of technology in teaching mathematics in ECE, focusing on the preschool level.

Integration of Technology in Early Childhood Education

DT is now a fundamental part of modern daily life (Ahmet, 2021). This diffusion surrounds young children, and a number of studies have revealed young children's intensive interaction with Information and Communication Technologies (ICT) from a broad perspective based on the literature review done in this research. The integration of DT concepts includes computers, printers, telephones, smartphones, electronic toys, Internet connections, tablet computers, interactive whiteboards, digital cameras, facsimile machines, and voice recorders (Bolstad, 2004; Plowman & Stephen, 2005). These varied forms of DT may provide opportunities to support many aspects of ECE.

In addition, Artificial Intelligence (AI, hereafter), sometimes called machine intelligence, is intelligence demonstrated by machines or computers (Solanki et al., 2021). AI is one of the integration uses of technology that has been increasingly showing significant contributions in ECE. From robotic instruction to the invention

of an automated system for scoring answer sheets, for instance, AI has a role to play in facilitating teaching, learning, and assessment (Jiahong et. al, 2022).

Research Trends on Technology in Early Childhood Education

The number of published studies on the subject has increased in lockstep with the growing usage of AI technology in education (Chen et al., 2020). There has recently been a vigorous amount of interest in AI tools, AI experiences of learning and teaching, even at the preschool level. For example, the trends in computer-supported collaborative learning with technology upgrades are likely in the research by S.Nadirah et.al (2020), Haliza et.al (2022) and Zaliza S.A et.al (2022).

Few studies have been conducted to investigate the application of technology in early childhood (ages 3–8 years old). However, more and more AI devices are appearing in children's lives, such as voice personal assistants, household robots, and networked smart toys (Williams et al., 2019). AI promotes the creation and effectiveness of systems, which are obviously very useful for educational purposes (Hwang, 2021).

The trends also included the DT that has been implemented in ECE areas. DT studies between 2010-2025 papers revealed that the classrooms were equipped with a variety of DT such as television, smart board, Digital Versatile Disc (DVD), computer, and smartphone. Teachers tended to use television and computers in classroom activities. Although the teachers had a positive attitude towards using DT in ECE, they used ICT on a limited scale. They mainly utilized these devices in order for the children to watch cartoon films and listen to music (Ahmet et.al, 2021).

Hence, we can examine the trends and roles of technology in ECE, including how teachers use digital games, e-commerce apps in education, and hybrid tools in teaching mathematics to preschoolers (Liu et al., 2023). This scoping review provides a starting point for early childhood researchers and educators in terms of promoting research and practice related to technologies.

Apart from these, other key points in the use of technology or digital tools in ECE may be overlooked, such as the characteristics of different AI tools and the successful implementation of computer-supported collaborative learning with technology in future early childhood projects.

Roles of Technology in Teaching Mathematics in ECE

The rapid development of ICT, in recent years, has brought significant developments in global education systems (Artemis et.al, 2021). In the present study, we aim to record preschool teachers' views on the use, benefits, and barriers of ICT for teaching mathematics in the classroom. Apart from these studies, they also seek to examine the roles of ICT and technology and other digital tools used as educational tools in teaching mathematics to preschool students.

Technology is an integral part of developing 21st-century skills among preschool students. The curriculum aims to help children expand their basic mathematical knowledge and practice new skills in an experiential, interdisciplinary context. Furthermore, toddlers who use the method of trying and testing can process new data and calculate simple mathematical equations. In addition, using modern technology, they can solve problems, recognise numbers on the keyboard, and understand the importance of calculators and digital tools in everyday life (KSPK, 2017). That has been comprehensively discussed in Malaysia's curriculum framework for developing 21st-century and other computational skills among preschoolers.

Trends among local Malaysian educators and researchers focus on the pillar stand in KSPK (2017), but recently, the new Kurikulum Prasekolah 2026 (KP2026) and Kurikulum Persekolahan 2027 will be implemented for Malaysian students soon. Thus, understanding the uses of the technology in implementing the KP2026 will assist teachers, educators, and researchers in enhancing pedagogy, especially in building digitally savvy characters among students. Digital literacy has been listed as one of the pillars in this new KP2026.

Various intelligent systems driven by information technologies have gained widespread adoption in ECE. Digital technologies such as the Internet of Things (IoT), data mining, and Machine Learning (ML), along with the acquisition and leveraging of diverse data, have been used for health diagnostics, developmental assessments, and behavioural pattern analysis, thereby providing robust support for early childhood development. For

instance, smart toys integrated with sensors, actuators, and internet connectivity offer novel pathways for children's learning and development (Liu,J. et.al, 2025).

METHODOLOGY

Research Objectives and Questions

This study aimed to examine mainstream digital technologies and their application characteristics as roles and trends in ECE practice, making a scoping review the suitable review form for this objective. In this scoping study, we followed the principles established by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Moher, 2015).

In view of the differences that may be caused by differences in research methods, participant characteristics, authors' country, digital tools and knowledge or activity evaluation found in the literature, this review aims to evaluate, synthesize and display the latest literature on the use in ECE, involving research design, AI tools, DT activities and research results. To achieve the objectives, we focused on articles on the application of AI in young children's learning and development and on studies on technology in ECE.

We also seek papers that explore any digital tools and review papers regarding the use of technology in preschool. In addition, the study proposes possible directions for future technology research, aiming to establish a strong theoretical foundation, clarify factors that hinder the efficient application of AI in ECE, and emphasise the digitalisation of digital tools.

Through this scoping review, the following Research Questions (RQs) will be answered:

RQ1:   What technology has been used in ECE?

RQ2: What technology has been used in teaching mathematics at the ECE level?

RQ3: What methods have been used in researching technology in ECE?

MATERIALS AND METHODS

This research project is a scoping review of published literature on the uses of technology in ECE. The methodology for this review is based on the framework outlined by Arksey and O'Malley (2005) and Levac et al. (2010). The scoping review went through six key stages:

1. Steps (1): Identifying the RQ to be carried out.
2. Steps (2): Identify past research that is relevant to the objectives of the scoping review.
3. Step (3): Select the articles that are suitable for analysis.
4. Step (4): Charting the data to be presented.
5. Step (5): Collating, summarizing, and reporting the data.
6. Step (6): Discussion of the results.

Literature Search

The electronic databases used for the literature search included Education Resources Information Center (ERIC), Institute of Electrical and Electronics Engineers (IEEE), Scopus, and Web of Science (WoS). The search was limited to written in English. In order to facilitate database search, this study surveyed peer-reviewed academic articles published in all years. All articles are accessed from 2010 to October 2025.

Initially, we entered search terms such as "technology in education," " digital tools use in ECE," "artificial intelligence," "AI," and "early childhood education." However, to narrow the results, we employed a similar approach to that of Toh et al. (2016). The search string used for technology in ECE review was: "AI" OR "Artificial Intelligence" OR "Deep learning" OR "Machine Learning" OR "Teaching Mathematics*" OR "computer- supported collaborative learning with technology" OR "DT Digital Tools*"AND "early childhood" OR "young child*" OR "preschool*" OR "kindergarten*" OR "pre-k*" OR "childcare" OR "child care" OR "day care" OR "children. Databse searched also includes ERIC, Scopus, WoS, JSTOR, ScienceDirect, and Google Scholar were searched using keywords like "technology in early math education," "preschool digital math tools," "interactive mathematics learning," and "ICT in preschool" in order to widen the literature search.

Selection of Studies

This review paper focuses on the usage of technology elements in ECE. The selected research studies were related to ECE and focused on analysing the impact of technologies on learning and teaching for preschool students. The selected research studies should report on any digital tool, interactive multimedia, technology approaches or AI as an educational tool in teaching mathematics. Note that 106 articles were found in the ERIC, IEEE, Scopus, and WoS [34 from ERIC, nine from WoS, 45 from IEEE and 18 from Scopus (n = 106)]. All citations were imported into the reference management software (EndNotes), and duplicate citations were removed manually.

Exclusion of Studies

Five criteria for exclusion (EC) articles were removed. Firstly, exclusion criteria (E1) were articles that were not related to the research topic and abstract (n = 24). Secondly, exclusion criteria (E2) were duplicate studies (n = 16). Thirdly, exclusion criteria (E3) were papers in which participants or settings were not 3–8 years old (n = 15). Furthermore, exclusion criteria (E4) were papers that focus/topics not on the usage of the technology in the context of education (n = 13). Lastly, exclusion criteria (E5) were papers that focus on topics not related to curriculum/ learning program and teaching for preschool students (n = 21).

Overview of the Selected Papers

Seventeen articles that focused on the usage of technology in ECE to help elicit creativity and curiosity among the children in preschool were thoroughly reviewed from 2010 to October 2025. Different types of literature were included in this review, such as journal articles, bibliometric, SLR review papers and conference papers. This process yielded 17 articles, including 11 research articles, two conference papers, two systematic literature reviews and two bibliometric papers. The authors came from different cultural backgrounds and countries (e.g., the United States, China, Australia, the UK, Brazil, Austria, Greece, Taiwan, Malaysia and France).

From this scoping review, we show that this collection of articles is strong enough to represent effective technology studies in the ECE field, representing educational articles and nationalities from diverse countries. More characteristics of the included studies, such as type of article, participants, author's name and country, can be found in the PRISMA Table attached to this paper. The diagram below also illustrates the process throughout the scoping review studies focused on the usage of technology in teaching mathematics for preschool students.
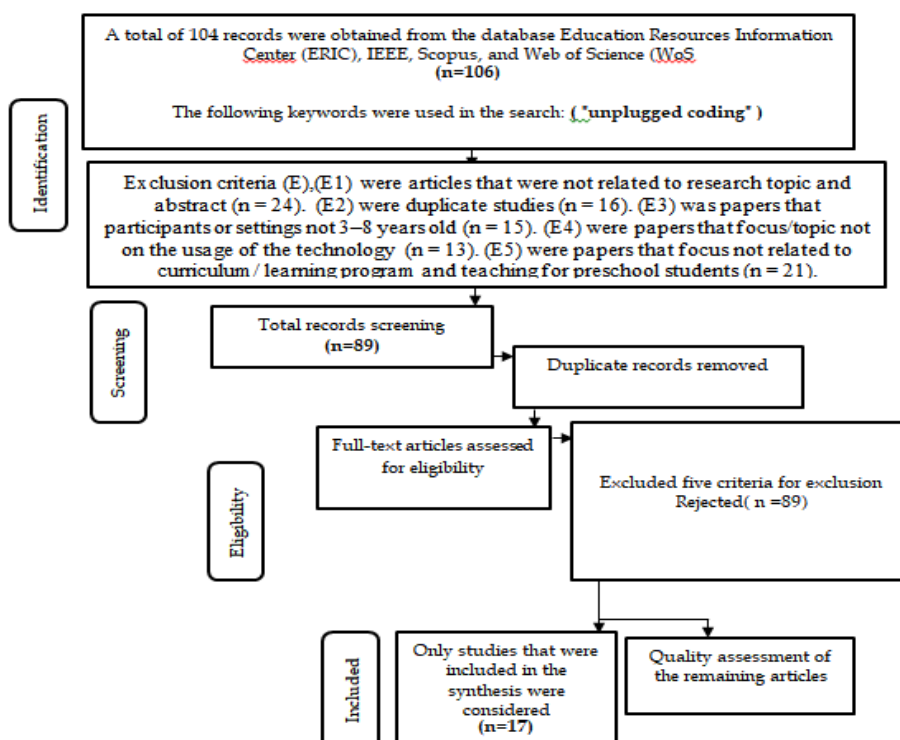

Diagram 1: Flow Diagram of Research Selection Process using PRISMA Adapted from a Study by Moher et al. (2015)

FINDINGS

Basic characteristics of the 17 included studies are presented in Table 1. These characteristics include author(s), publication year, publication title, research aims, research design, participants, the technology elements and tools, and main findings. A total of 106 papers were identified from the database search that can be considered for this scoping review research.

However, 89 of the articles and paper been excluded based on the five criteria for the exclusion. Thus only 17 papers found to be qualified based on the re-porting items indicated for the thematic review since they were found to be more relevant and fit with the research aims.

Table 1 Charting the Data

Author	Publication, Year and Location	Study Title	Main Findings
Marcelo C. Borba	2022 São Paulo, Brazil	The future of Mathematics Education Since COVID-19: Humans-with-media or Humans-with-non-living-things	There are three trends in mathematics education: the use of DT, philosophy of mathematics education, and critical mathematics education.
Johann Engelbrecht, Salvador Llinares, Marcelo C. Borba	2020, Brazil	Transformation of the Mathematics Classroom with the Internet	The central theme is the evolution and transformation of the classroom with the growing integration of the Internet and interactive digital devices into mathematics teaching and mathematics teacher education.
Artemis Eleftheriadi, Konstantinos Lavidas, Vassilis Komis	2021, Greece	Teaching Mathematics in Early Childhood Education with ICT: The Views of Two Contrasting Teachers' Groups	The main barriers of ICT integration, according to preschool teachers, are the lack of training on its integration and the preschool teachers' role during the teaching of mathematics. Implications for in-service teacher training and educational policy are discussed
Haliza Idris,, Mariani Md Nor, Mohd Nazri Abdul Rahman	2022, Malaysia	Sustainability of Quality Education: Development of a Pattern Learning Module for Early Mathematics Based on Flipped Classroom with Augmented Reality	The development of a module that integrates AR technology with the concept of reverse learning through pattern titles is an effort to reduce the gap in student mastery in the subject of Early Mathematics and stimulate student creativity.
Gwo-Jen Hwang and Yun-Fang Tu	2021, Taiwan	Roles and Research Trends of Artificial Intelligence in Mathematics Education: A	Incorporation of AI technologies into educational settings enables computer-based learning systems to play roles of intelligent tutors, tools or tutees as well as policy-making facilitators or an intelligent tutoring system.

		Bibliometric Mapping Analysis and Systematic Review	Emphasized that in mathematics education, it is important to support students to learn to think critically, communicate with others, solve problems and construct knowledge, while also delivering mathematics concepts and methods to them.
Adane Hailu Herut	2024, Ethiopia	Global trends of Research on Advancing the Pedagogical Competence of Preschool Teachers: A bibliometric analysis	The findings indicated a rising emphasis on promoting pedagogical competency in the early-grade teaching force. Principal contributors, including journals, authors, and countries, play a pivotal role in promoting collaboration and the dissemination of knowledge. Requirements of holistic training programs for 21st-century preschool teachers, spotlighting themes like early childhood educator training and the cultivation of pedagogical competence.
Dor Abrahamson, Mitchell J. Nathan, Caro Williams-PierceCaro, Candace Walkingto, Erin R. Ottmar, Hortensia Soto, Martha W. Alibali	2020, United States	The Future of Embodied Design for Mathematics Teaching and Learning	The finding included interactive technologies responding to kinetic qualities of students' motor actions, such as moving virtual objects, whether by on-screen manipulation. Graspable math engages the perceptual–motor system to reify the hierarchical structure of algebraic formalisms. Playful learning constitutes a set of principles for motivating content learning through engaging in technology-based, joyful, challenging tasks.
Lara Hoareau, Aude Thomas, Youssef Tazouti, J´erome ˆ Dinet, Christophe Luxembourger, Annette Jarl´egan	2021, France	Beliefs about Digital Technologies and Teachers' Acceptance of an Educational App for Preschoolers	The Technology Acceptance Model (TAM) is a robust and applicable framework for various types of technological tools and user groups. It has been widely applied in research into new technologies Preschoolers can work on them through educational apps. Studies have reported a positive impact of digital technologies (e-books, tablet computers, etc) LINUMEN was set up to develop an educational tablet app, called AppLINOU (Apprendre avec Linou en Maternelle – Learn in Preschool with Linou), for use in ´ecole maternelle' classrooms. AppLINOU was developed collaboratively by researchers

			and education professionals (teachers and school inspectors) in order to ensure it was suitable for use in France's preschools. It includes ten early numeracy activities.
Syasya Afiza Zazali1 & Nazita M.Nasir	2022, Malaysia	The Use of Interactive Multimedia to Increase the Use of Teaching Aid Materials in the Learning of Preschool Children	The findings showed that the use of interactive multimedia in teaching and facilitation (PdPc) can improve the understanding and concentration of preschool children and children in general enjoy using interactive multimedia.
Nurul Aini Jaafar, Siti Rohani Mohd Nor, Siti Mariam Norrulashikin, Nur Arina Bazilah Kamisan,, Ahmad Qushairi Mohamad1	2022, Malaysia	Increase Students' Understanding of Mathematics Learning Using the Technology-Based Learning	In this study, the effectiveness of implementation of technology and applications in students' understanding and visualization in mathematics learning. Students can use games, applications, simulations, and digital tools to explore and discover new things. This research will analyze the students' understanding and interest in learning mathematics with and without technology-based learning.
Raphaella Batha Augustine Sampar , Suziyani Mohamed	2023, Malaysia	Content Pedagogical Technology Knowledge (TPACK) of Preschool Teachers)	Knowledge of Technology Pedagogical Content (TPACK) is important to ensure the effectiveness of teaching delivery with technological integration.
Siti Nur Nadirah Ibrahim, Nor Syaidah Bahri, Nura Zafirah Zailan, Karimah Kassim, Alia Izzati Safuan	2020, Malaysia	Methods of Teaching and Assessment of Teachers in Early Mathematics Towards 6 Year's Old in Private Kindergarten	The findings of the study show that the teaching aid (ABM) and music are the methods used by teachers. Therefore, from that methods that children can use to improve their understanding and memory in early maths.
Cecelyia Evalyin Lingkon	2024, Malaysia	Animation about Elements of Form among Preschool students	Animation is a moving picture of a series of pictures or objects arranged in a row to produce the illusion of movement. They experience limitations in their visual experience to understand certain relationships and characteristics of geometric shapes because they have not been involved in practical experience involving those shapes. The use of deep animation (PdP) is able to provide a

			presentation that is easier to understand with a high visual appeal. This high visual appeal has a combination of design, character movement and color that can attract attention and is easy to understand for preschoolers.
Ahmet Sami Konca & Feyza Tantekin Erden	2021, Turkey	Digital Technology (DT) Usage of Preschool Teachers in Early Childhood Classrooms	The results of the study revealed that the classrooms were equipped with a variety of DT such as television, DVD, computer, and smartphone. Teachers tended to use television and computers in classroom activities. Although the teachers had a positive attitude towards using DT in early childhood education, they used ICT on a limited scale.
Jiahong Su & Weipeng Yang	2022, China	Artificial Intelligence in Early Childhood Education: A scoping review	This scoping review to evaluate, synthesize and display the latest literature on AI in ECE. Analyse existing literature in the areas of "AI activities," "AI tools and knowledge," and "research methods."
Ke Zhang & Ayse Begum Aslan	2021, United States	AI technologies for Education: Recent Research & Future Directions	This article reports the current state of AIEd research, highlights selected AIEd technologies and applications, reviews their proven and potential benefits for education, bridges the gaps between AI technological innovations and their educational applications, and generates practical examples and inspirations for both technological experts who create AIEd technologies and educators who spearhead AI innovations in education.
Rita Rodrigues & Lúcia Pombo	2024, Portugal	The Potential of a Mobile Augmented Reality Game in Education for Sustainability: Report and Analysis of an Activity with the EduCITY App	This paper presents a case study of a pedagogical approach based on the exploration of an AR game in the EduCITY app, and aims to analyse the potential of the 'EduCITY at the UA Campus' mobile AR game in terms of the promotion of education for sustainability among secondary students.

Roles of Technology in Teaching Preschool Mathematics

Enhancing Conceptual Understanding

Digital manipulatives and visual-based applications like Number Rack (Starkey et al., 2016) allow preschoolers to visualize mathematical operations. Tools such as TouchMath and Montessori-inspired apps help children internalize abstract concepts through interaction.

Promoting Engagement and Motivation

Gamified platforms like Moose Math and DragonBox Numbers foster motivation and sustained attention (Neumann, 2018). Studies highlight that game-based learning environments enhance interest and retention (Papadakis et al., 2020).

Supporting Differentiated Learning

Adaptive systems, such as DreamBox and Mathseeds, adjust the level of difficulty based on individual performance, making them suitable for diverse learning needs (Kim et al., 2021).

Facilitating Teacher Instruction and Assessment

Technology assists teachers in planning lessons, tracking progress, and identifying misconceptions (Chen & Chang, 2017). Interactive whiteboards and formative assessment apps are widely used tools.

Research Trends across the Globe

Dominance of Developed Countries

Most studies originate from the United States, Canada, Australia, Finland, and the United Kingdom. Fewer studies are available from Sub-Saharan Africa, Latin America, or Southeast Asia, indicating a gap in regional diversity.

Increasing Use of Emerging Technologies

Recent research includes Augmented Reality (AR) apps, such as Math AR (Gomez et al., 2023), as well as AI-powered systems designed to personalize learning experiences. China is the country leading the trends in research on the IoT (Liu ,J.et.al, 2025). The IoT technology has been employed in smart classrooms to monitor child safety. By integrating sensors and smart devices, IoT can monitor children's health indicators, behaviors, and social interactions in real-time. For example, Osimani et al. (2018) indicated that IoT devices can track children's physiological data such as heart rate and body temperature, enabling the early detection of potential health issues.

Multimodal and Cross-Disciplinary Approaches

There is an observable increase in integrating literacy, Science,Technology, Engineering and Mathematics (STEM) and creative arts with mathematics learning using technology (Eisenberg et al., 2019). Recently, trends across the globe showed tremendous approaches developed by educators and researchers based on the characteristics of the DT and AI, which led to the concept of ML. Multimodal ML in the field of ECE operates through the passive collection of multimodal data, thereby constructing classification and prediction models. Research found that the above algorithm has been applied to predict child behaviour, detect child motivation through activity monitoring, support early interventions, and improve learning environments.

Research Designs and Methodologies

Most studies are quasi-experimental or mixed methods. There is a notable shortage of longitudinal and ethnographic research capturing long-term outcomes and classroom culture shifts. Research trends in the early 2010s showed global disparities in interest in technology. In contrast, the trends have emerged strongly in the new global era of revolution, with developed countries like Finland, the United States, and China vigorously deepening their tech models, tools, research, and other approaches to enhance social skills, the economy, and education in their respective contexts.

DISCUSSION

This scoping review analysed 17 studies conducted across different countries from 2010 to October 2025 on technology as a teaching tool, knowledge, activities, and their impacts on learning and teaching in the crucial

field of ECE. This review includes various types of publications, such as journal articles, bibliometric reviews, and conference papers. Although a relatively small number of studies on this critical issue have been identified, the current scoping review provides cutting-edge insights into various aspects (knowledge, tools, activities, trends, and impacts) of technology and digital tools for children. These two subthemes were chosen as elements that enhance and foster creativity and curiosity in the education field, especially in ECE.

Technology as Digital Tools and Resources

William et.al (2019) designed the *PopBot* curriculum (e.g., knowledge-based Systems, supervised ML and Generative Music AI) and assessed its effectiveness (e.g., children's learning and data recording with robot interaction) with 80 Pre-K and Kindergarten children (4–6 years old). Thus, the study demonstrates that the role of technology has been widely acknowledged in this modern era. From this study, we seek the theme and subtheme based on the papers' review.

Based on 17 reviewed papers, two central themes emerged as the main findings in each paper: the trends of technology in ECE and the roles of technology in ECE. Two subthemes have also been identified: trends in technology or digital tools and resources. Apart from that, we also seek papers that focus only on ECE and teaching mathematics for preschoolers. Table 2 summarises the reviewed papers by theme and subtheme.

Table 2 Summarization of the Papers based on the Theme and Subtheme

Theme				
Trends			Roles of Technology	
Subtheme				
Trends in teaching maths	Trends in teaching ECE	Research trends of using technology in ECE	Digital Tools and Resources in ECE	Digital tools and Resources in teaching mathematics
5	3	1	7	1

For instance, in overviewing the theme roles of technology in ECE, the analysis identified seven papers that presented ways of integrating technology into education, such as digital tools and resources. There are various tech-teaching tools such as the Concept of Action Cognition Transduction (ACT) by Abrahamson D. et.al (2020), the TAM through AppLINOU by Lara et.al (2021), animation moving pictures by Lingkon.C (2024), and EduCITY by Rita (2024).

Based on the main theme analysed as the roles of technology in ECE, technology plays multiple roles in teaching preschool mathematics. It enhances conceptual understanding by enabling visualization of abstract ideas through digital manipulatives and interactive applications. Gamified platforms promote engagement and motivation, fostering both interest and retention. Adaptive systems support differentiated learning by tailoring tasks to individual abilities. Additionally, technology facilitates teacher instruction and assessment through tools for lesson planning, progress monitoring, and formative evaluation.

Hence, by analysing those papers, we can conclude that tech teaching tools have been part of educational tools that enhance teaching styles and educational environments. It is proven that technology plays a vital role in education systems, including at the preschool level. Thus, by noting the roles of technology in ECE, especially in teaching mathematics, there are positive results, as reported in the seven papers that used digital tools and resources in teaching.

Trends of Technology in Education

DT became a trend in mathematics education in response to the arrival of a different kind of digital tools, apps and resources (Marcelo, 2021). Taking into consideration the notion of trends, presented in this research, the trend that studies the link between mathematics education and "new technologies" or any digital resources, we can intertwine these new trends of research and phenomenon relatively.

The arrival of fast Internet, which reshaped the possibilities of online education and soon assisted the design of

educational apps, is one of the trends to fast forward in this globalisation. A wide array of media and technology is available to create new hybrid forms of teaching. This development process, the classroom, as we know it, may change entirely from a physical area with defined boundaries to a virtual environment, including various components that will probably be determined by the student rather than only by the teacher. Mobile technology, personal learning environments, digital learning objects, and other artefacts are 'stretching' the classroom, transforming the classroom, to the extent that it can hardly be recognised as such, as the elements of flipped classrooms. Global research on technology, especially in mathematics education, which is dominated by developed countries, has highlighted trends in developing educational programming, robotics, online educational apps, and hybrid tool packages.

These trends also make the learning environment more likely to utilise digital transformation learning activities, such as AR apps, IoT elements, and ML tools. Based on papers that conducted a deep search, the use of these AR elements in integrating the teaching and learning process was reported to have positive implications for preschoolers. The trends and use of technology in ECE created a wide virtual space. These interactive technologies enable students to collaborate with peers when using multimedia and the Internet, fostering new social ways of knowledge construction and making the learning process more meaningful.

Tool for Eliciting Creativity and Curiosity

Technology has been widely used in education as a powerful tool to foster and elicit creativity and curiosity. Based on this review, various activities and technologies align with children's passions, making learning more meaningful and engaging (Borba M, 2024). Apart, Rita et al. (2024) stated in their papers that the use of technology helps encourage children to explore and experiment on their own, offering support and guidance as needed. Thus, this helps celebrate the creativity and curiosity, which acknowledge and praise children's unique approaches to problem-solving and their willingness to ask questions (Artemis et al., 2021).

Using technology in these ways, we can create a dynamic and engaging learning environment that sparks creativity, curiosity, and a lifelong love of mathematics in preschoolers. In this globalisation era, empirical studies report that the roles and trends of technology have sparked curiosity among children, helping foster critical thinking and creativity.

Limitations of the Current Review

Our review has several limitations. First, given the relatively small number of studies included in this evaluation, there may be gaps in the research findings. Some of these knowledge gaps have been discussed above. Second, social and economic factors were not considered in our synthesis of previous research, which could affect the application of technologies in ECE due to the widely existing digital divide in the early years (Berson et al., 2021). Finally, the effects of alternative digital tools and platforms have not been fully explored due to a lack of reliable evidence in previous studies.

Implications

It was revealed that the number of eligible studies has expanded dramatically in recent years to investigate ECE technology. We also notice that there are still gaps and that a small number of papers focus only on ECE in teaching mathematics. However, the trends in the use of technology among preschool teachers and students were increasing, as indicated by the main findings of the papers reviewed for this research. According to this scoping review, we can summarize that there are at least two approaches to technology integration in ECE: first, as digital tools and resources, and second, as trends in teaching styles.

CONCLUSION

This scoping review examines a broader range of research subjects, as well as the expansion of research on the uses of technology in teaching mathematics to preschool students. The research reveals significant elements of how technology has become a trend and its role in ECE. We also examine the implications of this technology in teaching mathematics through the reviewed papers. Based on the findings, rapid developments in various apps,

interactive multimedia, and the use of high-tech mobility devices can be a strong support for the learning and teaching process in ECE. While this discussion provides a high-level summary, further research is needed to fully understand the widespread use of technology in ECE.

Furthermore, additional research is needed to reach broader agreement on the variables that contribute to trends in educational digital tools as a whole, thereby assisting educators more effectively. Overall, this research provides a detailed overview of the scope, current state, and areas for future investigation to improve digital tools and resources for teaching and learning in preschool.

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