Educational Technology in Early Childhood Education: A Systematic Literature Review

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Abstract: The development of science and technology in the 21st century is currently digital-based. In line with technological progress and innovation, it also impacts the world of education, such as changes in pedagogy and approaches to facilitating and delivering learning content. The advantages and ease of use of technology in education also have great potential to modernize the methodology of traditional teaching and learning systems. Early Childhood Education is vital in becoming the foundation for children's growth and development towards a successful and highly competitive future so that they continue to develop. Educational technology is an inseparable component in supporting the learning process of early childhood. This research uses Systematic Literature Review (SLR) analysis. This research aims to thoroughly explore how technology is used in Early Childhood Education and what aspects of development occur in children who use EdTech in Early Childhood Education. The data source in this research is the Scopus database of 174 documents published in 2018-2022, screened by applying inclusion and exclusion criteria in three different rounds, 13 articles were analyzed in complete text form. This research shows that technology is used in early childhood education to improve cognitive aspects, language, arts, students' interest in learning, and preschool preparation for children. Types of technology that can be applied include PowerPoint, video, digital storytelling, drawing, digital stories, and so on. This research also explains that the use of technology must be adjusted to the age, education level and targets of students. Improper use of technology can cause problems such as children losing their ability to mingle with society and tend to be comfortable with online life. Aspects of development in children that make good use of technology are cognitive aspects, language, art, and increasing knowledge in children, as well as motivation to learn.

Keywords: Educational technology, Early childhood education, Systematic literature review

Introduction

The Industrial Revolution era describes the rapid development of science and technology in the 21st century. Everything is based on digital, artificial intelligence, and connectedness in this era, so the world is increasingly united in globalization (Schwab, 2016). Technological advances and innovations also have an impact on the

world of education, such as changes in pedagogy and approaches to facilitating and delivering learning content (Sharma, 2019). The advantages and ease of using technology in the world of education also have great potential to modernize the methodology of traditional teaching and learning systems (Gizaw, 2020).

Early Childhood Education has a very important role in forming the basis for children's developmenttowards a successful and highly competitive future so that it continues to develop; educational. technology becomes an inseparable component in supporting the early childhood learning process. The advantages and ease of using technology in the world of education also have great potential to modernize the methodology of traditional teaching and learning systems (Parikh, 2012).

In this context, scientific literature plays a key role in constructing a comprehensive understanding of the influence and effectiveness of the use of educational technology in the early stages of child development. The use of technological tools will be beneficial if they are used according to age development (Qazi, 2018). Technological developments in education require students, teachers, and educators to reconsider their traditional teaching methods and invest in new technologies and tools. To support this, smart learning with educational technology (EdTech) is promoted as one of the supporting trends (Douglas, 2019).

However, current EdTech developments are still evenly distributed across several types of learning, especially in Early Childhood Education, where the use of EdTech still needs to be increased (Bozkurt, 2020). Learning methods are still focused on traditional knowledge. 21st-century learning is technology-oriented, utilizing various types of technology as learning tools to facilitate information retrieval (Long & White,2010). This is a major challenge faced by Early Childhood education. The explanation above shows that learning innovation is needed in Early Childhood Education by utilizing EdTech, such as media, methods, strategies, and learning techniques. This research wants to explore the use and development of EdTech in Early Childhood Education through systematic procedures supported by systematic literature analysis (SLR). SLR analysis is a research methodology for collecting, identifying, and critically analyzing available research studies (e.g., articles, conference proceedings, books, and dissertations) through a systematic procedure. The aim is to review key points of current knowledge about a topic or research question to suggest areas that require further research (Pati & Lorusso, 2018).

Therefore, this SLR research focuses on several things, as formulated in the following research questions: (RQ1) How is technology used in Early Childhood education? (RQ2): What aspects of development occur in children who utilize EdTech in Early Childhood Education?

Method

This research uses a systematic literature review (SLR) research analysis with several stages. Several stages in SLR research adopt the systematic literature review process carried out by Qazi et al. [9] and Ribeiro et al. [10] with minor modifications and adjustments. The stages in this SLR research are as follows:

1. Determine the research questions and objectives
2. Determine the data source and data search keywords.
3. Determine inclusion criteria and exclusion criteria
4. Perform a data search.
5. Select the data results that have been found
6. Data extraction
7. Data Analysis
8. Make interpretations and conclusions

Criteria for Inclusion and Exclusion

In this process, research may only be included if it meets the following criteria:

1. Studies published in 2018–2022;
2. Research is scientific journals and articles;
3. Studies that meet the following criteria: written in English, and
4. Research is available in full-text form. Articles that did not meet all inclusion criteria were excluded from this list.

5. Data Search carried out in November 2023 on the Publish or Perish Database according to the keywords that had been determined. Keywords (Educational Technology 116 and Early Childhood Education) contained 58 documents.

Data Selection

The initial data search results are then filtered again by applying inclusion and exclusion criteria in the process data search. The selection process is carried out in three rounds, with the following stages explained:

1. The selected documents are documents from various countries (without exception), published between 2018 and 2022, which can be seen in table 1.
2. The author selects the title and abstract (if necessary) without paying attention to the quality of each document. The selected document type discusses EdTech in Early Childhood Education
3. The author reviews the manuscript in more detail in terms of title, abstract, keywords and content documents to decide whether it is worthy of further review or not. The result at this stage is a document that discusses the application and development of EdTech in early childhood education attached in Table 1 below.

Table.1. EdTech in early childhood education

Data sources	Keyword	Result	R.1		R.2		R.3	
Scopus	*Educational Technology in*		In-	Ex	In-	Ex	In-	Ex
	Early Childhood Education	116	92	24	21	71	10	11
		58	48	10	8	40	3	5

Table 1 above explains that it should be noted that after the selection process, documents that pass the selection will only be published in 2018–2023. Following the data in Table 1, there can be keywords that contain a lot of data that is worth studying in more detail because the results of the search and selection for these two keywords are 13 documents published in 2018–2023. Thus, the systematic review process flows as follows:
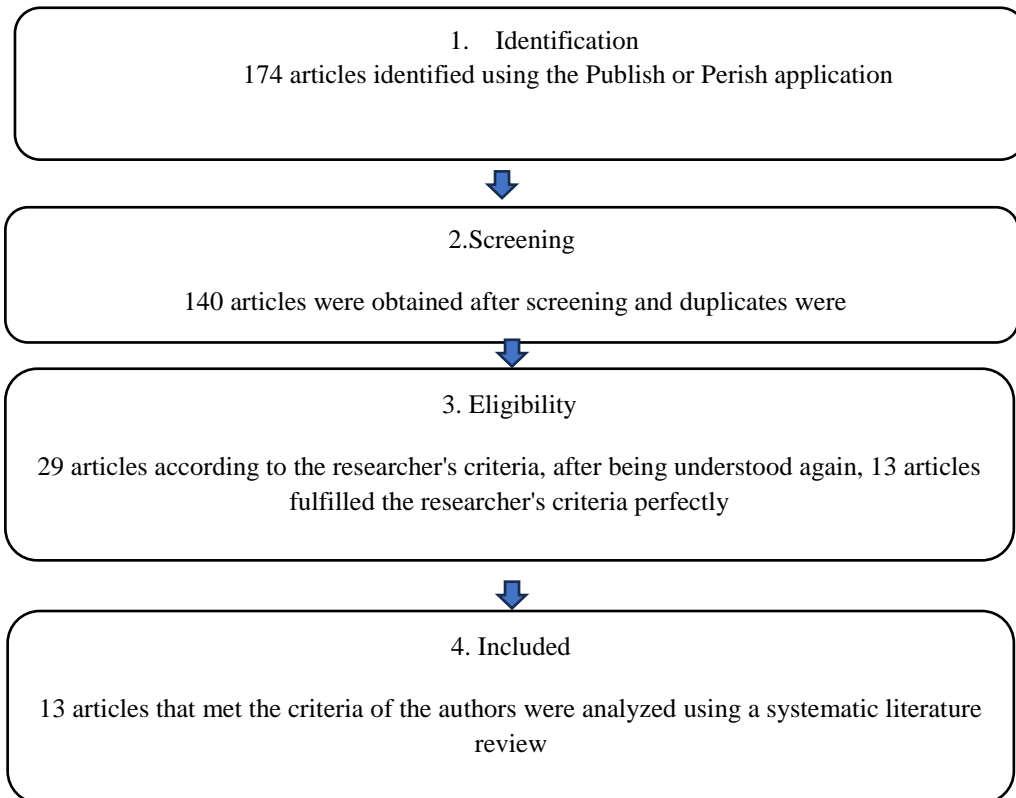
1. Identification
174 articles identified using the Publish or Perish application

⬇

2.Screening

140 articles were obtained after screening and duplicates were

⬇

3. Eligibility

29 articles according to the researcher's criteria, after being understood again, 13 articles fulfilled the researcher's criteria perfectly

⬇

4. Included

13 articles that met the criteria of the authors were analyzed using a systematic literature review

Figure 1. Ed-tech prism diagrams

Data Extraction

At this stage, all articles are reviewed and analyzed based on the indicators in Table 2. These indicators were chosen because of their relevance in providing information to answer the research questions explained in the introduction.

Table 2. Type of data to be extracted

No. Items	Discription
1.Year	Year of publication?
2.Location	Location and domain of acticle?
3.Educational technology tools	Educational Technology in Early Childhood Education
4. Educational technology tools	EdTech is use in the teaching of Early Childhood Education?

Results and Discussion

Based on the approach described previously, the 13 articles that have been selected and identified will be analyzed in detail in the data analysis stage. This process begins by providing a summary of each piece and outlining its entire content. The information recorded in Table 2 from each piece will be extracted and then presented in Table 3.

Table 3. Extraction data results (n=13)

Study	Year	Loc.	Domain	EdTech Tools	EdTech use
[11]	2018	Australia	A pedagogy of multiliteracies: Young children and multimodal learning with tablets	ablet technology, Computers, iPads, and BetterWorks applications,	Developing skills to improve literacy, such as letter and sound recognition (phonics), basic vocabulary, stimulation,for conversation and language use, multimodal learning
[12]	2019	Spanyol	Impact of using interactive devices in Spanish early childhood education public schools	Touch screen technology such as tablets, computers and interactive whiteboards (IW)	Increasing motivation to learn because content displays colors and moving images, there is language development in children.
[13]	2019	Finlandia	Teachers' beliefs about technology integration in early childhood education: A meta-ethnographical synthesis of qualitative research	Computers, Multimedia presentations, Digital games.	Improve children's social emotions, knowledge related to learning and skills, especially in the areas of literacy and mathematics. Children get the opportunity to practice word order, concepts, letter sounds, classification, counting, etc.
[14]	2019	Australia	It is a tool, but not a 'must': early childhood preservice teachers' perceptions of ICT and its affordances	Interactive whiteboards and desktop computers, laptops and screen-based technology (watching videos).	Developing social emotional aspects, language and children's experiences of technology outside of school and their experiences in the classroom.
[15]	2020	United Kingdom	A material for education process and the Teacher: the use of digital storytelling in	Computers (digital stories)	Arouse children's interest in learning, improve children's cognitive abilities.

			preschool science education		
[16]	2020	Mexico	Designing The Catbus: Interactive Support for Early Childhood Emotional Well-being in Education	Computers (digital stories)	Improve social and emotional skills in many ways through interactive storytelling about the perceptions, expressions and emotional responses of early childhood.
[17]	2020	Jerman	Can children benefit from early internet exposure? Short- and long-term links between internet use, digital skill, and academic performance	Computers (Internet)	Development of early digital skills and good screen time management in early childhood.
[18]	2020	Spanyol	Types of Use of Technologies by Spanish Early Childhood Teachers	Information and Communication Technology (JClick, NeoBook, Paint)	Improve aspects of language development and knowledge of early childhood from the digital stories displayed.
[19]	2020	Amerika Serikat	An Interactive Pedagogy in Mobile Context for Augmenting Early Childhood Numeric Literacy and Quantifying Skills	Mobile learning	Improve literacy and numerical quantification skills. Additionally, it allows children to learn while they explore their learning environment, which may provide additional social and physical benefits.
[20]	2020	Amerika Serikat	A cross-cultural study on technology use in preschool classrooms: early childhood teacher's preferences, time-use, impact and association with children's play	Smartphones, iPads and Computers.	Increases children's motivation to learn, helping children to prepare for school, although some Greek teachers state that outdoor play is better for children and the use of technology should be limited.
[21]	2020	Switzerland	Harnessing the Potential of Storytelling and Mobile Technology in Intangible Cultural Heritage: A Case Study in Early Childhood Education in	Computer (Digital storytelling, Drawing, video), Mobile technology.	Increasing new knowledge and motivation of preschool children about traditions, local cultural assets.

			Sustainability		
[22]	2020	United Kingdom	Early childhood practitioner beliefs about digital media: integrating technology into a child-centred classroom environment	Digital media (internet, Power point)	Increase motivation to interact with fellow students in learning and playing.
[23]	2022	South Korea	An IoT-Based Approach for Learning Geometric Shapes in Early Childhood	Computer (Video)	Increase children's interest in learning, improve aspects of language, social and artistic development from the educational videos displayed.

Table 3 above explains various EdTech applied in early childhood education in various countries. The types of EdTech that are widely used in Indonesia in early childhood education include the use of iPads and computers in learning. The aim is to increase children's learning motivation. Other types of learning used include Power Point, video, digital storytelling, drawing, digital stories and so on. This type of EdTech is applied in early childhood education combined with traditional environmental learning . Apart from that, the use of EdTech is also beneficial for improving aspects of social emotional development children, arts, language, literacy and numerical skills and increasing these development aspects is useful in the preschool preparation process for early childhood.

This section is a discussion of the data results that have been presented and described briefly in the previous quarter. This discussion is then used as the basis for answers to the research questions mentioned above. These answers are summarized in Table 5. The use of educational technology (EdTech) has been implemented in early childhood education. It should be emphasized that the use of EdTech in early childhood education is not only reserved for students, teachers, and educational institutions. However, this research can also be used by parents in the general public to provide an understanding of how to provide technology to early childhood. Several types of EdTech in early childhood education analyzed are combined with various types of traditional learning. They can train teachers and utilize technology to develop different competencies, knowledge, skill development, and attitudes, showing that the use of EdTech in early childhood education has proven to be beneficial for improving the quality of education if used appropriately.

Table 5. Answers to research questions

Question	Answer
(RQ1) How is technology used in Early Childhood education?	The use of technology in early childhood education is in improving cognitive aspects, language, art, students' interest in learning, and preschool preparation for children. The types of technology that can be applied include PowerPoint, video, digital storytelling, drawing, digital stories, and so on. The use of technology must be adjusted to the age, level of education, and targets of students. Inappropriate use of technology can cause problems such as children losing their ability to blend in with society and tend to be comfortable with online life.
(RQ2) What aspects of development occur in children who utilize EdTech in Early Childhood Education?	Aspects of development in children that make good use of technology are cognitive aspects, language, art, and increased knowledge in children, as well as motivation to learn in children.

These 13 articles come from the Scopus database and were published between 2018 and 2022. Research on the use and development of EdTech in early childhood education has been carried out by previous researchers, both generally and specifically discussing certain early childhood education materials. This research also found that

several aspects developed with the use of EdTech in early childhood education are quite diverse and do not only focus on developing knowledge and understanding of material , such as digital literacy development, interaction skills and Overall,technology can increase motivation in young children in learning.

Conclusion

SLR research is related to the use of EdTech in early childhood education and has been studied by many researchers in various countries, both generally and specifically in certain aspects. However, research related to technology education still needs to be deepened so that it can provide benefits for educators, parents and the general public. Early childhood education is combined with various learning approaches with various objectives of developing competence, knowledge, skills and character, as well as educational administration. Learning Approaches and competency aspects developed using Edtech in early childhood education have been adapted to the educational needs of the 21st century. This clearly shows the existence of technological innovation in early childhood education. This SLR has implications for researchers and practitioners. The results of this research can provide new knowledge and insight into the use of EdTech in early childhood education so that it can be used as a reference for teachers, students and educational institutions to improve the quality of early childhood education. Apart from that, it can also provide insight into the current state of technology.

Recommendations

I recommend this article for the development of early childhood education and learning

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPESS journal belongs to the authors.

Acknowledgements or Notes

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To cite this article: