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Using Technology for Learning in Early Childhood Education : A Review of Asian Countries

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ABSTRACT

Technology is one of the applicable tools in early childhood education learning, and its use necessitates the teachers to play important roles in the classroom. Hence, this research discusses a systematic review of technology use for learning during early childhood education in Asian countries. Empirical studies published between 2015-2022 and identified through systematic screening were examined to eventually obtain 16 articles with subjects spread across China, Jordan, Taiwan, Turkey, Hong Kong, Malaysia, Kuwait, Indonesia and South Korea. The result of this study show that implemented technology in the class can had a positive effects on teacher and children of self-confidence, curiosity, creativity, motivation, interest in learning, children's emotional (helping them control emotions and overcome fear, shame, and anxiety), social (increasing their communication and interaction with others), moral (assisting in the development of ethics), and physical/health abilities. Benefits of technology in the classroom, as well as self-efficacy, were the supporting factors, while the inhibitors were their lack of understanding in integrating technology into pedagogy, limited school budgets, and the negative impact on children's health.

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INTRODUCTION

Digital technology has been applied in various fields, including early childhood education, and its study is becoming a trend along with diverse developments. The concerned topics include the application of technology in learning and the inappropriate use in early childhood learning. A survey was conducted by Zabatiero (2018) involving 515 participants, consisting of early childhood educators and service administrators, managers, and/or directors, alongside parents/guardians. The results found pros and cons in applying digital technology in early childhood, with 37% agreeing and 52% agreeing, while the remaining chose other answers. However, the paradigm has shifted

from the 'good' or 'bad' effects to its use in supporting children's learning (Palaiologou, 2014). Another study showed that 1234 early childhood educators agreed that using digital technology, such as cameras, video games, computers, tablets, TV, ebooks, internet, smartphones, etc., had a strong influence in assisting learning (Blackwell et al., 2014).

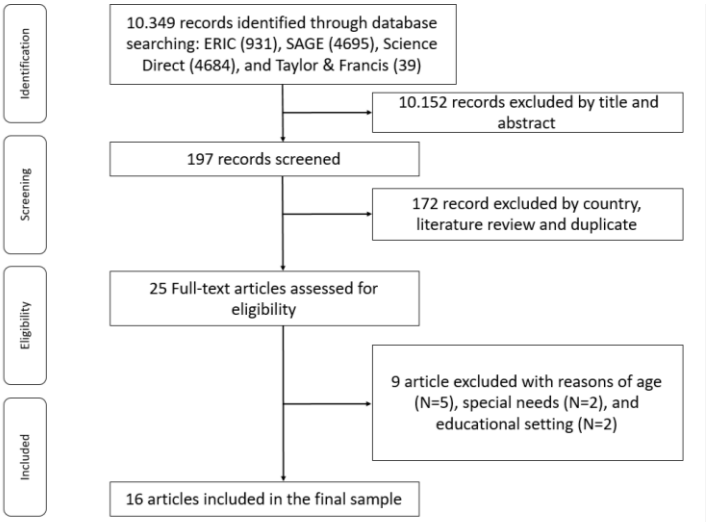
Consequently, teachers' involvement is required for the integration of technology into learning. Educators with positive perceptions and understanding of technology use can apply it teach using effectively (Xie et al., 2019). However, those who understand but possess negative perceptions will hinder its integration into the learning process.

Several countries have implemented digital technology in early childhood education classes. A quasi-experimental study by Kermani and Aldemir (2015) involving 58 Pre-K children in North Carolina showed that math and science skills improved by applying technologies such as Google or educational software games. Another study used a literature review by collecting 26 research articles from 2012 to 2017 on applying digital technology to early childhood in several countries, including the United States, Australia, United Kingdom, South Korea, etc. (Mantilla & Edwards, 2019). However, such studies concerning Asian countries have not been adequately reported in the literature. Therefore, this research examines studies published from 2015-2022 concerning the application of technology in the early childhood education of children aged 3 and 8 years in Asian countries to answer the effect and the factors of using technology in the classroom for early childhood education on child development.

RESEARCH METHODE

This research used systematic review that focused on studies published from 2015-2022 about the use of technology for early childhood education in Asian countries. The author adapted Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA) stages for collecting eligible article. The stages involved were identification, screening, eligibility, and inclusion, where the first step was to identify articles in the Scopus, Taylor & Francis, Sage, and ERIC databases. Only peer-reviewed articles were collected and analyzed, excluding project descriptions, program analysis, practice guidelines, reports, systematic and literature reviews, or conference researchs. The keywords used were "technology," OR "digital," OR "computer," OR "early childhood education," OR "kindergarten," OR "preschool," OR "early years." Then, the second stage concerned the screening of articles obtained with inclusion criteria, namely empirical studies from 2015-2022, the use of technology in early

childhood education, countries in Asia, such as Singapore, Jordan, Taiwan, China, etc. Meanwhile, the exclusion criteria comprised studies not focused on using technology in early childhood education at home as well as children with special needs. The purpose of this stage was to collect related data involving Asian countries. Lastly, 16 final articles based on all inclusion criteria were obtained in the third stage.



Picture 1.
PRISMA Diagram of Included Articles in the Systematic Review

RESULT AND DISCUSSION

Result

The data involved 16 studies published from 2015-2022, comprising teachers, parents, and children aged 3-8 years as participants. Meanwhile, the data collected comprised studies in China (n=4), Turkey (n=4), Jordan (n=2), Malaysia (n=1), South Korea (n=1), Hong Kong (n=1), Kuwait (n=1), Indonesia (n=1) and Taiwan (n=1). The methods used were surveys (n=5), qualitative (n=7), mixed-method (n=2), case study (n=1) and cross-sectional study (n=1). In addition, the digital technologies employed were Augmented Reality (n=1), computers (n=3), e-books (n=2), technologies (n=1), and more than 2 (n=9). The findings obtained can be see in table 1.

Table 1.
Studies on The Application of Technology in Early Childhood Education

Title	Country	Method	Author(s)
Early technology education in China: A case study of Shanghai	Shanghai, China	Survey	(Weng & Li, 2020)
In-service Preschool Teachers'	Turkey	Qualitative,	(Kara &

Thoughts about Technology and Technology Use in Early Educational Settings		Interview	Cagiltay, 2020)
Integrating ICT in Teaching and Learning: A Preliminary Study on Malaysian Private Preschool	Malaysia	Cross-Sectional Study	(Kamaruddin et al., 2017)
Using Augmented Reality in early art education: a case study in Hong Kong kindergarten	Hong Kong	Qualitative, exploratory	(Huang et al., 2016)
Teachers' and parents' perceptions of the role of technology and digital media in developing child culture in the early years	Jordan	Mixed Method	(Ihmeideh & Alkhawaldeh, 2017)
Preschool Teachers' Perception of the Application of Information Communication Technology (ICT) in Taiwan	Taiwan	Interpretive phenomenology analysis (IPA) qualitative	(Chen et al., 2018)
Technology in Early Childhood Education: Electronic Books for Improving Students' Literacy Skills	Turkey	Qualitative	(Kaynar et al., 2020)
The Role of Computer Technology in Supporting Children's Learning in Jordanian Early Years Education	Jordan	Qualitative	(Alkhawaldeh et al., 2017)
The acceptance of computer technology by teachers in early childhood education	South Korea	Survey	(Jeong & Kim, 2017)
Understanding kindergarten teachers' perceptions of the use of touchscreen technologies: An exploratory study in mainland China	China	Qualitative	(Yang & Gunn, 2020)
Integration of digital technologies into play-based pedagogy in Kuwaiti early childhood education: teachers'	Kuwait	Mixed Methods	(Aldhafeeri et al., 2016)

views, attitudes, and aptitudes			
Investigating Pre-Service Early Childhood Education Teachers' Technological Pedagogical Content Knowledge (TPACK) Competencies Regarding Digital Literacy Skills and Their Technology Attitudes and Usage	Turki	Survey	(Altun, 2019)
Integration of Digital Technology into an Early Childhood Teacher Preparation Program in China	China	Survey	(Luo et al., 2021)
Exploring the adoption of social media in self-paced physical activity in early childhood education: a case in central China	China	Case Study	(Lu, 2022)
Developing Computational Thinking Ability in Early Childhood Education: The InInfluence of Programming Toy on Influence of Programming Toy on Parent-Children Engagement	Indonesia	Qualitative	(Budiyanto et al., 2021)
Digital Technology Use of Kindergarten Teachers for Parental Involvement: E-Nvolvement in The Turkish Context	Turki	Survey	(Konca & Hakyemez-Paul, 2021)

Discussion

The Effect of Using Digital Technology on Child Development

Following the analysis of 11 studies, 8 showed various abilities that can be improved by integrating technology into the learning process. Yang & Gunn (2020) and Alkhawaldeh et al (2017) found that technology helps children learn numeracy. It also facilitates their ability to find and solve problems, which is a skill required in the future (Chen et al., 2018; Weng & Li, 2020). Meanwhile, studies by Ihmeideh & Alkhawaldeh (2017), (Kaynar et al., 2020), Alkhawaldeh

et al. (2017), and Chen et al. (2018) showed the ability of technology to improve children's language skills. Others demonstrated that it could enhance cognitive development abilities, though they were not specifically described (Huang et al., 2016; Kara & Cagiltay, 2020).

These studies also highlighted several additional abilities such as self-confidence, curiosity, creativity, motivation, and interest in learning (Huang et al., 2016; Kara & Cagiltay, 2020). According to Ihmeideh & Alkhawaldeh (2017), the use of technology affects children's emotional (helping them control emotions and overcome fear, shame, and anxiety), social (increasing their communication and interaction with others), moral (assisting in the development of ethics), and physical/health abilities.

Supporting and Inhibiting Factors in the Application of Technology in the Classroom

Another finding from this review was the supporting and inhibiting factors that affect the application of technology in early childhood education. The emergent supports were teachers' 1) awareness of the benefits in the classroom (Alkhawaldeh et al., 2017; Ihmeideh & Alkhawaldeh, 2017; Kara & Cagiltay, 2020; Kaynar et al., 2020; Weng & Li, 2020; Yang & Gunn, 2020), and 2) self-efficacy (Jeong & Kim, 2017).

Teachers' awareness of technology is inseparable from their literacy in its classroom utilization as well as their positive perception. Although this research discovered various perceptions, all were positive that technology helps the teaching and learning process (Weng & Li, 2020). This corresponds with the study by Slutsky et al. (2019) that teachers consider technology helpful for children to learn about the world around them and various other subjects. Another study showed that its application in learning provides an active experience and variety for children (Yang & Gunn, 2020). Also, teachers believe that it helps children improve their academic skills (Ihmeideh & Alkhawaldeh, 2017; Kaynar et al., 2020).

Meanwhile, teachers' self-efficacy in mastering technology has a major role in its value (Blackwell et al., 2014). This factor directly or indirectly influences the intention to use technology through perceived ease of use and benefits (Jeong & Kim, 2017). Hence, early childhood education teachers with high self-efficacy are more confident in using technology in the classroom, as they already understand its ease of use and benefits.

Some supporting factors that have been mentioned constitute the driving forces for these teachers and have become good practices in applying technology in the classroom. However, some inhibiting factors found were 1)

lack of understanding in integrating it into pedagogy, 2) limited school budgets, and 3) the negative impact on early childhood health.

Teachers' lack of understanding in integrating technology into pedagogy was discovered by Kamaruddin et al. (2017). According to this study, the majority of preschool teachers agree that their awareness of using ICT is very low, resulting in a poor understanding of technology integration into classroom teaching. Another finding was that there are differences between young and experienced teachers during the use of technology. The young teachers encountered challenges but generally felt confident, while experienced ones lacked confidence due to limitations in technological literacy (Huang et al., 2016). In addition, a study involving teachers of 3 - 5-year-olds was conducted in Kuwait. It showed that despite having mastered the use of technology and facilities, alongside being fully supported by the school's infrastructure, these teachers lacked confidence that the application in the classroom improved the learning process (Aldhafeeri et al., 2016). Studied Vidal-Hall et al. (2020) stated that the teachers' lack of knowledge, as well as the beliefs and changing understanding of children's use, were factors that encouraged schools to integrate technology into early childhood education. Therefore, discovering various ways to overcome these obstacles, such as providing training on technology application in classroom learning, is necessary to ensure they are aware of the benefits and directly practice its use.

Another problem discovered was the limited school budget. Although each school has its budget policy for procuring technology equipment, this becomes a problem in cases where funds are limited or there are no allocations. For instance, Huang et al. (2016) found that no special funding was allocated for procuring technology equipment because the school prioritized teaching materials and game tools. However, this problem can be solved by borrowing equipment from teachers.

Furthermore, teachers realize that technology use negatively impacts the health of young children. This was revealed in the study by Woo et al. (2016), which found that its use can cause vision, muscle, or physique-related problems in children. Therefore, Mantilla & Edwards (2019) suggested several ways that parents and teachers can minimize the negative health and pedagogical impacts. The methods to improve health include 1) encouraging correct body positioning while operating technology, 2) limiting its use after 7 pm or before going to bed, 3) avoiding violent content, 4) inviting children for direct interaction during video calls, and 5) utilizing technology such as touchscreens to stimulate fine motor development. Meanwhile, pedagogical efforts by the teacher are 1) using digital technology related to the class themes, interests, and

activities, 2) working in pairs or groups to allow the children to benefit from collaboration, 3) adapting equipment software and digital technology to the child's age to facilitate independent and collective operation, and 4) placements in classrooms using arrangements that can support collaboration.

CONCLUSION

The use of technology is undeniably close to children's environment and can be applied in early childhood education classrooms. Hence, teachers' mastery is expected to facilitate its optimal application for learning. The results of reviewing various literature showed that the technology applied in the classroom positively influences the development and learning in early childhood education. However, besides the benefits and good practices, teachers need to provide rules for children on using technology at school and at home to reduce the negative impacts that concern adults. They can also minimize their obstacles by participating in training programs to support the integration of technology into the classroom.

Overall, the summary of the results of the review on studies that apply technology in early childhood education learning can affect children's abilities including numeracy, ability to find and solve problems, language skills cognitive development abilities, self-confidence, curiosity, creativity, motivation, and interest in learning. , emotional and social. Another finding states that there are supporting and inhibiting factors that are observed from the teacher's point of view. However, a more in-depth study is needed to review not only the technology as a whole but more specifically (computers, tablets, etc.). Subjects who use technology also need to be covered in subsequent studies (younger or older children) as well as the arrangement of technology in the classroom and the time required to use technology.

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