European Journal of Alternative Education Studies
ISSN: 2501-5915
ISSN-L: 2501-5915
Available on-line at: www.oapub.org/edu

DOI: 10.46827/ejae.v7i2.4558 Volume 7 | Issue 2 | 2022

EDUCATORS' PERSPECTIVES ON THE APPROPRIATENESS OF TECHNOLOGY INTRODUCTION PRACTICES FOR EARLY CHILDHOOD CHILDREN THROUGH THEIR CREATIVE THINKING APPROACH

Michael Vitoulis[i]
Assistant Professor,
International Hellenic University,
Department of Early Childhood Education and Care,
P.O. Box 141, Sindos 57400,
Thessaloniki, Greece

Abstract:
Technology is widely recognized as an important factor in early childhood education and can play an important role in the education of young children. To make effective use of technology in young children's learning, the extent to which, how, and when digital media are integrated is important. Reflecting on how children discover uses of technology helped professionals to question the purpose of ICT and to formulate, reflect, define, reflect, and ensure changes in pedagogy. This study explores the potential technology learning practices that prospective educators would choose to introduce early childhood children to the use of technology through their creative thinking approach. Based on the research findings, it is clear how future educators will attempt to introduce children to the use of technology. 519 prospective educators participated in the survey as part of their studies at the Faculty of Early Childhood Education and Care in Greece. The prospective educators seem to prefer teaching methods that give the child room for initiative and self-activity. On the contrary, the more traditional methods exploited to teach the use of digital media do not seem to be the most effective in the long run, as the trainee educators do not seem to believe in their effectiveness. Of particular interest is the observation that the selection of software to promote creativity correlates positively with didactic practices of self-discovery. This is a research indicator that examines and analyzes the methods that future educators believe to be more effective, suggesting that these methods will be used in the future because they are professionals who have a critical impact on the education and care of children in early childhood.

Keywords: digital pedagogy, technology learning practices, creative thought, teacher training, early childhood education, ICT

[i] Correspondence: email vitoulis@ihu.gr,, vitoulism@gmail.com

1. Introduction

Today children live in environments where in their daily lives they have an extended interaction with technological means (Arnott and Yelland, 2020). Finally, the integration of technology into daily life in the 21st century redefines the concept of literate citizens (Papadakis, 2022). The rapid diffusion of technologies in social contexts is changing the practises of the learning process (Kim et al., 2021). The practical design and tactile digital interface of modern touchscreens allow children from an early age to interact with technology (Plowman et al., 2012). Young children are exposed to technology and learn to use it in two places, at home and in preschool education. Due to the widespread use of mobile devices, many young children interact with them (Kyriakides et al., 2016), while a large percentage of children use apps to play or draw on them (Lee, 2016).

2. Literature Review

It is argued that active interaction with digital content, when used properly, can have positive effects on children's intellectual development, similar to traditional play or books (OECD, 2019). There is an agreement that technology can play an important role in young children's education (NAEYC & Fred Rogers Center, 2012). By the term, technology is meant digital tools and devices as well as digital resources and media more broadly, it includes digital technologies that can enable imaginative, creative and collaborative activities (Jack and Higgins 2019).

In preschool education technology is used in three different fields, acquiring operational skills, expanding the understanding of the world and developing learning skills (Plowman, Stephen & McPake, 2010). To make the use of technology in young children's learning effective, it is important to understand to what extent, how and when digital media is integrated (NAEYC & the Fred Rogers Center, 2012). A related literature review suggests that early childhood interaction with modern technology touch screens can have a positive impact on literacy, mathematics, science and problem-solving (Herodotou, 2018; Xie et al., 2018). The use of digital resources can also foster creativity in young children (Bers, 2018).

Various research papers have supported the field of early childhood education to integrate digital technologies (Bers, 2018; Coleman, 2019; Mantilla and Edwards, 2019). The integration of technology into early childhood education seems to face obstacles and reservations (Aubrey & Dahl, 2014).

Recent research has increasingly focused on exploring pedagogical practices and technological learning experiences in early childhood education. (Saxena et al., 2020; Wang et al., 2021). Young children's interaction with digital technologies is usually viewed from the perspective of their developmental appropriateness (Papadakis, 2020; NAEYC, 2012). There are approaches that consider young children's familiarity with the use of technology as a problem-solving process (Rich & Hodges, 2017; Bers, 2018). There are also descriptions of how to stimulate the use of technology, for example through

questioning strategies (Murcia and Tang, 2019), guided interactions (Palmer, 2017) and detailed guidance and support (Newhouse, Cooper and Cordery, 2017).

The way young children learn to use technology is determined by several factors (Plowman, Stephen & McPake, 2010): What kind of technology is available and accessible to children? Who accompanies the children in this process? What is the motivation for this support? How is this support provided? What kind of learning is supported? Are children supported by other adults or older peers, either family members or educators? Appropriate handling and use of technology by children is argued to be a problem-solving process (ISTE, 2016) or a field for critical thinking (Yadav et al., 2017). There is limited research into how early childhood children engage with technology (Undheim, 2022).

Thinking about the ways children discover to use technology helped practitioners to question the purpose of ICT and to formulate, reflect and define, reflect and ensure changes in pedagogy (Plowman & Stephen, 2007). It is argued that children in early childhood who confront the use of technology and encounter difficulties, usually quit after a minute or two because they want to discover by themselves and rarely ask for help (Plowman & Stephen, 2007). Acquiring operational skills refers to understanding the function of objects such as the mouse and switches, and the ability to control them, which often depends on motor skills. Activity competencies also develop children's ideas in technological interactions and demonstrate their understanding of performing an action that can lead to a reaction. Children often need adults to help them acquire some operating skills in order to walk on their own and become independent users.

The mediating role of adults significantly shapes how children learn to use technology. (Plowman, McPake, and Stephen, 2003). In the development of digital competencies, children are largely guided and supported by teachers (Pérez-Jorge et al. 2020). In the research by Plowman at all (2010), the term "*guided interaction*" is used to refer to the way children are assisted to become familiar with the use of technology. With proper utilization, technology could contribute constructively to early childhood education (Edwards et al., 2020; Fleer, 2020; Hatzigianni et al., 2020). Although children's learning practices are interactively influenced by the nursery and home habits, it is the nursery that has the greatest impact on the child's space at home (Marsh, 2003). This means that educators should have sufficient knowledge and provide appropriate support and guidance in the use of technology by young children (Mantilla and Edwards 2019). There is a gap in children's ways of using and experiencing technology, at home and in ECEC settings (Edwards et al., 2020).

The use of technology in preschool education is still in its infancy and it is not clear how technology should be taught to children at an early age (Angeli et al., 2016). As Edwards and Bird point out, this is a process of " *exploratory* " for young children as they try to master the use of technology (Edwards and Bird, 2017). In early childhood, the use of technology requires support and guidance from the children's educators or parents. (Stephen and Edwards, 2018). Appropriate training for teachers can help them to be more effective in teaching digital skills to young children (Bower et al., 2017; Rich et al., 2021).

Knowing the appropriate ways to integrate technology into education is an important element for the training and pedagogical development of educators (Johnston, Hadley, and Waniganayake, 2020). Additionally, educators' knowledge of digital technology affects the way technology is integrated pedagogically into the learning process (Jack and Higgins, 2019). Edwards and Bird proposed a framework for observing children's technology learning, which they call the Digital Play Framework, but this is about the use of technology in education as a tool (Edwards and Bird, 2017). Our knowledge of the use practices of early childhood children with technology or how children learn to use digital technology is limited and needs to be further investigated, (Edwards and Bird, 2017). There is a lack of knowledge among educators about the ways in which they should engage children with technology (Jack and Higgins, 2019). The purpose of this study is to examine what practices future educators would choose to introduce to children for the use of technology.

The rapid spread of technology means that children inevitably interact with digital resources and are introduced to the use of technology. Research has shown that when children learn to use technology, they are guided by an adult, either in the family environment or a professional educator. This effect is considered to determine how children experience technology and how much time they need to master it. As part of this research approach, we are investigating how future educators assess the most effective ways for children to engage with and learn about digital media.

3. Methodology

The purpose of this study was to examine the potential technology learning practices that prospective educators would choose to introduce to early childhood children through the use of technology. Additionally, their choice in the above topic is explored at a particular level when using digital applications to cultivate creative thinking in early childhood children.

Based on the literature review above and for our research purposes, we have created a four-fold typology that covers the spectrum of technology learning practices that can be used to introduce children in early childhood to the use of digital applications. Technology learning practices for the use of technology in early childhood.

1) Self-activity/Self-discovery (the child tries and finds the progression of the program by himself) (Guided interaction (distal))
2) Guided-assisted discovery (the child again finds the correct operation by himself, but after specific suggestions, e.g. "go here", "see what happens if you press this?" "if you didn't want to do this what would you press etc.") (Guided interaction (proximal))
3) Demonstration/modeling (the adult shows it to the child by performing it at least once or more and then the child repeats imitating on his own, while the adult intervenes only when asked) (Guided interaction (distal))

4) Demonstration supported by intervention (the adult first demonstrates the correct operation and then asks the child to repeat, either pointing on the screen, directing the child's hand, or verbally instructing the child in detail) (Guided interaction (proximal))

The research question is: What are the technology learning practices that future educators will find most appropriate for early childhood children from the perspective of using the software selected by the educators? By extension, what kind of technology learning practices do they choose when trying to encourage children's creative thinking using apps? This research project seeks to describe future educators' perceptions of what they believe to be the most appropriate technology learning practices for children in early childhood. Finally, it is clear that teachers' attitudes and opinions largely determine their decisions in the learning process. Therefore, we believe that through the research findings, it will become clear how future educators will attempt to introduce children to the use of technology. We also believe that the views of future educators are broadly representative of adults' general understanding of how they might intervene to help early childhood children master digital media literacy.

Future educators were asked to select 5 software for early childhood children and design a corresponding number of learning scenarios. Without having applied them to children, however, educators to evaluate the degree to which discrete methods were effective in familiarising children with the applications they selected. These practices were preformulated by the researchers, according to the data obtained from the literature review. In other words, educators assume and calculate the degree of effectiveness that each of the four technology learning practices could have as an outcome for the children. At the same time, they link each learning scenario to teaching practices, learning domains, and skills it promotes. The applications on which they designed the scenario was chosen by them, without any guidance or suggestion, and are those they believe to be effective. The prospective educators were asked to adopt a creative mindset when approaching the teaching scenario and to focus on the creative use of digital resources. The survey focuses on the practices they would use to teach children how to use this digital application.

The research lasted 5 years (2017-2021) and involved 519 prospective educators studying at the Department of Early Childhood Education and Care at Hellenic International University, located in Thessaloniki, Greece. The research data yielded 2595 learning scenarios that provided our research data. In the learning scenarios, participants describe their user activities while using an evaluation grid to select teaching practices, learning domains, and skills acquired in the process. They also rate the effectiveness of the four teaching mediation practices. The degree of effectiveness of the teaching practices is rated on a 5-point scale (not at all... too much) and each entry concerns the teacher's assessment of each software he or she selected. To check the reliability of variables with Likert-type questions, Cronbach's statistical analysis was applied. Cronbach's alpha value was found to be 0.82, a level considered satisfactory (Cronbach, 1990).

To determine the relationship between variables, the mathematical method of the relationship between two variables (crosstabs) is used. The statistical control is done according to the Pearson x2 test and the method of correlation of the strength of the relationship with the index (r) (at the level of r≥.30 and p≤0.05) and for the direction of the relationship with the sign of the index (r). In addition, analysis of variance with one factor was also applied at the level of inferential statistics (one-way ANOVA). The significance level for correlations was $p < 0.05$, while in cluster analysis the reference of 2 different groups.

4. Results and Discussion

Over time, the difference between the methods of self-discovery (Q1, Q2) and those of demonstration (Q3, Q4) increases (Figure 1). This result is obtained by comparing the means using the statistical method of analysis of variance (one-way ANOVA) (Table 1). Future educators seem to prefer teaching practices that give the child room for initiative and self-activity (Figure 2). More clearly, educators also perceive that early childhood children are introduced to technology use primarily through interaction with it, while they believe that children master technology through their direct contact with digital content. On the contrary, the more traditional methods of demonstrating how to use digital media do not seem to be considered the most effective over time, as future educators do not seem to believe in their effectiveness. This viewpoint may also arise from the prevailing view that children discover technology on their own initiative, which future educators believe is becoming more common in their social environments.

Table 1: Correlation of technology learning practices with year in the two groups

	2017		2021		Analysis of variance (ANOVA)		
	Mean	S.D.	Mean	S.D.	df	F	Sig.
Q1. Self-activity / Self-discovery	3.49	1.009	3.71	1.084	818	8,161	.000
Q2. Guided - assisted discovery	3,25	1.112	3,60	,9271	818	23,112	.000
Q3. Demonstration / modeling	2,73	1,313	2,997	1,290	818	7,686	.006
Q4. Demonstration supported by intervention	2,51	1,316	2,750	1,350	818	6,144	.013

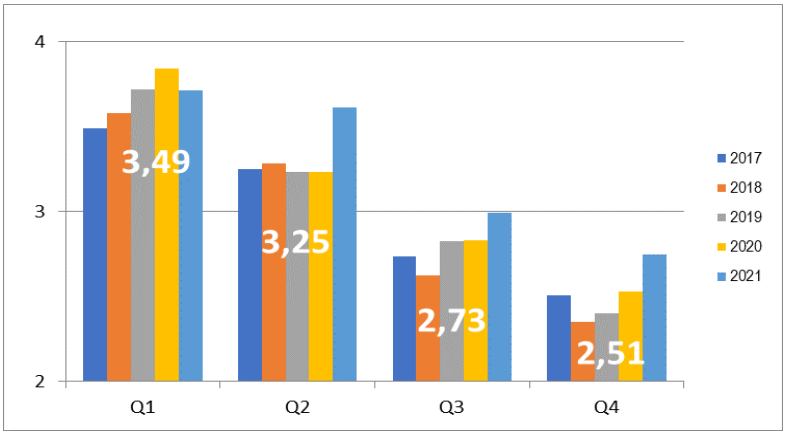

Figure 1: Technology learning practices over the years

Table 2: Correlation between technology learning practices by other teaching practices, learning domains, and skills

	Number of…	**X^2 / df / γ**
Self-discovery (Q1, Q2) by variables	other teaching practices	197.03 /96 / -.38*
	learning domains	87.63 / 80 / .09*
	skills	213.31 / 120 / -.12*
Demonstration (Q3, Q4) by variables	other teaching practices	384.09 / 192 / -.11*
	learning domains	181.63 / 160 / -.07*
	skills	339.8 / 240 / .09*
		* p < 0.05

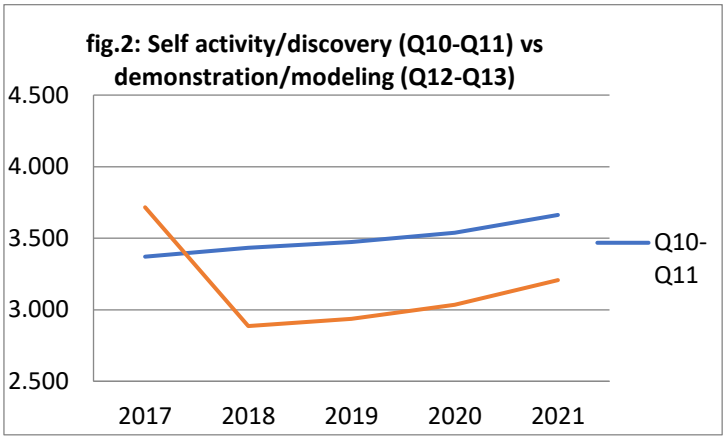

Figure 2: Self activity/discovery (Q10-Q11) vs demonstration/modeling (Q12-Q13)

Of particular interest is the observation that the selection of software aimed at fostering creativity correlates positively with didactic practices of self-discovery (Table 3). In other words: When the application aims to cultivate creative thinking, prospective educators select didactic practices of self-discovery to a greater extent (Figure 3). It seems, then, that for those applications that encourage creative thinking and are generally open-ended, future educators recommend instructional practices that provide children with opportunities for self-discovery.

Table 3: Correlation between technology learning practices by creative thinking skills

	Number of…	**X^2 / df / γ**
Self-discovery (Q1, Q2) by variables	creative thinking skills	22.09 / 8 / .31*
Demonstration (Q3, Q4) by variables	creative thinking skills	21.17 / 16/ -.14*
		* p < 0.05

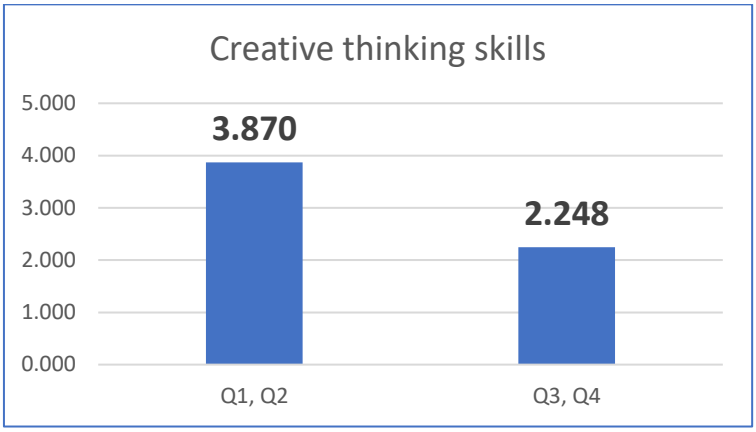

Figure 3: Creative thinking skills

4. Discussion

The increasing prevalence of technology in society had a major impact on the field of children's learning in early childhood. The ways in which children are exposed to technology and introduced to its use is a current topic that is beginning to engage researchers. Related to this topic, this article examined prospective educators' intentions regarding the technology learning practices they would use to introduce children to technology use in early childhood. According to the research findings, prospective educators clearly prefer self-discovery practices. It is noted that this trend has increased over the past five years, as educators appear to be choosing self-discovery methods more frequently. This finding is likely due to the entrenchment of the notion that children are capable of interacting with technological media from an early age. This finding is even more pronounced when digital applications are used to promote creative thinking, i.e. when open-type digital applications are used. This tendency is strongly confirmed in the apps, which cover a wide range of teaching practices in their approach. This finding suggests that prospective educators appreciate that the child-centered approach, which gives the child the initiative to discover how to use the application, can be linked to a variety of other teaching practices that support overall learning objectives. They combine children's initiative in self-discovery with the ability to combine a wider range of teaching methods for greater overall learning benefits. This is an element that reflects the tendency of future educators to adopt a more child-centred approach while accepting, to a greater extent, the possibility that children in early childhood will respond to the demands of digital media use.

Conflict of Interest Statement

Michael Vitoulis declares no conflicts of interest.

About the Author

Michael Vitoulis is an Assistant Professor at the International Hellenic University (IHU), Dept. of Early Childhood Care & Education of the School of Social Sciences at International Hellenic University. He has over 20 years of teaching experience in

undergraduate and postgraduate study programs at various universities (International University, Hellenic Open University, University of West Attica). His research interests focus on: a) Digital Pedagogy, b) ICT in Education, c) Creativity and Innovation in Education, d) Teaching Methodology Issues, e) Open and Distance Education and f) in Intercultural Education. He also has articles in scientific journals in the above fields. He has participated in research projects financed by the European Union and by the European Social Fund (Operational Program "Education and Lifelong Learning"). He has a teaching work of over 5,000 hours in educational seminars in the field of adult education.

References

Angeli, C., Voogt, J., Fluck, A., Webb, M., Cox, M., Malyn-Smith, J., et al. (2016). A K-6 computational thinking curriculum framework: implications for teacher knowledge. *J. Educ. Technol. Soc.* 19, 47–57

Arnott, Lorna, and Nicola Yelland (2020). Multimodal Lifeworlds: Pedagogies for Play Inquiries and Explorations. Journal of Early Childhood Education Research 9 (1): 124–146. https://jecer.org/multimodal-lifeworlds-pedagogies-for-play-inquiries-and-explorations

Aubrey C. and Dahl S. (2014). The confidence and competence in information and communication technologies of practitioners, parents and young children in the Early Years Foundation Stage. *Early Years* 34(1): 94–108.

Bers, M. U. (2018). Coding and computational thinking in early childhood: The impact of ScratchJr in Europe. *European Journal of STEM Education,* 3(3), 08.

Bers, M. U. (2019). Coding as another language: a pedagogical approach for teaching computer science in early childhood. *Journal of Computers in Education,* 6(4), 499–528. https://doi.org/10.1007/s40692-019-00147-3

Bower, M., Wood, L. N., Lai, J. W., Highfield, K., Veal, J., Howe, C., et al. (2017). Improving the computational thinking pedagogical capabilities of school teachers. *Aust. J. Teach. Educ*. 42, 53–72. doi: 10.14221/ajte.2017v42n3.4

Coleman, L. (2019). Ten topics ECE teachers can and should study today. *Exchange*, Nov/Dec, 86–87.

Cronbach, L. J. (1990). *Essentials of psychological testing. (5th ed.)* New York: Harper Collins Publishers, Inc.

Edwards, Susan, Ana Mantilla, Susan Grieshaber, Joce Nuttall, and Elizabeth Wood. (2020). Converged Play Characteristics for Early Childhood Education: Multi-Modal, Global-Local, and Traditional-Digital. Oxford Review of Education 46 (5): 637–660. doi:10.1080/03054985.2020.1750358

Edwards, Susan, and Jo Bird (2017). Observing and Assessing Young Children's Digital Play in the Early Years: Using the Digital Play Framework. Journal of Early Childhood Research 15 (2): 158–173. doi:10.1177/1476718X15579746.

Fleer, Marilyn (2020). Examining the Psychological Content of Digital Play Through Hedegaard's Model of Child Development. Learning, Culture and Social Interaction 26: 1–9. doi:10.1016/j.lcsi.2018.04.006.

Hatzigianni, Maria, Michael Stevenson, Matt Bower, Garry Falloon, and Anne Forbes. (2020). Children's Views on Making and Designing. European Early Childhood Education Research Journal 28 (2): 286–300. doi:10.1080/1350293X.2020.1735747.

Herodotou, C. (2018). Mobile games and science learning: A comparative study of 4 and 5 years old playing the game Angry Birds. *British Journal of Educational Technology,* 49(1), 6–16. https://doi.org/10.1111/bjet.12546

International Society for Technology in Education. (2016). *ISTE standards for students.* https://www.iste.org/standards/for-students.

Jack, Christine, and Steve Higgins (2019). "What Is Educational Technology and How Is It Being Used to Support Teaching and Learning in the Early Years?". International Journal of Early Years Education 27 (3): 222–237. doi:10.1080/09669760.2018.1504754.

Johnston, Kelly, Fay Hadley, and Manjula Waniganayake (2020). Practitioner Inquiry as a Professional Learning Strategy to Support Technology Integration in Early Learning Centres: Building Understanding Through Rogoff's Planes of Analysis. Professional Development in Education 46 (1): 49–64. doi:10.1080/19415257.2019.1647871.

Kim, M. S., Xing, M., & Kim, M. H. (2021). Technology-enhanced multiliteracies teaching toward a culturally responsive curriculum: A multiliteracies approach to ECE. *Interactive Learning Environ ments,* 1–13. https://doi.org/10.1080/10494820.2020.1870503

Kyriakides, A. O., Meletiou-Mavrotheris, M., & Prodromou, T. (2016). Mobile technologies in the service of students' learning of mathematics: the example of game application ALEX in the context of a primary school in Cyprus. *Mathematics Education Research Journal,* 28(1), 53-78. https://doi.org/10.1007/s13394-015-0163-x

Lee, J. (2019). Coding in early childhood. *Contemporary Issues in Early Childhood.* https://doi.org/10.1177/1463949119846541

Lydia Plowman, Christine Stephen & Joanna McPake (2010). Supporting young children's learning with technology at home and in preschool, *Research Papers in Education*, 25:1, 93-113

Mantilla, Ana, and Susan Edwards (2019). Digital Technology Use by and with Young Children: A Systematic Review for the Statement on Young Children and Digital Technologies. Australasian Journal of Early Childhood 44 (2): 182–195. doi:10.1177/1836939119832744.

Marsh, J. (2003). One-way traffic? Connections between literacy practices at home and in the nursery. *British Educational Research Journal* 29, no. 3: 369–82.

Murcia, K. J., & Tang, K.-S. (2019). Exploring the multimodality of young children's coding. Australian *Educational Computing,* 34(1).

National Association for the Education of Young Children (NAEYC) and Fred Rogers Centre for Early Learning and Children's Media (2012). Technology and interactive media as tools in early childhood programs serving children from birth through age 8 (Joint Position Statement). Available at: http://www.naeyc.org/files/naeyc/file/positions/PS_technology_WEB2.pdf

Newhouse, C. P., Cooper, M., & Cordery, Z. (2017). Programmable toys and free play in early childhood classrooms. *Australian Educational Computing,* 32(1).

OECD (2019). Children and digital technologies: Trends and outcomes. In T. Burns & F. Gottschalk (Eds.) (2019), *Educating 21st Century Children: Emotional Well-being in the Digital Age* (pp. 38–51), Educational Research and Innovation, OECD Publishing, Paris. https://doi.org/10.1787/b7f33425-en

Palmér, H. (2017). Programming in preschool - with a focus on learning mathematics. International *Research in Early Childhood Education,* 8(1), 75–87.

Papadakis, S. (2020). Apps to promote computational thinking concepts and coding skills in children of pre-school and pre-primary school age. In *Mobile learning applications in early childhood education*, 101–121.

Papadakis, S. (2022). Can Preschoolers Learn Computational Thinking and Coding Skills with ScratchJr? A Systematic Literature Review. *International Journal of Educational Reform*, 0(0). https://doi.org/10.1177%2F10567879221076077

Pérez-Jorge, D., Rodríguez-Jiménez, M., Gutiérrez-Barroso, J., and Castro-León, F. (2020). Training in digital skills in early childhood education teachers: the case of the University of La Laguna. Interact. J. *Interact. Mobile Technol.* 14, 35–49.

Plowman, L., Stevenson, O., Stephen, C., & McPake, J. (2012). Preschool children's learning with technology at home. *Computers & Education,* 59(1), 30–37. https://doi.org/10.1016/j.compedu. 2011.11.014

Plowman, Lydia, and Christine Stephen (2003). A 'Benign Addition'? Research on ICT and PreSchool Children. Journal of Computer Assisted Learning 19 (2): 149–164. doi:10.1046/j.0266-4909.2003.00016.x.

Rich, P. J., & Hodges, C. B. (2017). Emerging research, practice, and policy on computational. *Thinking*. https://doi.org/10.1007/978-3-319-52691-1

Rich, P. J., Larsen, R. A., and Mason, S. L. (2021). Measuring teacher beliefs about coding and computational thinking. *J. Res.Technol. Educ.* 53, 296–316.

Undheim Marianne (2022). 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

Xie, H., Peng, J., Qin, M., Huang, X., Tian, F., & Zhou, Z. (2018). Can touchscreen devices be used to facilitate young children's learning? A meta-analysis of touchscreen learning effect. *Frontiers in Psychology*, 9, 2580. https://doi.org/10.3389/fpsyg.2018.02580

Yadav, A., Gretter, S., Good, J., & Mclean, T. (2017). Computational thinking in teacher education. In P. J. Rich & C. B. Hodges (Eds.), *Emerging research, practice, and policy on computational thinking*. Springer.