EDUCATIONAL RESOURCES IN PRESCHOOL EDUCATION

Daciana LUPU, Ph.D.,
Department of Psychology and Training in Education, Transilvania
University of Braşov, Romania
dacianalupu@unitbv.ro

Abstract: *The research aimed to identify and analyze the educational resources used by preschool teachers and to assess the usefulness of employing information technologies in the teaching process with preschoolers. The research subjects were preschool teachers, who were investigated through a questionnaire specially developed and validated for this study. Most preschool teachers use charts as teaching materials (M-4.69, SD-.62), followed by the magnetic board (M-4.29, SD-.92), and only in third place do they choose a technological tool—namely, the laptop/computer (M-3.91, SD-1.27). The most frequently used information technology teaching tool employed by preschool teachers is the laptop/computer (M-4.14, SD-.92), followed by educational platforms (M-3.62, SD-1.27) and educational software (M-3.44, SD-1.43). Regarding the usefulness of employing information technologies in the educational process with preschoolers, respondents believe that these primarily serve to facilitate and deepen knowledge (M-9.26, SD-.90), to develop and strengthen skills and abilities (M-9.19, SD-.99), as well as to support thinking operations (M-8.85, SD-1.19).*

Keywords: *educational resources; information technologies; preschool teachers.*

Introduction

Education specialists give great importance to the preschool stage, considering it a decisive stage in a child's development. However, to achieve the purpose of this process, well-planned educational programs are necessary (Burgul & Yağan, 2009). As the demand to incorporate educational technologies into teaching curricula increases, there is a growing need for teachers to cultivate the essential competencies and skills required for the effective integration of technology into their teaching methods (Smiling & Hollebrands, 2025). Teaching materials have evolved due to technological advancements that have made them more accessible. Current debates address issues such as the content,

consumption, and production of materials; their role in children's learning and teachers' professional development; the value of global versus local materials; and ideological representation in textbooks (Norton, 2025).

Background
Early childhood education has a tremendous impact on children's later development; therefore, kindergarten teachers must be competent and use appropriate teaching and educational methods (Kurent & Avsec, 2023). Teachers' perceptions o regarding the use of Information and Communication Technology (ICT) deeply influences how children experience ICT-supported activities in kindergartens. ICT can be used as a presentation tool, a documentation and communication tool, and as a classroom management tool (Tian, 2024). It has been observed that ICT literacy, teacher self-efficacy, and positive experience have indirect effects, while support and self-efficacy in technology integration have direct effects on changes in teachers' use of ICT in teaching (Paetsch, Franz, & Wolter, 2023). The potential of technology in early childhood education has been widely acknowledged. The importance of adapting to a rapidly changing world is quite evident today; therefore, awareness of how to teach children so that they are prepared to face future challenges is crucial (Kurent & Avsec, 2023). The implementation of ICT by teachers directly influences how children learn in early childhood education (ECE) contexts. Although the number of studies on teachers' implementation of ICT in ECE has increased in recent years, there is still a need for a more comprehensive understanding of the factors that shape teachers' actual technology-based practices (Yang & Dong, 2024). Three types of resources have been identified (knowledge, tools, and networks) that teachers have recontextualized to apply in their own practices (Popov et al., 2025). Although teachers generally report positive attitudes toward digital educational resources, their adoption is not uniform; four distinct evaluative profiles have been identified, ranging from skepticism to full integration. The presence of digital educational resources has been found to be a stronger predictor of their adoption than teachers' technical knowledge (Sosa-Alonso et al., 2025). The same authors discuss the influence of digital determinism and anticipatory beliefs, which can lead to an uncritical integration of digital educational resources in the teaching process.
The use of digital educational resources influences the learning process by improving children's cognitive skills; cognitive, metacognitive, and motivational outcomes (Sibley et al., 2025; Fahrni et al., 2025); social development (Elbaum, Perry, & Messinger, 2024); and creative

thinking abilities (Sun, Wang, Dai, & Li, 2025; Mengyun et al., 2025). A distinction can be made between two educational environments: on the one hand, the kindergarten, and on the other, hyper-technological family environments where video games, smartphones, and the Internet are always available. In kindergartens, activities occur under the teacher's supervision, who stimulates, guides, and corrects essential steps in children's education. In family environments, technology is increasingly omnipresent. These new technologies often fail to stimulate children cognitively, instead providing entertainment without parental participation or supervision (Miranda, Marzano, & Lytras, 2017). The same authors identify three types of indicators involved: measures for the use of learning environments, indicators of satisfaction and engagement among different actors, and the real impact on children's socio-cognitive development. Some studies have focused on kindergarten teachers' emotions when using technology and their relationships with emotional intelligence, technological self-efficacy, and latent multi-level emotional profiles to explore: (1) emotional profiles in technology use, (2) the predictive role of emotional intelligence in profile membership, (3) the association between emotional profiles and teachers' technological self-efficacy (Li, Bai, & Liu, 2025). The research identified four teacher profiles: suppressed, balanced, engaged, and conflicted. Furthermore, emotional intelligence—particularly the perception, use, and understanding of emotions—predicted membership in more positive emotional profiles. Teachers with more positive emotional profiles demonstrated higher technological self-efficacy (Li, Bai, & Liu, 2025). Another study identified four teacher profiles regarding artificial intelligence: enthusiasts, cautious supporters, skeptics, and pragmatists (Zhang et al., 2025). Moreover, the results highlight the importance of AI compatibility and digital literacy–related factors in shaping AI acceptance among teachers. When discussing artificial intelligence, one important aspect to consider is how the application of these tools in education will transform the entire experience of children, their knowledge, and their relevant skills in this era of artificial intelligence (Ukwandu et al., 2025). An empirical study investigates the revolutionary potential of integrating artificial intelligence and predictive analytics to identify learning challenges at an early stage within the continuously evolving educational landscape. The role of AI in education is examined, emphasizing its capacity to personalize learning and streamline administrative tasks. The study envisions a future in which AI-based predictive analytics foster interdisciplinary collaboration, continuous improvement, and the integration of cutting-edge technologies—ultimately leading to a more efficient, personalized

educational experience despite obstacles such as bias mitigation and infrastructural disparities (Ravichandran et al., 2023).

Preschoolers interact with ICT, including augmented reality (AR), in acquiring scientific concepts (Alzahrani, 2025). Digital educational applications on mobile devices hold significant potential for improving preschool children's cognitive abilities and have been widely adopted in early education (Wang & Wei, 2025).

Mobile touch-screen devices are widely recognized as accessible educational tools that enhance children's cognitive and intellectual development as early as age two. Preschool educators easily integrate technology into young children's instruction, preparing them to become digital citizens (Mak & Nathan-Roberts, 2017).

In today's rapidly evolving digital era, smart learning has become an important trend in preschool music education, and intelligent voice entertainment robots have emerged as an educational tool. A smart preschool music education model has been proposed that uses digital audio technology to promote children's learning and musical perception, providing a personalized learning experience (Xu, 2024).

Kindergarten teachers' opinions regarding the usefulness of digital technologies can influence their acceptance of tablet-based educational applications for classroom use (Hoarea et al., 2021). Preschoolers' linguistic and communication skills were shown to improve following a short tablet-based intervention designed to teach new word–object and letter–sound associations. This playful, tablet-based intervention for vocabulary and pre-reading instruction can enhance young children's linguistic and communicative abilities, which are essential for future development (Peña et al., 2024). By using various programming languages (embedding the concept of gamification in the educational process), efficiently training a model for letter recognition, and developing an intuitive graphical interface, a practical and engaging application was created that was well received by children (Brooks & Edstrand, 2023; Morel, Dinu, & Cataron, 2024).

It has been observed that children from low socioeconomic and/or migrant backgrounds often show weaker literacy outcomes than their peers. Game-based learning through applications can support the development of children's skills, although its effects may depend on app usage patterns, child and family characteristics, and individual differences (Schiele et al., 2025). One of the technologies that can be used to improve the educational process is digital storytelling. Digital stories can be used for different purposes due to the benefits they bring to the educational process (Yilmaz & Ayperi, 2023). In a 2014 study, teachers reported that they mainly used computers, projectors, and televisions in preschool activities (Yurt & Cevher-Kalburan, 2011;

Bağcı, İlbay, & Bağcı, 2014). Driven by the global wave of digitalization, the education industry is undergoing profound change, and the migration of traditional classroom teaching toward online education is accelerating, giving rise to a large number of educational platforms. Thus, the education system can enhance children's learning outcomes, stimulate engagement, and optimize learning experiences through the precise allocation of resources, offering a personalized, data-driven teaching solution in the field of educational technology and promoting the development of intelligent education (Zhang, 2025).

The use of digital educational resources also brings major challenges, such as technological implementation difficulties, insufficient teacher training (Mourlam et al., 2019; Popov et al., 2025), and lack of resources (Mengyun et al., 2025). Most preschool teachers believe that technology has significant potential to enhance learning (Yilmaz & Ayperi, 2023; Alzahrani, 2025). This holds true even when they also demonstrate empathy for traditional methods. Furthermore, some teachers have successfully used technology despite the challenges they have faced. Teachers must be provided with adequate support and professional development to ensure that digital tools are properly utilized (Alzahrani, 2025). In the context of emerging artificial intelligence technologies (AI)—such as AI robots (ChatGPT), programmable robots (Ploog & Wiktorski, 2024), virtual reality laboratories (Dodevska et al., 2025), and AI agents—it is imperative to make appropriate adjustments within the field of education. These must be carried out from an informed, responsible, and well-intentioned standpoint. There is no doubt that these technologies will transform the way we live, conduct our daily activities, teach, learn, and carry out research (Ukwandu et al., 2025).

Methodology
The research started from the following objectives: identifying and analyzing the educational resources used by preschool teachers, and assessing the usefulness of using information technologies in the teaching process with preschoolers. The method used was the survey, with the questionnaire as the instrument. It was built on three dimensions: types of teaching aids used in the educational process, usefulness of information technologies in the teaching process with preschoolers, and dentification data. The questionnaire was developed and validated especially for this research (Cronbach's Alpha = 0.7671, medium consistency). The questionnaire items involved dual choices, multiple choices, and Likert-type response scales. Data were collected during May–June 2025. Consent was obtained before applying the instrument, and participants were informed about: the purpose of the

research, the method, the instrument, associated risks, and their rights. Participants were assured of the confidentiality of their data. On average, completing the questionnaire took 10–15 minutes per participant. The research group consisted of 221 preschool teachers. Of these, 98.6% (218 subjects) were female, and 1.4% (3 subjects) were male. The average age of the participants was 38.68 years. Most subjects belonged to the 40–49-year age range (74 subjects – 33.5%), followed by those aged 30–39 years (59 subjects – 26.7%), those aged 20–29 years (56 subjects – 25.3%), and the fewest were over 50 years old (32 subjects – 14.5%). Depending on the environment where the kindergarten was located, 171 subjects (77.4%) worked in urban areas and 50 subjects (22.6%) in rural areas. According to teaching degree, the distribution was as follows: 49.8% – 110 subjects with the permanent degree; 24% – 53 subjects with first teaching degree; 16.3% – 36 subjects with second teaching degree; 9.9% – 22 subjects' beginners. From the perspective of teaching experience, most subjects, 65 (29.4%), had between 1 and 4 years, followed by 49 subjects (22.2%) with 5–9 years, then 48 subjects (21.7%) with over 20 years, 31 subjects (14%) with 15–20 years, and 28 subjects (12.7%) with 10–14 years. The level of education completed is another indicator by which participants can be characterized: 150 subjects (67.9%) had completed university studies, 58 subjects (26.2%) had completed master's studies, and 13 subjects (5.9%) had completed specialized high school. Regarding the research topic related to information technologies, participants were asked whether they had attended courses in information technology. 133 subjects (60.2%) had attended such courses, while 88 subjects (39.8%) had not.

Results

We begin with the analysis of the first objective: identifying and analyzing the educational resources used by preschool teachers. The preschool teachers were presented with a series of teaching aids - both traditional (charts, sound recordings, etc.) and those involving technological means (laptop, projector, educational software, etc.). They had to select those they use in the teaching process (the item was on a Likert scale, where the value 5 represented very often and 1 represented never). A very large number of preschool teachers preferred to use (see Table no.1) charts as teaching materials (M-4.69, SD-.62, for a maximum of 5 and a minimum of 1), followed by the magnetic board (M-4.29, SD-.92), and in third position, a technological means — the laptop/computer (M-3.91, SD-1.27) (see Table no.1). Markers (M-3.62, SD-1.27) and flipcharts (M-3.45, SD-1.44) were also chosen before traditional sound recordings (M-3.03, SD-1.41) and the

television (M-2.95, SD-1.4). Educational software was used less frequently (M-2.91, SD-1.75 — the large standard deviation shows a lack of response homogeneity). The same lack of homogeneity appeared in the use of the projector (M-2.38, SD-1.57) and video games (M-2.08, SD-1.62).

Table no.1. Teaching aids used – mean values

Teaching aids	Mean	SD	Maximum	Minimum
Charts	4.69	0.62	5	1
Magnetic board	4.29	0.92	5	1
Laptop / computer	3.91	1.27	5	1
Marks	3.62	1.27	5	1
Flipchart	3.45	1.44	5	1
Sound recordings	3.03	1.41	5	1
Television	2.95	1.4	5	1
Educational software	2.91	1.75	5	1
vProjector	2.38	1.57	5	1
Video games	2.08	1.62	5	1

The following medium-level correlations were recorded, for p = 0.01: between flipchart and sound recordings (r = .488**), between laptop/computer and educational websites (r = .408**), and between laptop/computer and projector (r = .436**). Following the application of the ANOVA test, the following results were obtained: F (2.9) = 7.57, p < .005 between the use of charts and the use of teaching aids belonging to information technologies. Significant differences were observed between the use of teaching aids and the teaching degree of preschool teachers, as follows: for the use of charts: F (2.67) = 7.56, p < 0.01; use of laptop/computer: F(10.3) = 7.08, p < 0.01; use of educational software: F(20.9) = 7.08, p < 0.01; use of projector: F(11.2) = 4.88, p < 0.01.

The use of teaching aids belonging to information technologies in preschool activities is a common practice for 87.8% (n = 194) of the participants in this study (Sosa-Alonso et al., 2025). From the perspective of frequency of use by preschool teachers in teaching activities, 44.3% (n = 98) use them often, 29% (n = 64) very often, 15.8% (n = 35) moderately, and only 6.3% (n = 14) rarely or 0.9% (n = 2) very rarely. Only 3.6% (n = 8) of teachers stated that they do not use information technologies at all.

Another item in the questionnaire investigated which technological teaching aids are used by preschool teachers in educational activities. The options presented were: television, video games, laptop/computer, educational software, educational platforms, projector, and tablet.

Participants had to select the tools they use in the teaching process (on a Likert scale where 5 = very often and 1 = never).
The most used technological teaching aid among preschool teachers is the laptop (rarely the computer) (M-4.14, SD-.92) (see Table 2). Indeed, the laptop is used by the majority of preschool teachers in the teaching–learning process (the mean value being close to the maximum) — for images, various didactic games, and accessing educational platforms. These platforms rank second in usage in kindergartens (M-3.62, SD-1.27), being increasingly accessed for the rich materials they offer. Educational software is also preferred for its content, interactivity, and age-appropriateness (M-3.44, SD-1.43). The "old" television is still used (M-3.07, SD-1.19) in preschool activities. The following teaching aids show a large standard deviation, indicating a lack of response homogeneity: projector (M-1.96, SD-1.68), video games (M-1.81, SD-1.38), and tablet – the least used (M-.77, SD-1.16).

Table no. 2. Technological teaching aids used – mean values

Teaching aids	Mean	SD	Maximum	Minimum
Laptop / computer	4.14	0.92	5	1
Educational platforms	3.62	1.27	5	1
Educational software	3.44	1.43	5	1
Television	3.07	1.19	5	1
Projector	1.96	1.68	5	1
Video games	1.81	1.38	5	1
Tablet	.77	1.16	5	1

The teachers prefer to use these teaching aids in various combinations, the most frequent being (Yurt & Cevher-Kalburan, 2011; Bağcı, İlbay, & Bağcı, 2014): laptop – educational software – Internet – educational platforms (37 choices), laptop – Internet (18 choices), games – laptop – Internet – educational platforms (16 choices), and games – laptop – software – Internet – educational platforms (16 choices). Most preschool teachers (38% – 84 subjects) reported using information technology tools in 1–2 activities per week, 28.1% (n = 62) in 3–4 activities per week, and 24.9% (n = 55) in 1–2 activities per day.
In addition, 12 subjects (5.4%) stated they use them 1–2 times per month, and 8 subjects (3.6%) declared that they do not use them at all. Teachers with the permanent degree most frequently use the television (62 choices), educational software (40 choices), educational platforms (49 choices), and the projector (25 choices).
Next, the second objective is analyzed: evaluating the usefulness of using information technologies in the teaching process with preschoolers.

Table no. 3. The role of technological teaching aids – mean values

Teaching aids	Mean	SD	Maximum	Minimum
Facilitation / deepening of knowledge	9.26	0.90	10	7
Development / deepening of skills and abilities	9.19	0.99	10	5
Development / deepening of personality traits	8.33	1.38	10	5
Support of thinking operations	8.85	1.19	10	6

It is observed that respondents consider technological teaching aids to play a facilitating and knowledge-deepening role (M-9.26, SD-.90) (Yurt & Cevher-Kalburan, 2011; Bağcı, İlbay, & Bağcı, 2014), as well as a skill-forming and strengthening role (M-9.19, SD-.99) and a supporting role for thinking operations (M-8.85, SD-1.19) (Mak & Nathan-Roberts, 2017). The least emphasized role was that of developing personality traits (M-8.33, SD-1.38). Regarding the impact of technological teaching aids on preschoolers' results, most preschool teachers (86.4% – n = 191) stated that results are better when classical methods are combined with information technology–based teaching aids. For 7.2% (n = 16), combining classical methods with IT tools did not influence preschoolers' results. Additionally, 2.7% (n = 6) said results were similar to those obtained using classical methods alone, while 8 subjects (3.6%) did not respond.

Another item examined the learning opportunities provided to preschoolers by technological teaching aids, in terms of the following functions: communication, illustrative–demonstrative, formative–educational, stimulating, and performance evaluation. Respondents could make multiple choices. The combination communication – illustrative–demonstrative – formative–educational – stimulating – evaluation gathered the highest number of choices (42 – 19%), followed by communication – illustrative–demonstrative – formative–educational – stimulating (40 – 18.1%). The fewest choices were for the single functions: stimulating and evaluation, each with 2 choices (0.9%). Participants' personal needs regarding adaptation and performance through technological teaching aids were also investigated. The first reported need was primary / additional training for the use of information technologies, totaling 64 choices (28.96%) (Mourlam et al., 2019; Popov et al., 2025). This was by far the most pressing need, followed by non-responses (21.72% – n = 48). The acquisition of information technology tools by kindergartens was the second most mentioned need (14% – n = 31) (Mourlam et al., 2019;

Popov et al., 2025). Lower percentages (under 10%) were recorded for: lack or poor Internet connection (9% – n = 20) and support/training for equipment use (7.2% – n = 16). There were also 8 participants (3.6%) who stated that "you cannot stimulate a child through technology." For the second choice of personal needs, results were similar but with the first two positions reversed: acquisition of information technology tools by kindergartens (29 choices – 13.1%), and lack or poor Internet connection (21 choices – 9.5%). This second response also introduced a new option: adapting classical content for online activity (5.9% – n = 13). For a third need, subjects again selected adapting classical content for online activity (8.1% – n = 18), along with primary/supplementary training for the use of information technologies (Alzahrani, 2025), introducing technology in kindergarten activities, and parents' reluctance toward technology, all at 3.6% (n = 8). Most respondents abstained from choosing a second or third need (second need: 59.7% – n = 132; third need: 76.9% – n = 170). The following medium-level correlations were found for p = 0.01: between television and educational software (r = .511**), between laptop/computer and educational platforms (r = .486**); and high-level correlations for p = 0.01: between television and educational platforms (r = .647**) and between software and educational platforms (r = .678**). Following the ANOVA test, the result was F (25) = 8.66, p < .004 between Internet use and teaching aids belonging to information technologies.

Conclusions
In reference to the teaching aids used by preschool teachers, most of them use charts (M-4.69, SD-.62), followed by the magnetic board (M-4.29, SD-.92), and only in third place do they choose a technological means, namely the laptop/computer (M-3.91, SD-1.27). The most frequently used information technology–based teaching aid employed by preschool teachers is the laptop/computer (M-4.14, SD-.92), followed by educational platforms (M-3.62, SD-1.27) and educational software (M-3.44, SD-1.43). The following medium-level correlations were recorded for p = 0.01: between flipchart and sound recordings (r = .488**), between laptop/computer and educational websites (r = .408**), and between laptop/computer and projector (r = .436**). Following the application of the ANOVA test, the result was F (2.9) = 7.57, p < .005, between the use of charts and the use of teaching aids belonging to information technologies.
Regarding the importance of using information technologies in the teaching process with preschoolers, the respondents consider that these primarily play a role in facilitating/deepening knowledge (M-9.26, SD-.90), developing/deepening skills and abilities (M-9.19, SD-.99), and

supporting thinking operations (M-8.85, SD-1.19). Significant differences were observed between the use of teaching aids and the teaching degree of preschool teachers, as follows: for the use of charts: $F_{(2.67)} = 7.56$, $p < 0.01$; for the use of laptop/computer: $F_{(10.3)} = 7.08$, $p < 0.01$; for the use of educational software: $F_{(20.9)} = 7.08$, $p < 0.01$;

and for the use of the projector: $F_{(11.2)} = 4.88$, $p < 0.01$. The following medium-level correlations were also recorded for $p = 0.01$: between television and educational software (r = .511**), between laptop/computer and educational platforms (r = .486**), and high-level correlations for $p = 0.01$: between television and educational platforms (r = .647**) and between software and educational platforms (r = .678**). Following the ANOVA test, the result was $F_{(25)} = 8.66$, $p < .004$, between Internet use and teaching aids belonging to information technologies. As a result of the research, one could observe that the years following the pandemic brought an enrichment of the teaching aids used by preschool teachers, which led to increased attractiveness of the teaching process.

References
Alzahrani, A. (2025). A systematic review of the use of information communication technology, including augmented reality, in the teaching of science to preschool children. International Journal of Educational Research Open 9, 100453. https://doi.org/10.1016/j.ijedro.2025.100453

Bağcı, H., İlbay, A.B., Bağcı, O.A. (2014). Examining Preschool Teachers' Attitudes about the Usage of Technological Tools in Education. Procedia - Social and Behavioral Sciences Volume 152 (7), 143-148. https://doi.org/10.1016/j.sbspro.2014.09.171

Brooks, E., Edstrand, E. (2023). Participatory Designs for Computational Play: A Study of Children's Play Across Traditional and Digital Domains. Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics) 14012LNCS, 3-25. DOI: 10.1007/978-3-031-35599-8_1

Burgul, N., Yağan, M. (2009). The importance and the roles of information technologies in preschool education. Procedia - Social and Behavioral Sciences 1 (1). 2889. https://doi.org/10.1016/j.sbspro.2009.01.514

Dodevska, M., Zdravevski, E., Chorbev, I., Kostoska, M., Branco, F., Coelho, P.J., Pires, I.M., Lameski, P. (2025). Virtual reality as a learning tool: Evaluating the use and effectiveness of simulation laboratories in educational settings. Social Sciences

&   Humanities   Open   12,   101742.
https://doi.org/10.1016/j.ssaho.2025.101742

Elbaum, B., Perry, L.K., Messinger, D.S. (2024). Investigating children's interactions in preschool classrooms: An overview of research using automated sensing technologies. Early Childhood Research Quarterly 66, 147-156. https://doi.org/10.1016/j.ecresq.2023.10.005

Fahrni, D.D.D., Iten, G., Pras D., Hascher, T. (2025). Teachers' practices in the use of digital technology to promote students' self-regulated learning and metacognition: A systematic review. Teaching and Teacher Education 165, 105150. https://doi.org/10.1016/j.tate.2025.105150

Hoarea, L., Thomas, A., Tazouti, Y., Dinet, J., Luxembourger, Ch., Jarlégan, A. (2021). Beliefs about digital technologies and teachers' acceptance of an educational app for preschoolers. Computers & Education 172. https://doi.org/10.1016/j.compedu.2021.104264

Li, J., Bai, B., Liu, H. (2025). When technology meets emotions: Exploring preschool teachers' emotion profiles in technology use. Computers & Education 236, 105355. https://doi.org/10.1016/j.compedu.2025.10535

Mak, D., Nathan-Roberts, D. (2017). Design Considerations for Educational Mobile Apps for Young Children. Sage Journals 61 (1). https://doi.org/10.1177/1541931213601773

Miranda, S., Marzano, A., Lytras, M.D. (2017). A research initiative on the construction of innovative environments for teaching and learning. Montessori and Munari based psycho-pedagogical insights in computers and human behavior for the "new school". Computers in Human Behavior 66, 282-290. https://doi.org/10.1016/j.chb.2016.09.056

Kurent, B., Avsec, S. (2023). Examining pre-service teachers regulation in distance and traditional preschool design and technology education. Heliyon 9 (2), e13738. https://doi.org/10.1016/j.heliyon.2023.e1373

Li, J., Bai, B., Liu, H. (2025). When technology meets emotions: Exploring preschool teachers' emotion profiles in technology use. Computers & Education 236, 105355. https://doi.org/10.1016/j.compedu.2025.105355

Morel, I., Dinu, A., Cataron, A. (2024). ALPHA-EDU: An Educational Platform for Alphabet Learning with AI. 2024 16th International Symposium on Electronics and Telecommunications, ISETC 2024 - Conference Proceedings. DOI: 10.1109/ISETC63109.2024.10797292.

Norton, J. (2025). Materials in Language Teaching. https://doi.org/10.1016/B978-0-323-95504-1.00579-2

Paetsch, J., Franz, S., Wolter, I. (2023). Changes in early career teachers' technology use for teaching: The roles of teacher self-efficacy, ICT literacy, and experience during COVID-19 school closure. Teaching and Teacher Education 135, 104318. https://doi.org/10.1016/j.tate.2023.104318

Peña, M., Vásquez-Venegas, C., Cortés, P., Pittaluga, E., Herrera, P., Pino, E.J., Escobar, R.G., Dehaene-Lambertz, G., Guevara, P. (2024). A brief tablet-based intervention benefits linguistic and communicative abilities in toddlers and preschoolers. npj Science of Learning 9. DOI: https://doi.org/10.1038/s41539-024-00249-3

Ploog, M., Wiktorski, T. (2024). The intentions of the designers of digital educational tools in early childhood education. International Journal of Child-Computer Interaction 40, 100653. https://doi.org/10.1016/j.ijcci.2024.100653

Popov, J., Pischetola, M., Poderi, G., Møller, G.K. (2025). It opened a new teaching space for me': Transforming higher education practice through digital education. Learning, Culture and Social Interaction 53, 100922. https://doi.org/10.1016/j.lcsi.2025.100922

Ravichandran, K., Virgin B.A., Tiwari, Tiwari A., Javheri S.B., Gulnaz, F., Lourens, M. (2023). Predictive Analysis in Education: Using Artificial Intelligence Models to Identify Learning Difficulties. 2023 10th IEEE Uttar Pradesh Section International Conference on Electrical, Electronics and Computer Engineering, UPCON 2023, 1754-1758. DOI: 10.1109/UPCON59197.2023.10434783

Schiele, T, Edelsbrunner, P., Mues, A., Birtwistle E. Wirth, A., Niklas, F. (2025). The effectiveness of game-based literacy app learning in preschool children from diverse backgrounds. Learning and Individual Differences 117, 102579. https://doi.org/10.1016/j.lindif.2024.102579

Sibley,L., Fabian, A., Plicht, C., Pagano, L., Ehrhardt, N., Wellert, L., Bohl, T., Lachner, A. (2025). Adaptive teaching with technology enhances lasting learning. Learning and Instruction 99, 102141. https://doi.org/10.1016/j.learninstruc.2025.102141

Smiling, J., Hollebrands, K. (2025). Examining the effect of active participation on the TPACK knowledge of mathematics educators in a teaching mathematics with technology MOOC. International Journal of Educational Research Open 9, 100469. https: //doi.org/10.1016/j.ijedro.2025.100469

Sosa-Alonso, J.J., Hernández Rivero, V.M., Sanabria Mesa, A.L., Bethencourt Aguilar, A. (2025). Adoption of digital educational resources by early childhood education teachers: A fad or a conviction? Computers & Education 238, 105396. https://doi.org/10.1016/j.compedu.2025.105396

Sun, Q., Wang, C., Dai, D.Y., Li, X. (2025). Developmental effects of digitally contextualized reading on preschooler's creative thinking: A quasi-experimental study. Journal of Experimental Child Psychology 259, 106307. https://doi.org/10.1016/j.jecp.2025.106307

Tian,Y. (2024). „I can't teach without ICT": unpacking and problematising teachers' perceptions of the use of ICT in kindergartens in China. Early Years 44 (1), 79-96. DOI: 10.1080/09575146.2022.2090517

Ukwandu, E., Omisade, O., Jones, K., Thorne, S., Castle, M. (2025). The future of teaching and learning in the context of emerging artificial intelligence technologies. Futures 171, 103616. https://doi.org/10.1016/j.futures.2025.103616

Xu, Y. (2024). Intelligent e-learning system in the development of preschool music education based on digital audio technology. Entertainment Computing 50, 100682. https://doi.org/10.1016/j.entcom.2024.100682

Yang, T., Dong, C. (2024). What influences teachers' implementation of ICT in early childhood education? A qualitative exploration based on an ecological-TPACK framework. Computers and Education Open 7, 100228. https://doi.org/10.1016/j.caeo.2024.100228

Yilmaz, M.M., Ayperi, S. (2023). A material for education process and the Teacher: the use of digital storytelling in preschool science education. Research in Science and Technological Education 41 (1), 61-88. DOI: 10.1080/02635143.2020.1841148

Yurt, Ö., Cevher-Kalburan, N. (2011). Early childhood teachers' thoughts and practices about the use of computers in early childhood education. Procedia Computer Science 3, 1562-1570. https://doi.org/10.1016/j.procs.2011.01.050

Zhang, C., Hu M., Wu, W., Chen, Y., Kamran, F., X. (2025). A profile analysis of pre-service teachers' AI acceptance: Combining behavioral, technological, and human factors. Teaching and Teacher Education 163, 105086. https://doi.org/10.1016/j.tate.2025.105086

Zhang, X. (2025). Research on the application of big data learning recommendation model driven by knowledge graph algorithm in educational information platform optimization. Systems and

Soft   Computing   7, 200298.
        https://doi.org/10.1016/j.sasc.2025.200298
Wang, Y., Wei, X. (2025). Enhancing preschoolers' geometric
        cognition   through   mobile   educational   applications: a
        comparative   study   of   interface   styles. Acta   Psychologica
        258, 105181.   https://doi.org/10.1016/j.actpsy.2025.105181