# Digital Technology in Preschool Education: A Systematic Review[1]

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*Article History*:
Received 04.03.2023
Received in revised form 30.06.2023
Accepted
Available online 06.07.2023

Studies on digital technology have become increasingly important for restructuring education both in the world and in Türkiye. The rapid increase studies concerning digital technology in the field of preschool education in recent years reveal the need for a systematic review study that will guide future studies by evaluating the current situation of digital technology studies in Türkiye. Within the scope of the research, the studies to be included in the systematic review were examined with the determined keywords between 2017-2022 and determined by examining based on the inclusion-exclusion criteria. 136 studies were included in the research and examined based on publication dates, research method, participant type, analysis method used and the subject of the study. The data were analysed by content analysis. The results showed that studies on digital technology in the preschool period have increased in recent years, content analysis is used more in parallel with the qualitative research method, documents are frequently reviewed, and the most frequently discussed subject is the use of technology in education.



**Keywords:** Preschool education, digital, technology, systematic review

## INTRODUCTION

Children who encounter various digital technological devices such as televisions, computers, tablet computers and telephones at an early age and are born into technology grow with these technologies (Common Sense Media, 2020; Kol, 2017). For example, in a survey conducted on 3797 children between the ages of one month and eighteen years in Australia, the use of screen devices such as television, computer, laptop, play console, iPhone, smartphone, iPad and other tablets was examined (Rhodes, 2017) and it was found that one-third of preschool children (from birth to five years old) had their tablet or smartphone. In addition, it was found that the average number of hours for which preschool children used screens ranged from fourteen hours a week for infants and young children to 26 hours a week for two- to five-year-olds. These findings were found to be similar to those conducted in the US (Kabali et al., 2015), Europe (Chaudron, 2015; Ofcom, 2017) and Southeast Asia (Unantenne, 2014). It is noteworthy that there has been no large-scale study conducted on preschool children in Türkiye. However, according to the Research on the Use of Information Technologies in Children conducted by the Turkish Statistical Institute (TURKSTAT) in 2021, internet use was 82.7% for children aged 6-15 years, and 90.1% of children used the internet almost every day (TURKSTAT, 2021). In addition, with the recent effect of the worldwide Covid-19 pandemic, participation in online classes (86.2%) was the most common activity carried out by children in the 6-15 age group, who regularly used the internet in the years when the research was conducted, followed by using the internet for homework or learning purposes (83.6%), playing or downloading games with 66.1%, watching videos from social media websites with 61.0%, and making audio or video calls over the internet with 55.5%. The rate of children in the 6-15 age group who stated that at least one form of computer (desktop, laptop, tablet), mobile phone or smartphone, TV, smart TV, smart watch, and game console technology products used only by them was 66.6% in 2021. From all these reported findings, it is noteworthy that there is an increasing use of technology by young children in the family environment and in society both in the wider world (Common Sense Media, 2020) and in Türkiye (TURKSTAT, 2021).

The increasing use of technology by young children changes learning processes and it has become inevitable to benefit from technology in today's education (Sayan, 2016). It has been emphasized that teachers should be appropriately equipped to support children and their families in terms of the use of technology (Zabatiero et al., 2018). In addition, in education, it has been emphasized that teachers should be able to use technology effectively in order to form a developmentally appropriate educational environment for children of this age (Özdurak Sıngın & Gökulut, 2020), and to integrate technology with their pedagogical content

[1]This study was presented orally at DILET 2022- The 4th International Conference on Distance Learning and Innovative Educational Technologies (December 8-9, 2022, Ankara / Turkey).
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knowledge (Ağmaz & Ergüleç, 2020). Moreover, knowledge, media, and technology skills should be supported within the context of twenty-first-century skills (Partnership for 21st-century learning (P21), 2015). All of these developments have caused digital technology to be considered a new research area (Zabatiero et al., 2018). Studies have shown that the use of digital technology in preschool education positively affects children's learning and increases their motivation (Clarke & Abbott, 2016; Çakıroğlu & Taşkın, 2016; Kocaman-Karoğlu, 2016). It has also been stated that children could solve problems through hard technologies such as multi-touch surfaces, smartphones, tablets, robots, and technologically developed toys, and express, reflect and discover their external representations using symbolic information (González-González et al., 2019).

The results of the research on technology reported in the literature have also led to shaping and revising education programs. In the education standards prepared for the age groups from preschool to high school, which are called the Common Core State Standards (CCSS) in the US, there are expectations for the use of technology in different content areas (US Digital Literacy, 2022). In these standards, it can be seen that there are some expectations that teachers should provide opportunities to strengthen their students' digital skills for the preschool education level (Illinois Early Learning and Development Standards, 2013). Similarly, according to the teacher training program in Australia, teachers should guide young children sufficiently for them to develop digital literacy and computational thinking (Murcia et al., 2018). In contrast, it is noteworthy that there is no acquisition or indicator related to the use of technology in the Ministry of National Education's (MoNE) Preschool Education Program (2013) in Türkiye. Also, the undergraduate teacher training programs do not have compulsory courses on digital literacy. Even so, it has been reported that preschool teachers in Türkiye include digital technology in their daily schedule (İnci & Kandır, 2017). For this reason, it is considered that exploring the current situation regarding digital technology studies in preschool education in Türkiye will suggest directions for future studies.

When the systematic review studies conducted on early childhood education in the last five years are examined in the literature, it can be seen that each of them evaluated the studies from a different perspective. A systematic review carried out to reveal the diversity of research designs, screen time, type of technological device used, and features related to social interaction in the use of technology in the research studies on digital technologies was carried out with children aged 0-5 between the years of 2011 and 2015 (Miller et al., 2017). In another review study, the type of technologies used in early childhood, the educational purposes of these technologies, and the level of educational effectiveness were examined in empirical studies on digital technology carried out in 2013 and 2018 with children between the age of 0 to 6 (González-González et al., 2019). Mantilla and Edwards (2019) examined empirical studies published from 2012 to 2017 which were intended to advise adults on the use of appropriate digital technology for children aged 0-8. Eliasson et al. (2022) reviewed the principal dimensions that represent technology as artifacts a creation process, human practice, the history of technology and the constant change of technology rarely included in technology education reported in empirical studies of early childhood education conducted between 2013 and 2020.

Two systematic reviews were found which had been conducted in Türkiye. Theses and articles published between 2010 and 2016 on the use of digital technology in preschool education were examined by İnci and Kandır (2017), who evaluated the year in which publications most frequently appeared, the participants who were studied most, the most discussed topics, research designs and types of data collection tools. Ağmaz and Ergüleç (2020), on the other hand, examined only postgraduate theses written on the use of technology in preschools; theses written between 1988 and 2019 were evaluated in terms of the years when the frequency of publication increased, the participant groups, data collection tools and research results. No reviews were found of articles written between 2017 and 2022 on digital technology in preschool education in Türkiye. The current study was therefore undertaken to explore the current status of articles published in the last five years on the use of digital technology in preschool education and to guide other researchers who could work in this field. In this systematic review, digital technology is defined as digital devices (such as computers, tablets, and play consoles) and products or outputs (such as applications, websites, and games) viewed, played, read, or formed by children on these devices (Plowman, 2016).

In line with the purpose of this research, the following research questions were prepared:

1. What is the frequency of the studies in terms of the years?
2. What are the research methodologies?
3. What is the sample/study group?
4. How the studies are analysed?

5. What are the trends of the studies in terms of their subjects?

## METHOD

### Research Design

This study reviewed articles on the use of digital technology in preschool education in the current literature in Türkiye using the systematic review method, one of the qualitative research methods. A systematic review is a methodology that identifies existing studies on a topic, selects studies to include in the review by using selection criteria and evaluating the quality of the studies, and analyses and synthesizes the included studies (Aslan, 2018).

### Population and Sample of the Research

For this review study, 136 research articles written on the use of digital technology in preschool education in Türkiye between 2017 and 2022 were examined.

### Data Collection and Analysis

Google Scholar, Dergipark, and the TR Index databases were searched to find the relevant the articles. In order to define the common literature "and" was used between the keywords. Searches were made with the words "preschool and digital" and "preschool and technology". The databases were searched without any year restrictions and all studies related to the use of technology and digital devices in the preschool period during April 2022. A total of 21,303 studies were identified using keywords to search the databases; they were transferred to Excel with titles, authors, and links. In the first stage, the titles and abstracts of the studies were examined by the researchers in terms of their relevance. Repeated and duplicated studies were then removed. This process is presented in Figure 1.

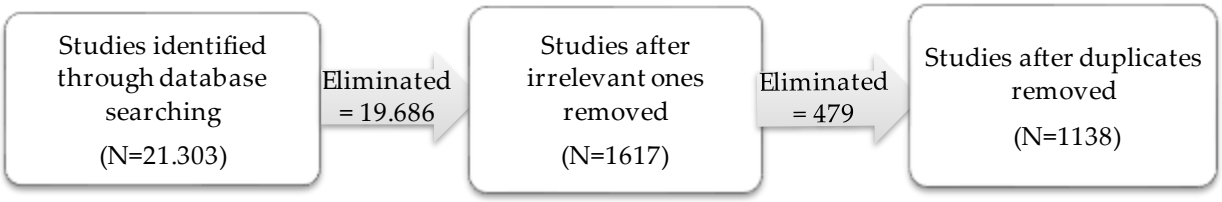


**Figure 1.** Selection Stages of Studies

In the second stage, it was determined whether the studies to be included in the review met the inclusion and exclusion criteria by conducting full-text analysis.

### Inclusion and Exclusion Criteria

Articles published in Google Scholar, Dergipark and the TR Index database were selected based on the inclusion and exclusion criteria set out Table 1.

**Table 1.** Selection Criteria

| | *Inclusion Criteria* | *Exclusion Criteria* |
|---|---|---|
| Search Engine | Studies in Google Scholar, TR Index and Dergipark databases | Other search engines |
| Publication Date | Between 2017 and 2022 | Before 1 January 2017 and after 20 April 2022 |
| Research Method | Qualitative, quantitative or mixed | Review articles |
| Study Group/Sample | Preschool children, families of preschool children, preschool teachers, preschool teacher candidates, preschool administrators | Studies with more than one sample group |
| Type of Publication | Articles | Scale development studies<br>Reports, book chapters, postgraduate theses, project, congress, and symposium papers, review articles |
| Language of Publication | Turkish | Other languages |
| Country of Study | Türkiye | Other countries |

As a result of the selection process described above, 136 studies were included in this study and a diagram of the systematic review was formed (Figure 2). The results are presented in the form of tables and graphs. Codes from 1 to 136 were given to the surname and year information of the authors of the articles examined within the scope of the research (see Appendix 1).

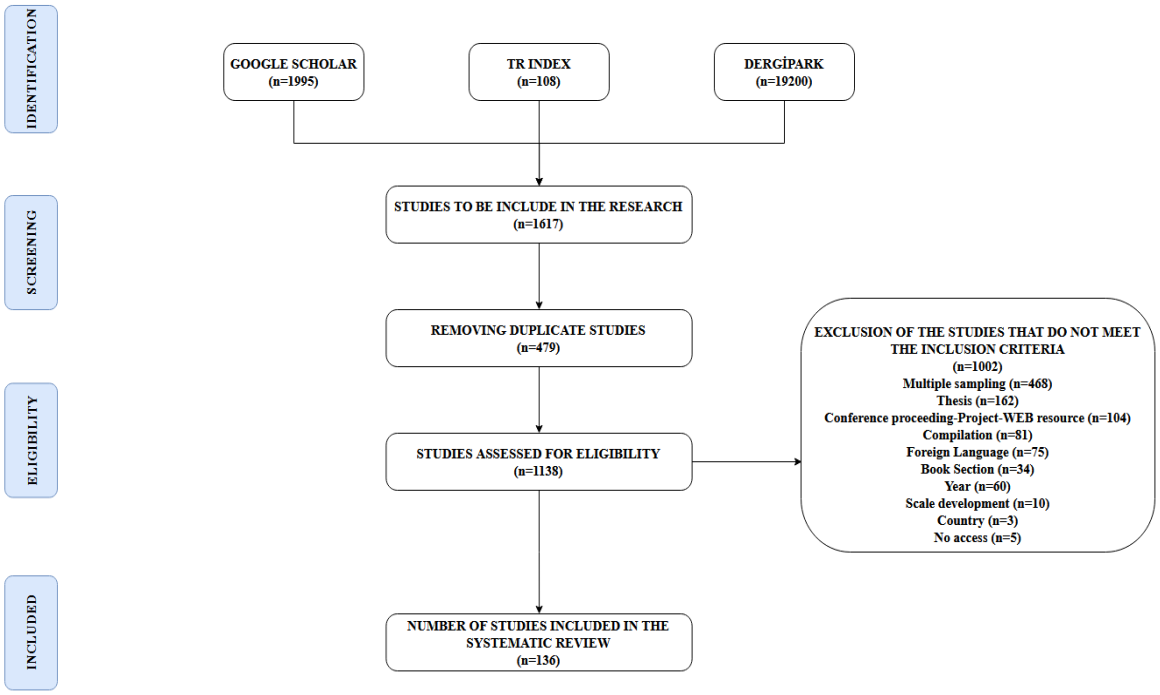


**Figure 2.** Diagram of Study Retrieval and Selection Progress

## RESULTS

The studies analysed in terms of their publication years is presented in Table 2 and Figure 3.

**Table 2.** Studies by Year

| *Years* | *Articles* | *f* |
|---|---|---|
| 2017 | 113; 117; 28; 47; 71; 97; 89; 38; 62; 121; 101; 80; 11; 100; 127; 91; 115; 30; 12; 79; 135 | 21 |
| 2018 | 109; 22; 34; 7; 90; 36; 25; 120; 81; 92; 14; 76; 78; 82; 83; 130; 70; 112; 53; 110 | 20 |
| 2019 | 128; 4; 6; 19; 75; 136; 45; 39; 98; 42; 77; 123; 134; 23; 63 | 15 |
| 2020 | 64; 55; 96; 20; 103; 66; 18; 51; 8; 61; 68; 54; 106; 2; 16; 86; 29; 67; 87; 43; 40; 37; 58; 116; 114; 93; 131; 84; 65; 46 | 30 |
| 2021 | 48; 126; 74; 27; 94; 111; 10; 3; 13; 105; 50; 133; 95; 118; 49; 31; 5; 107; 35; 132; 73; 102; 33; 1; 9; 41; 119; 52; 15; 59; 104; 129; 44; 17; 122; 21; 99; 88; 124; 108; 32; 85; 125; 26; 56 | 45 |
| 2022 | 57; 69; 24; 72; 60 | 5 |
| **Total** | | **136** |

Table 2 shows that the highest number of studies were conducted in 2021 with 45 articles. Thirty studies were published in 2020, 20 in 2018, 21 in 2017, 15 in 2019 and 5 in 2022. It was observed that there was a significant increase, especially between 2019 and 2021. The reason why there were fewer articles in 2022 can be interpreted as the absence of articles which had not yet been published due to the timing of the collection of data in that year.

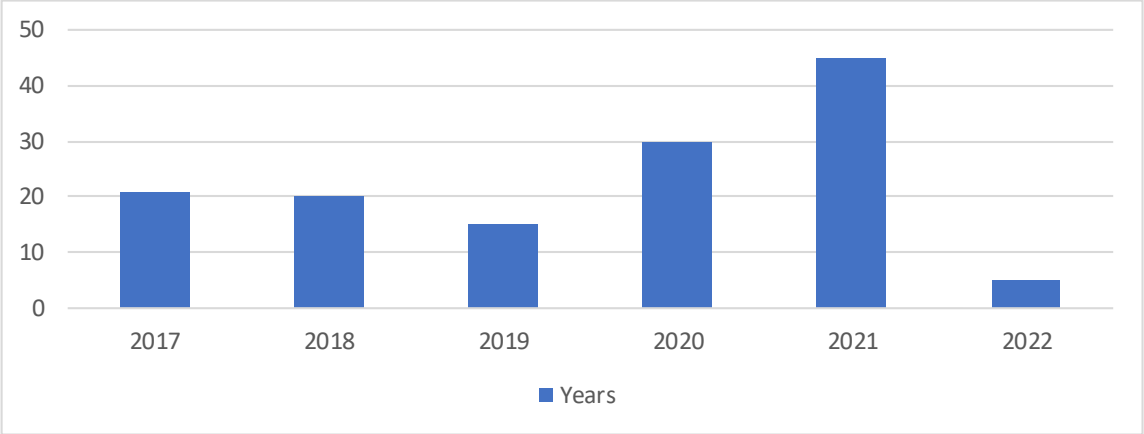


**Figure 3.** Bar Chart of Studies by Years

The evaluation of the methods of the studies are given in Table 3 and Figure 4.

**Table 3.** Frequency based on the Methods of the Studies

| *Method* | *Articles* | *f* |
|---|---|---|
| Qualitative | 48; 113; 22; 34; 55; 7; 18; 94; 10; 117; 128; 8; 90; 36; 28; 61; 13; 105; 50; 133; 97; 95; 49; 38; 54; 31; 5; 62; 121; 101; 24; 73; 86; 29; 67; 87; 11; 1; 39; 40; 119; 37; 52; 76; 78; 59; 104; 116; 127; 44; 82; 17; 91; 134; 114; 130; 30; 93; 12; 72; 63; 122; 70; 84; 88; 32; 85; 110; 60; 46; 135; 26; 56; 123; 83 | 75 |
| Quantitative | 109; 126; 96; 103; 66; 27; 51; 3; 25; 47; 19; 81; 71; 136; 118; 69; 68; 45; 80; 106; 2; 16; 35; 132; 102; 9; 98; 41; 92; 15; 58; 77; 100; 129; 115; 23; 21; 131; 112; 124; 79; 65; 53 | 43 |
| Mixed | 64; 74; 57; 111; 4; 6; 75; 120; 33; 43; 42; 14; 20 | 13 |
| Not Specified | 89; 107; 99; 108; 125 | 5 |
| **Total** | | **136** |

Table 3 shows that qualitative (f=75), quantitative (f=43) and mixed (f=13) methods were used. It was found that qualitative studies had a large proportion and that mixed-method studies formed a significantly smaller proportion of the distribution.

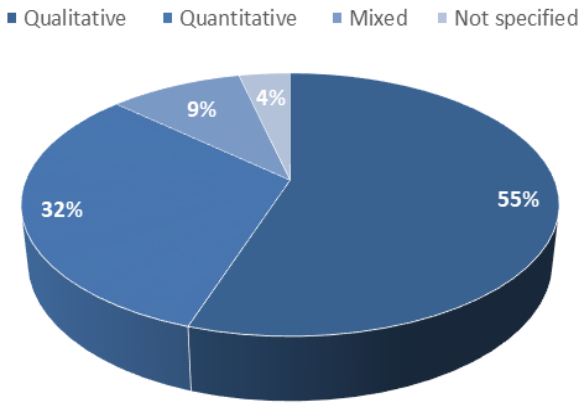


**Figure 4.** Pie Chart Based on the Methods of the Studies

The studies in terms of the sample/study group is presented in Table 4 and Figure 5.

**Table 4.** Frequency based on the Sample/Study Group of the Studies

| *Sample* | *Articles* | *f* |
|---|---|---|
| Children | 7; 18; 3; 36; 28; 6; 25; 47; 19; 81; 95; 118; 68; 38; 54; 31; 101; 132; 29; 102; 40; 52; 58; 100; 78; 127 | 26 |
| Parents | 109; 34; 96; 128; 8; 90; 50; 136; 49; 89; 62; 16; 37; 14; 15; 77; 76; 82 | 18 |
| Teachers | 113; 22; 103; 66; 94; 111; 10; 61; 13; 75; 97; 69; 121; 80; 106; 24; 73; 86; 1; 9; 98 | 21 |
| Teacher candidates | 48; 64; 55; 126; 20; 74; 57; 27; 117; 51; 4; 71; 133; 5; 45; 120; 35; 11; 33; 39; 43; 42; 41; 119; 92 | 25 |
| Documents | 2; 67; 123; 44; 17; 91; 115; 83; 114; 130; 30; 23; 93; 12; 72; 122; 21; 131; 99; 112; 84; 88; 124; 65; 79; 53; 60; 46; 135; 26; 56;63;105; 87 | 34 |
| Cartoon episodes and TV shows | 107; 59; 104; 129; 116; 108 | 6 |
| Social platforms (Instagram and YouTube) | 134; 32; 85; 125 | 4 |
| Websites | 70; 110 | 2 |
| **Total** | | **136** |

Table 4 shows that the majority of the participating samples of the studies were carried out with documents (f=34), followed by studies conducted with children (f=26) and teacher candidates (f=25). Websites were used significantly less in the studies.

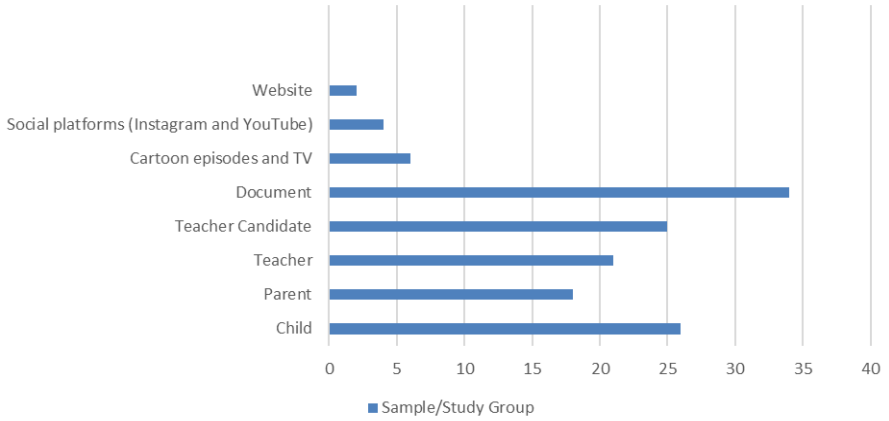


**Figure 5.** Bar Chart of Studies by Sample/Study Group

The research method and analysis method used in the studies are given in Table 5 and Figure 6 in detail.

**Table 5.** Frequency Concerning Method of Analysis

| | *Research Method/Analysis Method* | | *Article* | *f* |
|---|---|---|---|---|
| Quantitative | Descriptive (frequency, percentage) | | 64; 55; 51; 6; 47; 81; 71; 38; 54; 80; 35; 33; 15; 57 | 14 |
| | | T-test | 74; 111; 3; 47; 19; 120; 35; 102; 43; 42; 58; 25 | 12 |
| | | Correlation | 66; 3; 69; 89; 35; 77 | 6 |
| | | ANOVA | 69; 89; 106; 132; 102; 58; 77; 25 | 8 |
| | | MANOVA | 77 | 1 |
| | Predictive | Factor analysis | 3 | 1 |
| | | Regression | 51; 89 | 2 |
| | | Mann Whitney U | 96; 19; 118; 35 | 4 |
| | | Kruskal Wallis | 96; 118; 89; 35 | 4 |
| | | Correlation | 35 | 1 |
| | | Chi-square test | 53 | 1 |
| Qualitative | Content Analysis | | 48; 34; 64; 55; 20; 74; 57; 111; 10; 117; 90; 36; 28; 6; 13; 105; 50; 71; 133; 49; 62; 107; 121; 120; 2; 24; 73; 86; 11; 33; 1; 39; 43; 98; 42; 40; 41; 119; 92; 76; 123; 59; 104; 129; 116; 127; 44; 17; 91; 134; 115; 83; 30; 23; 93; 12; 63; 122; 21; 70; 112; 84; 88; 124; 65; 108; 32; 85; 110; 125; 60; 135; 26; 56 | 74 |
| | Descriptive Analysis | | 113; 22; 34; 7; 103; 128; 8; 90; 28; 61; 133; 136; 95; 5; 45; 87; 78; 72; 53, 94 | 18 |
| Not Specified | | | 109; 126; 18; 4; 75; 97; 68; 31; 101; 16; 29; 67; 9; 37; 14; 52; 100; 82; 114; 131; 99; 79; 46; 130 | 24 |
| **Total** | | | | **172** |

Table 5 shows that qualitative data analysis methods (f=92) were used the most in the studies. Of the quantitative data analysis methods, predictive analysis (f=40) was used the most. It was also found that content analysis (f=74) was used the most among the qualitative data analysis methods.

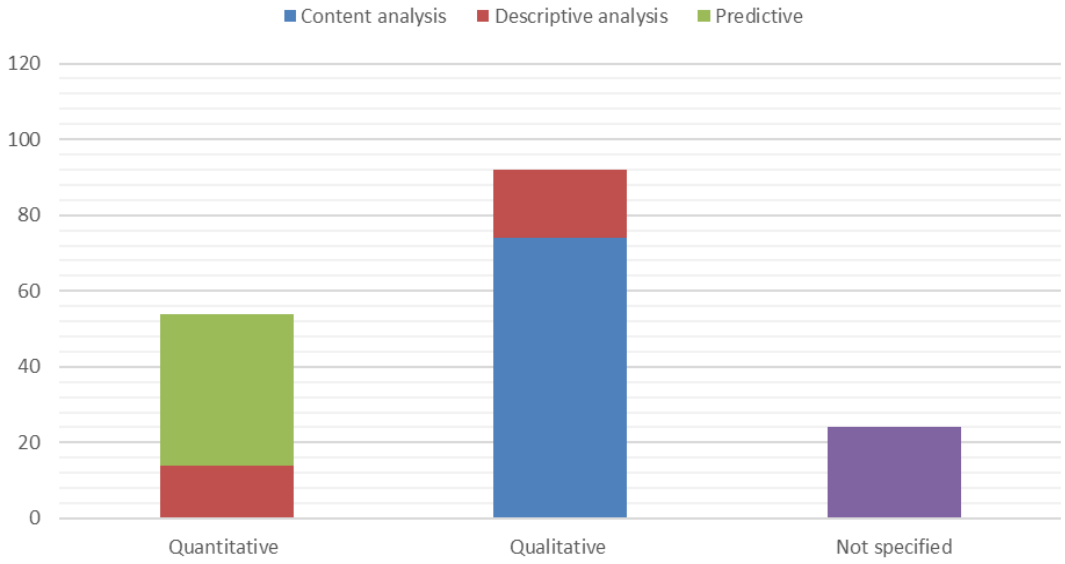


**Figure 6.** Graphical Representation of Studies by Method of Analysis

The findings regarding the studies in terms of their subjects are presented in Table 6 and Figure 7.

**Table 6.** Frequency based on the Subjects of the Studies

| *Topics* | | *Articles* | *f* |
|---|---|---|---|
| Technology | | 2; 30; 56; 67; 83; 93; 131 | 7 |
| Technological devices | Computer and tablet | 36 | 1 |
| | Smartphone | 51; 66; 90 | 3 |
| | Television | 29; 33; 70; 82; 102 | 5 |
| Cartoon | | 6; 28; 49; 52; 58; 59; 78; 104; 107; 116; 127; 128; 129 | 13 |
| Technology usage | Children | 14; 34; 37; 54; 62; 68; 89; 96; 109; 136 | 10 |
| | Teacher | 9; 80; 97; 103; 113 | 5 |
| | Teacher candidate | 71; 117; 126 | 3 |
| Usage of technology in education | Digital technology in education | 79 | 1 |
| | Computer-aided education | 26; 53; 100 | 3 |
| | STEM | 1; 19; 48; 20; 7; 111; 75; 31; 5; 120; 121; 87; 42; 40; 43; 41; 98; 119; 92; 44, 72; 63; 84; 125; 60 | 25 |
| | Distance education | 8; 10; 13; 17; 24; 57; 65; 73; 108; 124; 133 | 11 |
| | Software, applications and games | 12; 18; 47; 74; 94; 95; 101; 130; 132; 135 | 10 |
| | Web 0.2 | 64 | 1 |
| | Digital story | 21; 25; 38; 55; 115; 118; 122 | 7 |
| Views\perceptions of teacher candidates concerning technology | | 4; 45 | 2 |
| Children's technology skills | | 3 | 1 |
| Techno-pedagogical field skills (TPFS) | | 91; 106 | 2 |
| Digital | Media | 11; 15; 35; 81; 105; | 5 |
| | Literacy | 27; 69; 86 | 3 |
| | Privacy | 23 | 1 |
| | Parenting | 88 | 1 |
| | Citizenship | 112 | 1 |
| | Games | 39; 46; 50; 76; 77; 99; 110; 114 | 8 |
| Internet | Social media platforms | 16; 22; 32; 61; 85; 123; 134 | 7 |
| **Total** | | | **136** |

Table 6 shows that the use of technology was most investigated in the studies. It was also observed that the use of technology was mostly included in education. It was observed that the studies with the use of education generally focused on the STEM subjects, software, applications and games, distance education/learning, computer-aided education and digital storytelling. It was found that a limited number of studies had been carried out on Web 0.2 tools.

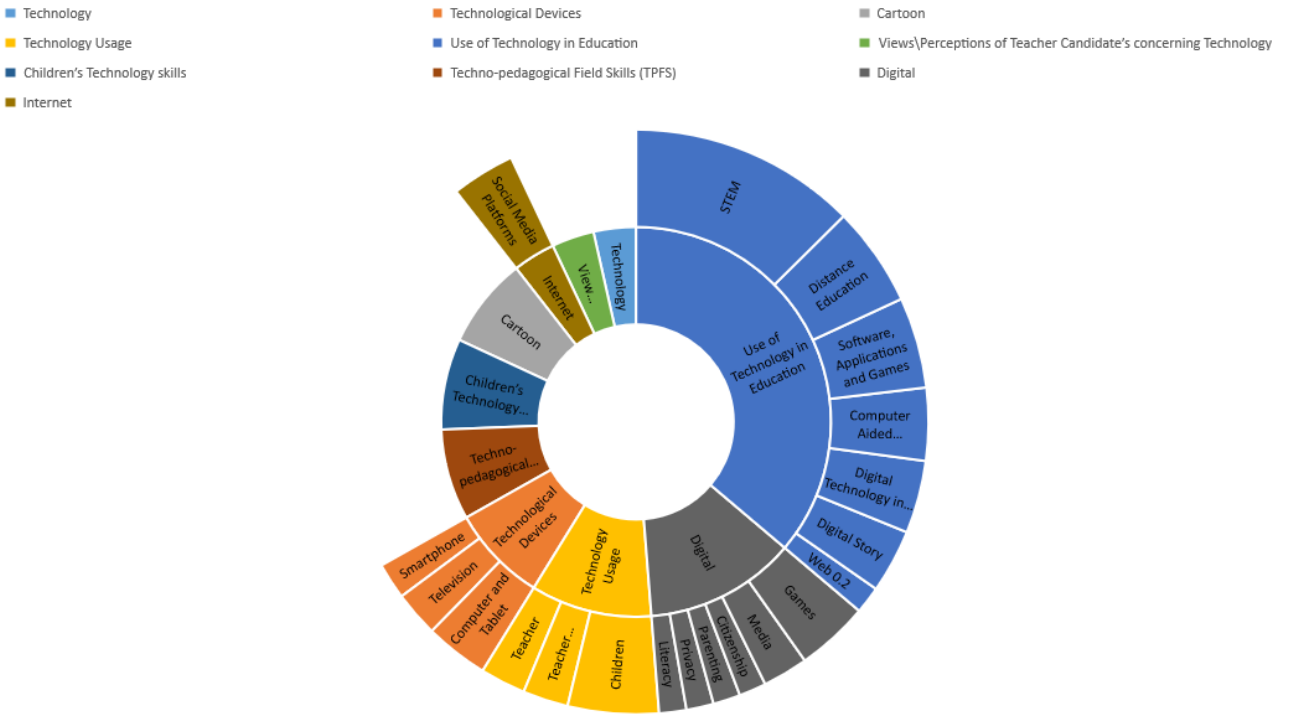


**Figure 7.** Graphic Representation of Studies by Subject

## CONCLUSION and DISCUSSION

This study was a systematic analysis conducted to determine the trends of recent articles on the use of digital technology in preschool education in Türkiye. In accordance with this design, 136 studies written between 2017 and 2022 were selected based on a series of inclusion criteria and examined in terms of publication years, research design, participant sample, methods of analysis and the main topic.

The results of the study showed that the majority of the studies were conducted between 2019 and 2021. It is thought that there are two reasons for this finding. The first is that technology is taking more and more place in our lives every day, the second is an increase in the usage of technology in education especially during the Covid-19 pandemic.

This shows that interest in this subject has increased in recent years. This supports İnce and Kandır's (2017) finding which examined studies between the years 2010-2016 of an increasing interest in digital devices and technology in preschool education.

In the examination of the methodology of the research designs used in the studies, it was found that the qualitative research method was used in the majority of the included studies. Contradicting the findings reported by İnce and Kandır (2017) and Ağmaz and Ergüleç (2020), it was found that the number of qualitative studies on the use of digital technology in preschool education has increased in recent years. It was found that content analysis was most used for qualitative data analysis and that t-tests were most used for the quantitative data analysis method. A similar finding that comparative studies were included the most was made by Killer et al. (2017).

Another result of the study was that the population and participant sample were included in all the studies. It was found that mostly documents were examined in the studies. Considering the increase in the use of technology at early ages and its benefits in preschool education, it was found that there have been relatively few studies on the use of digital technology conducted with children. However, Yılmaztekin and Olgan (2013) found a decade ago that most of the studies of the use of technology in the preschool period were carried out with children. Similarly, in a review study of postgraduate theses, it was found that children were

the most preferred study group (Ağmaz & Ergüleç, 2020). As can be seen, document analysis was not preferred in thesis studies. However, the importance of technology in education in the literature may have led to an increase in document review studies over the years.

The final results of this systematic review were that the articles on the use of technology in preschool education had mostly focused on education, children, teachers and teacher candidates. Studies of the use of technology in education had generally focused on the STEM subjects, software, applications and games, distance education/learning, computer-aided education and digital storytelling. In the other systematic review study in which only postgraduate theses were examined, the subject distribution of the theses was as follows: teachers' views, parents' views, their effects on children, experimental studies comparing the methods used in education, and educational software used in education (Ağmaz & Ergüleç, 2020). In a review conducted by Mantilla and Edwards (2019), the studies included healthy practices, relationships, pedagogy and digital themes. In particular, the studies under the theme of pedagogy were grouped into three sub-themes: social interactions and knowledge construction, teaching/learning with digital technology and digital media production. Another study included gender and early childhood interventions, social interactions, creativity, the relationship between play and learning, and sensory experiences (the use of hands and fingers) among topics related to technologies and early childhood education (González-González et al., 2019). The reason why the use of digital technology in education has mostly been discussed could result from research on the positive or negative effects of educational technologies on children (Sert, 2010). In the current study, it was found that only a limited number of studies had been carried out on Web 0.2 topics. Also, the least included subject in the review was found to be children's technology skills. It is thought that it would be beneficial to consider this result as motivation to enrich future studies. In summary, it was found that digital studies were also discussed a lot and that digital games were the subject discussed most.

In line with the results of this study, it is suggested that it would be beneficial to include in future reviews quantitative studies in which preschool children are considered as the target group and standard measurement tools are used to generate more generalizable results. Considering that teachers have an important role in helping pupils to benefit from the use of technology in education, the number of studies carried out with teachers should be increased and the effectiveness of teachers' professional development programs for the use of digital technology can be designed and their effectiveness evaluated. In this way, it is thought that the crucial effect of teachers can be increased. Considering these results, it is thought that it is important to increase the number of studies on digital technology in the preschool period which focus on how children can benefit from technology to facilitate their learning and development.

**Declarations**

**Conflict of Interest**

The authors declare that they do not have any conflicts of interest.

**Ethics Approval**

A Systematic Review is an analysis that incorporates assessments based on data from earlier studies. In this regard, the ethics committee's consent is not required.

**Funding**

The authors declare that there is no financial support for this study.

**Contribution Rates of Authors to the Article**

Nevra Atış Akyol: concept, data collection, formal analysis, writing-original draft.

Rabia Turanoğlu: data collection, formal analysis, writing-original draft.

Nurbanu Parpucu: writing review, writing-original draft, and editing.

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## APPENDIX

**Appendix 1.** Coding of Author Names with Publication Year

| Author | Year | Code |
|---|---|---|
| Abanoz & Deniz | 2021 | 1 |
| Ağmaz & Ergüleç | 2020 | 2 |
| Ahmetoğlu et al. | 2021 | 3 |
| Ahmetoğlu & Yavuz | 2019 | 4 |
| Akarsu et al. | 2021 | 5 |
| Akça & Çilekçiler | 2019 | 6 |
| Akgündüz & Akpınar | 2018 | 7 |
| Akkaş Baysal et al. | 2020 | 8 |
| Aksoy | 2021 | 9 |
| Aktan Acar et al. | 2021 | 10 |

| | | |
|---|---|---|
| Alıcı & Gökbulut | 2017 | 11 |
| Alpkıray & Samur | 2017 | 12 |
| Altın & Gündoğdu | 2021 | 13 |
| Aral & Doğan Keskin | 2018 | 14 |
| Aral & Kadan | 2021 | 15 |
| Aslan & Durmuş | 2020 | 16 |
| Ata & Arslan | 2021 | 17 |
| Atabay & Albayrak | 2020 | 18 |
| Aydın et al. | 2019 | 19 |
| Azamet & Altun Yalçın | 2020 | 20 |
| Bahadır et al. | 2021 | 21 |
| Balcı & Tezel Şahin | 2018 | 22 |
| Barkuş & Koç | 2019 | 23 |
| Bartan | 2022 | 24 |
| Başdaş & Akar Vural | 2018 | 25 |
| Batdı & Anıl | 2021 | 26 |
| Bay | 2021 | 27 |
| Bayır & Günşen | 2017 | 28 |
| Bayrak Çelik | 2020 | 29 |
| Baz | 2017 | 30 |
| Bilen et al. | 2021 | 31 |
| Boğa & Sağlam | 2021 | 32 |
| Bulut Pedük et al. | 2021 | 33 |
| Bulut | 2018 | 34 |
| Burak & Durak | 2021 | 35 |
| Büyükbahçıvan & Korucu | 2018 | 36 |
| Cengiz Saltuk & Erciyes | 2020 | 37 |
| Cırık & Gözen | 2017 | 38 |
| Coşkun & Filiz | 2019 | 39 |
| Çakır & Altun Yalçın | 2020 | 40 |
| Çakır & Altun Yalçın | 2021 | 41 |
| Çakır et al. | 2019 | 42 |
| Çakır et al. | 2020 | 43 |
| Çalışkan & Okuşluk | 2021 | 44 |
| Çalışoğlu | 2019 | 45 |
| Çardak & Özbey | 2020 | 46 |
| Çevik et al. | 2017 | 47 |
| Çiftçi & Topçu | 2021 | 48 |
| Darga et al. | 2021 | 49 |
| Darga | 2021 | 50 |
| Demir Öztürk & Coşanay | 2020 | 51 |
| Deniz Vural | 2021 | 52 |
| Dikmen & Tuncer | 2018 | 53 |
| Doğan & Kavgaoğlu | 2020 | 54 |
| Doğusoy | 2020 | 55 |
| Donmuş Kaya & Eroğlu | 2021 | 56 |
| Döğer | 2022 | 57 |
| Duman et al. | 2020 | 58 |
| Duman & Koçtürk | 2021 | 59 |

| | | |
|---|---|---|
| Ecevit et al. | 2022 | 60 |
| Erdem & Avcı | 2020 | 61 |
| Ergüney | 2017 | 62 |
| Erhan | 2019 | 63 |
| Eskimen & Erdoğdu | 2020 | 64 |
| Gezer & Durdu | 2020 | 65 |
| Gezgin et al. | 2020 | 66 |
| Güçhan Özgül & Mısırlı | 2020 | 67 |
| Gülay Ogelman et al. | 2020 | 68 |
| Gülay Ogelman et al. | 2022 | 69 |
| Güler İplikçi & Batu | 2018 | 70 |
| Güler et al. | 2017 | 71 |
| Gülhan | 2022 | 72 |
| Gündoğdu | 2021 | 73 |
| Gündüzalp | 2021 | 74 |
| Günşen et al. | 2019 | 75 |
| Haşıl Korkmaz et al. | 2018 | 76 |
| Işıkoğlu Erdoğan | 2019 | 77 |
| İmik Tanyıldızı & Karabulut | 2018 | 78 |
| İnci & Kandır | 2017 | 79 |
| Kaçan & Kimzan | 2017 | 80 |
| Kadan & Aral | 2018 | 81 |
| Kalafat Çat | 2018 | 82 |
| Baysan et al. | 2018 | 83 |
| Kalemkuş | 2020 | 84 |
| Karakoç & Ünlü | 2021 | 85 |
| Kardeş | 2020 | 86 |
| Kardeş 21.yy | 2020 | 87 |
| Kaya & Mutlu Bayraktar | 2021 | 88 |
| Kaya | 2017 | 89 |
| Kızıltaş & Ertürk | 2018 | 90 |
| Korucu et al. | 2017 | 91 |
| Koyunlu Ünlü & Dere | 2018 | 92 |
| Köybaşı | 2020 | 93 |
| Kurt | 2021 | 94 |
| Kurtboğan et al. | 2021 | 95 |
| Kutluca & Oğuz | 2020 | 96 |
| Kuzgun & Özdinç | 2017 | 97 |
| Mercan & Kandır | 2019 | 98 |
| Nergiz & Fidan Nergiz | 2021 | 99 |
| Okur Akçay et al. | 2017 | 100 |
| Olgun | 2017 | 101 |
| Oral Paksoy & Arslan | 2021 | 102 |
| Öner | 2020 | 103 |
| Öneren Şendil et al. | 2021 | 104 |
| Özdil & Tuğluk | 2021 | 105 |
| Özdurak Sıngın & Gökbulut | 2020 | 106 |
| Özkar & Aytaş | 2021 | 107 |
| Öztürk & Çetinkaya | 2021 | 108 |

| | | |
|---|---|---|
| Özyürek | 2018 | 109 |
| Sağlam & Kayaduman | 2018 | 110 |
| Samur & Altun Yalçın | 2021 | 111 |
| Sari & Taşer | 2018 | 112 |
| Simsar & Kadim | 2017 | 113 |
| Şimşek & Karakuş Yılmaz | 2020 | 114 |
| Şimşek | 2017 | 115 |
| Talu & Yüzbaşıoğlu | 2020 | 116 |
| Turan Güntepe & Dönmez Usta | 2017 | 117 |
| Türe Köse & Bartan | 2021 | 118 |
| Türk & Duran | 2021 | 119 |
| Uğraş & Genç | 2018 | 120 |
| Uğraş | 2017 | 121 |
| Ulu | 2021 | 122 |
| Uyanık Aktulun & Elmas | 2019 | 123 |
| Ülger | 2021 | 124 |
| Ünlükaya et al. | 2021 | 125 |
| Ünver & Bilgici | 2021 | 126 |
| Yağan Güder et al. | 2017 | 127 |
| Yazıcı | 2019 | 128 |
| Yener et al. | 2021 | 129 |
| Yeşilyurt | 2018 | 130 |
| Yıldız Durak & Durak | 2020 | 131 |
| Yıldız & Zengin | 2021 | 132 |
| Yılmaz et al. | 2021 | 133 |
| Yılmaz | 2019 | 134 |
| Yolcu & Demirer | 2017 | 135 |
| Zehir et al. | 2019 | 136 |