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The Use of Technology in Literacy Teaching in Türkiye: A Meta-Synthesis Study (2012-2022)

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In this study, the line of research on the use of technology in literacy teaching in Türkiye was analyzed using a meta-synthesis approach. The studies examined were selected by using YÖK (Council of Higher Education) database, YÖK Academic, TR Index, and Google Academic search engines. In this study, 14 studies were selected according to the inclusion criteria. Of these studies, 5 are theses, and 9 are articles. The meta-synthesis method was used in the research. The aims, results, and recommendations of the relevant studies were analyzed and evaluated. As a result of the analysis, it was revealed that researchers focused on evaluating the usability of technology in literacy teaching and understanding how technology was utilized in literacy education during the Covid-19 period. It was also determined that using technology for teachers and students in literacy teaching before and during the pandemic had positive (concretizing teaching, motivation, active participation, improving reading skills, and alike) and negative (lack of hardware-software, internet access, cost, and so on) consequences. In the analyzed studies, it was suggested that institutions should develop policies to eliminate disadvantages in terms of literacy and to expand free applications. Educational technologists were emphasized in developing rich content and taking into account the developmental characteristics of students in the applications to be developed.

Introduction

In addition to reading and writing skills, the primary school develops skills in many areas, such as the use of technology, listening, speaking, mathematics, aesthetics, thinking, and sports. Primary school courses are one of the most important tools for gaining these skills. Among these courses, literacy is of critical importance in primary school. Historically, many different technologies have been used in literacy teaching, from sand tables to interactive whiteboards (Açıkalın, 2018; Aksoy, Karabay, & Aksoy, 2021; Brown, Bryan, & Brown, 2005; Ersoy & Bozkurt, 2017; Orhan Karsak, 2014; Smith, Hardman, & Higgins, 2006; Şahin, 2019; Yüksel Özkaya, 2020). Students with advanced literacy skills can have a successful academic

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and social life. Especially during the Covid-19 pandemic, two generations of students had to learn literacy remotely or hybrid in different technological environments. This situation has made it necessary to evaluate studies on the use of technology in literacy teaching from a holistic perspective.

Writing is a complex process in which various emotions, thoughts, and experiences in the human mind are transferred through certain symbols and rules. When a student wants to write something, they perform various operations on their knowledge. Examples of these processes include organizing their information, enriching their knowledge, spreading their thoughts to wider areas and using language (Göçer, 2009). Developing writing skills is also related to the student's reading. Although reading alone is insufficient for developing writing skills, it plays a critical role. Reading is a special action in which cognitive activities are intense and complex (Akyol, 2006). Literacy skills are acquired by students starting from the first grade, which is the first year of their school life (Baştuğ & Demirtaş Şenel, 2016). It is crucial for a primary school student to successfully navigate the literacy teaching process, as it lays the foundation for future learning. In addition to gaining psychomotor skills such as reading and writing in literacy teaching, it is aimed to gain various cognitive skills such as thinking, decision-making, criticism, understanding and using information (Güneş, 2003). In successful literacy teaching, the effectiveness of the selected method, the time it is used and the way it is applied are important. Currently, synthesis, analysis and mixed methods are used in literacy teaching (Baştuğ & Demirtaş Şenel, 2016). In the synthesis method, syllables are formed by combining sounds, words by combining syllables, sentences by combining words, and texts by combining sentences (Güleryüz, 2002). In the analysis method, it is easier for students to perceive and learn the units given as a whole. After students perceive and learn the given whole, they divide it into parts. The sentence given as a whole is divided into words, syllables, and letters. After the words are divided into syllables and letters, syllables and therefore letters are used again to form new words. The mixed method includes more than one method. Even if reading skills are taught quickly in the mixed method, it is very difficult to gain fluent, stable, and meaningful reading skills and make them a habit (Kavcar, Oğuzkan, & Sever, 1995).

There are current technologies that teachers can use to support the methods they choose in literacy teaching. These include multimedia applications, projectors, interactive boards, educational platforms, web 2.0 tools, and augmented and virtual reality applications. Different technologies are used in the immediate environment of students and students can learn to use these technologies in some way. Since students in the first quarter of the 21st century is born into technological environments and their lives are shaped by technological advancements, the use of technology in their education appears inevitable. Considering the inequalities of opportunity in education in Türkiye, the FATİH Project was launched in 2010. This project aims to improve the hardware and software infrastructure in schools, provide and manage educational e-content, use information technologies effectively in teaching, provide in-service training for teachers, and ensure the use of conscious, safe, manageable, and measurable information technologies. The use of technology in literacy teaching can be divided into two periods: pre-Covid-19 and the pandemic period. Before the pandemic, technology was mostly used in a part of the lesson to support teaching, while during the pandemic, the lesson was carried out entirely in technological environments (Atik Avcı, 2021; Brown et al., 2005; Kargin & Karataş, 2021; Kesik & Baş, 2021; Safa, 2019; Sağırlı, 2021).

In 2020, with the COVID-19 pandemic, face-to-face education was suspended in schools at all levels around the world and continued online. It was known that very few primary school teachers and students were familiar with online education, while those in higher education were



more familiar with it. Although educators were partially familiar with online education, they faced some difficulties. However, the most difficulties were experienced at the primary school level. At the time of the pandemic, there was little information about how literacy was being taught at the primary level and how teachers were coping with it (Gonzales & Mohamed, 2022). While before the pandemic, technology was used to support teaching in the classroom, after March 2020, technology turned into an educational platform. In this context, with the rapid change in educational needs and technology, computers were already being used effectively in classrooms (Bushweller, 2017, cited in Taylor et al., 2020), while discussions about teaching and learning continued in parallel with this change (Collins & Halverson, 2009). The effectiveness of classroom teaching is closely related to how digital resources are used (Cheung & Slavin, 2013). Models such as those elaborating technological pedagogical content knowledge recognize the complexity of incorporating technology into teaching (Taylor et al., 2020). In a more technical subject such as literacy, this can be further complicated by elementary school students' inexperience in using technology for learning, the fact that they are just learning literacy, and the fact that teachers are caught unprepared for this during periods such as the pandemic. Research on the use of technology in literacy teaching at the elementary school level largely centres on the applications, programs, and adaptive capabilities of digital tools and devices. Because of the breadth of technology available in schools, studies often focus on a particular facet or intervention (Taylor et al., 2020). For these reasons, it can be said that a holistic evaluation of the studies conducted using technology before and during the pandemic, especially in literacy teaching, will fill an important gap in the field.

This study aims to examine the studies conducted in Türkiye using technology in literacy teaching by using the meta-synthesis method. In line with this purpose, answers to the following questions were sought:

- (1) What are the aims of studies on the use of technology in literacy teaching?
- (2) What are the results of studies on the use of technology in literacy teaching?
- (3) What are the recommendations of studies on the use of technology in literacy teaching?

Method

Research Design

This study was conducted with a qualitative meta-synthesis design. The data of meta-synthesis studies consists of studies in the literature related to the identified problem. Stern and Harris (1985) first used the concept of qualitative meta-synthesis by referring to the combination of a group of qualitative studies. They aimed to put forward a theory or model that could explain the findings of qualitative studies on similar topics. Meta-synthesis is a methodology in which qualitative research findings in the literature are reinterpreted, and information is reconstructed and developed (Aspfors & Fransson, 2015). In this study, the following steps developed by Noblit and Hare (1999) in their meta-ethnographic approach were followed:

- Defining the research problem.
- Identifying keywords and conducting a literature review.
- Determining the criteria for the studies to be included in the research and eliminating the studies that do not meet these criteria.
- Reading, identification, and evaluation of the sources to be used in the study.

- By analyzing the studies, common themes and sub-themes are created, and similar and different aspects are emphasized.
- Making inferences from the findings in line with the themes.
- Detailed reporting of the process and findings.

A meta-synthesis to be conducted, there must be a sufficient number of qualitative studies to provide a holistic perspective in the chosen field. These studies should be adequate to explain the situation or concept under examination and to establish a theoretical foundation (Polat & Ay, 2016). 10-12 studies would be sufficient for a meta-synthesis study, and if there are more, difficulties may arise in determining the themes (Bondas & Hall, 2007).

Data Collection

The data of this study consisted of articles and theses originating from Türkiye in the Higher Education Council (YÖK) National Thesis Center, YÖK Academic, TR Index, and Google Academic databases. It was ensured that the studies were conducted in primary schools until 08.05.2022. Theses and articles were searched with the keywords “ilk okuma ve yazma [first reading and writing]”, “ilkkokuma ve yazma [firstreading and writing]”, “ilk okuma yazma [firstreading writing]”, “ilk okuma-yazma [first reading-writing]”, “ilk okuma yazma öğretimi [first reading writing teaching]”, “ilk okuma ve yazma öğretimi [first reading-writing].” Different keywords were used since primary literacy teaching is written in many ways. The keyword "technology" was not used in this process. The titles and abstracts of the accessed studies were examined to determine whether technology was used in the study. In the case of a thesis and an article by the same author among the studies accessed, the thesis was preferred since it would be more comprehensive. The databases, selection processes, and numbers of the studies selected for meta-synthesis according to the following criteria are given in Figure 1.

- Do the participants of the study consist of primary school students or teachers?
- Does the research design consist of qualitative methods?
- Is the subject of the research related to the use of technology in literacy teaching?

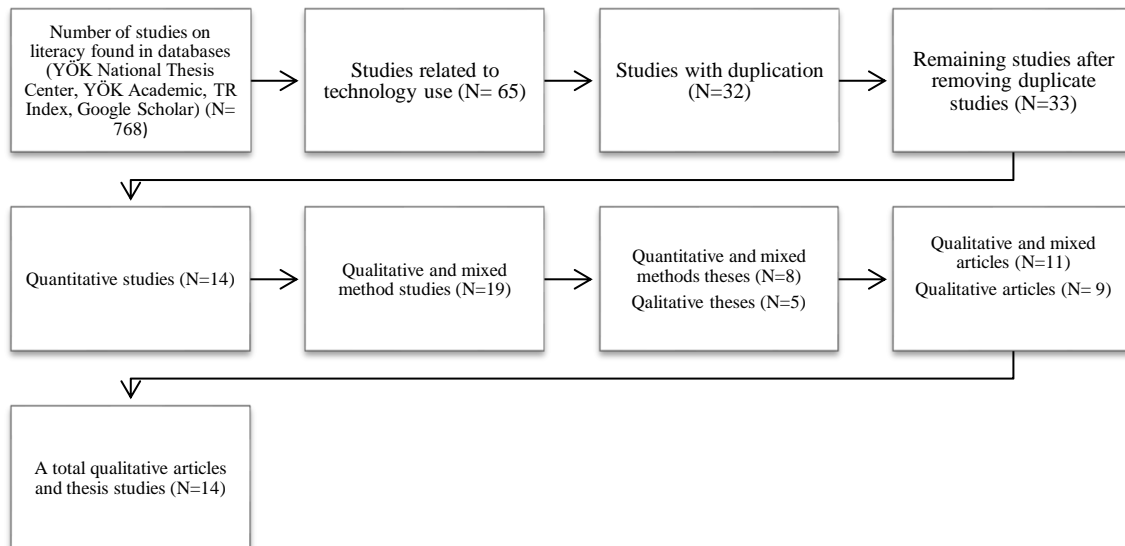


Figure 1. Studies obtained as a result of searching the databases

Out of the 768 studies identified in the search conducted until 08.05.2022, 65 were found to be related to the use of technology in literacy teaching. Of these 65 studies, 32 were eliminated due to duplication. Of the remaining 33 studies, 14 were quantitative, and 5 were mixed methods. Of the remaining 14 qualitative studies, 9 were articles, and 5 were thesis studies. Information about the studies accessed is given in Table 1.

Table 1 Information about The Articles Included in The Study

Code	Author(s)	Study Name	Year	Article (Journal) / Thesis (University)
A1	H. G. Orhan Karsak	An Analysis of the Teachers Opinions on Computer Supported First Reading Writing Instruction	2014	Academic Sight International Refereed Online Journal
A2	V. Açıklalın	The Use of Interactive Board A-at the First Reading and Writing Education	2018	International Journal of Leadership Education
A4	A. Ferah Özcan, E. N. Saydam	Perceptions of Primary School First Grade Teachers towards Initial Reading Writing Teaching in the Covid 19 Epidemic Process	2021	Journal of Individual Differences in Education
A5	C. Kesik Ö. Baş	First Reading and Writing Teaching with EBA and Education Portals from The Perspective of Classroom Teachers	2021	Educational Technology Theory and Practice
A6	H. Atik F. Avcı	The Difficulties Faced by First-Grade Teachers During the Covid-19 Pandemic in Teaching Their First Reading and Writing and their Suggestions for Solutions	2021	International Journal of Contemporary Educational Studies
A7	M. Sağırlı	Literacy Education during the Pandemic	2021	EKEV Academy Journal
A8	Y. H. Erbas	Education during the Covid-19 Pandemic: Problems Encountered in Reading and Writing Instruction and Suggested Solutions	2021	Journal of Mother Tongue Education
A9	T. Kargın A. Karatas	Teaching Literacy via Distance Education in the Pandemic Through the Eyes of Primary School Teachers	2021	Journal of Mother Tongue Education
A10	A. Uğur Göçmez, E. Ünal	An Evaluation of The Opinions of Teachers About the Problems Experienced in The First Literacy Teaching in the Digital Education Period	2021	Ahi Evran University Journal of Institute of Social Sciences
T3	A. Sahin	Investigation of the Use of Educational Software in Primary Reading and Writing Teaching in terms of Teachers' Views	2019	Niğde Omer Halisdemir University
T4	H. Yüksel Özkaya	Investigation of the Usability of Free Hand Interactive Technologies in the Literacy Process According to the Views of Classroom Teachers and Field Experts	2020	Aksaray University
T6	M. Ercan	Teacher and Parent Views on the First Literacy Process During the Covid-19 Pandemic	2021	Inonu University
T7	O. Karanfil	The Opinions of Primary School Teachers about the Problems Faced with Teaching Literacy through Online Education	2021	Inonu University
T8	H. Ş. Dudak	The Opinions of Teachers and Parents on Distance Primary Literacy Teaching	2022	Amasya University

According to Table 1, the study included research conducted between 2012-2022. By limiting

the studies to 10 years, it was aimed to reach current studies on technology use. In Table 1, all 5 theses included in the study consist of master's theses. While the first article was published in 2014, the thesis was completed in 2019. After 2020, it was determined that there was an increase in the number of articles and theses.

Data Analysis

Content analysis was applied to the data in four stages. These stages were (1) coding the data, (2) finding themes, (3) organizing the codes and themes, (4) defining and interpreting the findings (Yıldırım & Şimşek, 2021). The studies included in the research were sorted according to the years of publication; thesis studies were coded as "T1, T2..." and article studies were coded as "A1, A2...". These codes were used when direct quotations were made from the studies. Analyses were created in line with these codes. The participant group of the studies consisted of classroom teachers (T3, T4, T6, T7, T8, A1, A2, A4, A5, A6, A7, A8, A9, A10), parents (T6, T8) and field experts (T4). Case study (T3, T4, T6, T7, A1, A2, A5, A6, A7, A8, A9) and phenomenology (T8, A4, A10) designs were used in the studies. While 11 of the 14 studies included in the meta-analysis were case studies, 3 of them were conducted in phenomenology design. For example, an article (A8), in which a case study was preferred, explained the rationale as follows: "Since this study was based on examining the views of first-grade teachers on literacy teaching in emergency distance education implemented during the Covid-19 pandemic, it was planned as the case study design of the qualitative research model". In a thesis (T8) in which phenomenology design was preferred, the reason for this was stated as "In the research, phenomenology design was preferred in order to discuss and make sense of the phenomenon of distance reading and writing teaching with the views of the participants". The data of the studies were collected through interviews (T3, T4, T6, T7, T8, A1, A2, A4, A5, A6, A7, A9, A10), observations (T3) and questionnaires (A8). In 13 of the 14 studies, semi-structured interviews were used to collect data in 13 studies, observation in 1 study, and questionnaire in 1 study. In one study, both interviews and observations were used to collect data. In most studies during the pandemic, interviews were conducted via video conferencing. In one study (A9), "Due to the coronavirus pandemic, face-to-face interviews could not be conducted with the participants. Instead, video calls were made with the participants via the Google Meet platform and the interviews were recorded". Content analysis (T3, T4, T6, T7, T8, A1, A2, A4, A5, A8, A9, A10) and descriptive analysis (A6, A7) methods were used to analyze the research data. The participant group of the 14 studies included in the meta-synthesis was evaluated following the general characteristics of the qualitative research paradigm in terms of research design, data collection tool, and analysis methods.

Validity and Reliability

For validity and reliability in meta-synthesis studies, the research purpose and questions and the criteria according to which the studies to be included in the meta-synthesis are selected should be clearly stated (Noblit & Hare, 1999). In this context, first of all, the purpose of the study was determined as examining the studies on the use of technology in literacy teaching in Türkiye by the meta-synthesis method. The coding process was explained in detail (Thomas & Harden, 2008). Finally, to increase the research's credibility, direct quotations were made from the findings of the analyzed studies.



Findings

Objectives of Using Technology in Literacy Teaching

The studies included in the meta-synthesis revealed that technology was used for two purposes in literacy teaching. These are "availability of technology" in literacy teaching and "use of technology in the pandemic". Examples of the codes and purposes of the studies included in the meta-synthesis related to the themes of the usability of technology in literacy teaching and the use of technology in the pandemic are given in Table 2.

Table 2 The Themes, Codes, and Purposes of The Studies on The Use of Technology in Literacy Teaching

Themes	Codes	Study Objectives
Availability of Technology	Educational Software	To examine the use of educational software in literacy teaching in terms of teachers' views (T3). To investigate how the interactive whiteboard is a teaching and learning tool in literacy teaching and what positive contributions it provides to teachers and students (A2). To determine the opinions of classroom teachers about teaching literacy with Educational Informatics Network (EBA) and educational portals from their perspective (A5).
	Freehand Interactive Technologies	Investigating the potential of using freehand interactive technologies in the literacy teaching process and examining their usability according to the opinions of classroom teachers, classroom teaching education field experts, and educational technology experts (T4).
	Computer Assisted Instruction	To determine the opinions of 12 teachers who provide computer-assisted literacy teaching about computer support in literacy teaching (A1).
Use of Technology in Pandemic	Evaluation of the Literacy Teaching	To determine the opinions of classroom teachers and parents about the literacy process in which distance education and face-to-face education are carried out together (T6). To determine how literacy teaching was realized through distance education during the COVID-19 pandemic was evaluated from the teacher's perspective (A4). To determine the opinions of 1st grade teachers about using educational technologies in the literacy process during the distance education process that emerged with the COVID-19 outbreak (A6).
	Identifying Problems in the Process	To determine how first-grade teachers teach literacy through distance education during the global pandemic and what kind of problems they experience in the distance education process (A9). To determine the problems classroom teachers, face while teaching literacy (T7). To examine first-grade teachers' problems and solution suggestions during literacy teaching in the emergency distance education model implemented during the Covid-19 pandemic (A8). To reveal teachers' opinions regarding the problems encountered in literacy teaching in the digital education process (A10).

According to Table 2, the studies conducted for the purpose of "availability of technology" in literacy consisted of "educational software", "freehand interactive technologies," and "computer-assisted instruction" codes. In the studies coded as educational software (T3 and A5), the suitability of the materials used for literacy teaching was evaluated. In another study, the interactive board's contributions to literacy teaching students and teachers were investigated (A2). Freehand interactive technologies and computer-assisted instruction codes are one study each. The participant group of the study coded as freehand interactive technologies (T4)

consisted of classroom teachers, experts in the field of classroom teaching education, and experts in the field of educational technologies. The computer-assisted instruction themed study (A1) participant group consisted of classroom teachers. These studies aimed to evaluate the availability of technologies used in literacy teaching according to the opinions of the participants.

According to Table 2, the studies conducted for the purpose of "using technology in the pandemic" consisted of the codes "evaluation of the literacy process" and "identification of problems in the process". All of the studies on this theme were conducted with the participation of classroom teachers. The participants of two studies (T6 and T8) consisted of parents and classroom teachers. The problems code aimed to evaluate the technologies used in literacy teaching and the problems experienced during the Covid-19 Pandemic process based on the opinions of classroom teachers and parents.

Results Regarding the Use of Technology in Literacy Teaching

The results obtained in the "availability of technology" theme of the Turkish studies on the use of technology in literacy teaching included in the meta-synthesis were divided into two sub-themes as: "positive results" and "negative results". Positive and negative results themes, codes, and sample expressions for the usability of technology in literacy teaching are given in Table 3.

Table 3 Results Obtained for the Usability of Technology in Literacy

Themes	Codes	Example Phrases
Positive Results	Focusing attention	Classroom teachers stated that EBA and educational portals effectively captured children's attention in the reading-writing process, improved their reading attitudes and arousing curiosity about what they would encounter in teaching the next sound (A5).
	Improving reading attitude	
	Motivation	Teachers emphasized that interactive whiteboards support student learning. Teachers think interactive whiteboards especially increase students' motivation, facilitate learning, encourage students to enjoy using them, support concrete and permanent learning, and appeal to multiple senses (A2).
	Appealing to multiple senses	
	Permanent learning	
	Learning with fun	Teachers stated that the software used in literacy teaching effectively eliminates the problems that occur in the process. They stated that it eliminated the problems encountered in the letter teaching process and facilitated teaching (T3).
	Facilitating teaching	Based on the findings and comments on the usability of freehand interactive technologies in literacy teaching, it is believed that technology will be very effective in attracting attention, increasing interest and motivation , and encouraging students to participate (T4).
	Active participation	
	Enriching teaching	The teachers participating in the study stated that the use of computer-assisted instruction in literacy teaching enables the teacher to access materials such as pictures, photographs, animations, and songs very quickly and easily, thus enabling the lessons to be taught with richer materials (A1).
	Improving reading skills	
Use as a supplementary material	Apart from that, educational software can be used as a support and resource (T3).	
Concretization	It increases the curiosity of play-age children who can still understand concrete concepts and facilitates the concretization of concepts (A5).	

Negative Results	Lack of hardware-software	The difficulties encountered in the teaching process include the lack of technological equipment in the classrooms regarding hardware and software , weak or no internet connections, and the fact that teaching materials are mostly non-interactive (A5).
	Cost	Educational technology experts stated that integration would not be difficult, but the cost would increase (T4).
	Class size	Teachers think that crowded classrooms cause inefficiency in computer-assisted instruction (A1).

According to Table 3, the theme of positive results for the use of technology in literacy teaching is composed of the codes of "focusing attention, improving their reading attitudes, motivation, appealing to multiple senses, permanent learning, learning with fun, facilitating teaching, active participation, enriching teaching, improving reading skills, using as supplementary material, and concretization". Teachers use technology in literacy teaching for positive reasons, such as making the lesson fun, appealing to more than one sense of the student, making students active in the lesson, facilitating learning, realizing permanent learning, enriching education, improving reading skills, using it as an auxiliary material and making it concrete.

According to Table 3, the theme of negative consequences of using technology in literacy teaching was formed by the codes "lack of hardware and software, cost and class size". Under the title of negative consequences for the use of technology in literacy teaching, lack of hardware and software, high cost of the technology to be used, and overcrowded classrooms were the problems mentioned.

The themes, codes, and sample expressions under the title of "results on the use of technology in the pandemic", were reached in the "availability of technology" theme of the studies conducted on the use of technology in literacy teaching from Türkiye included in the meta-synthesis, are given in Table 4.

Table 4 Results Obtained Regarding the Use of Technology in Literacy Teaching During the Covid-19 Pandemic

Themes	Codes	Example Phrases
General Issues Regarding the Use of Technology in the Covid-19 Pandemic	Disadvantaged families	When families do not have enough economic power or the number of children increases, they cannot provide technical equipment for each child. This situation can negatively affect the healthy conduct of lessons (A4).
	Lack of hardware	Teachers had difficulties making the students feel the sounds of the letters, mainly due to problems with the sound system of the computers or the internet connection (A4).
	Inability to access the internet	While some teachers stated that one class hour to 30 minutes was a problem, other teachers stated that it was not pedagogically and health-friendly for primary school students to be in front of the screen for 6 class hours (A10).
	Online course durations	Parents also stated that their children did not want to attend classes because they could not be in the same environment with their teachers and friends and that they could not feel like students because they could not be in the school environment, and therefore, they had problems in fulfilling their responsibilities (T8).
	Not feeling like a student	

	Lack of content	Some teachers also mentioned that the EBA content was particularly inadequate for first-grade students , leading them to supplement it with various web platforms (A9)
Problems Related to Literacy Teaching in the Covid-19 Pandemic	Inability to perform dictation exercises	At the stage of literacy initiation and progression, teachers had difficulties in remote literacy activities, especially in dictating syllables, words, and sentences to students (A4).
	Inability to give feedback	Regarding the writing problem in this process, it was revealed that it was experienced most frequently because teachers could not intervene with students in distance education and parents could not provide adequate writing instruction (T6).
	Difficulty in forming syllables, words, and sentences	First-grade teachers who tried to teach the sound-based sentence method through emergency distance education had the most difficulty forming words from syllables and forming syllables from sounds (A8).
	Writing letters incorrectly	Again, the child who sees the shape of the sound on the screen may not be able to follow the order in which the teacher moves their hand in which directions while writing the sound and may learn the spelling of the sound incorrectly (A9).
	Measurement and evaluation problems	In distance education, measurement and evaluation in literacy teaching have been a problem. It was concluded that measurement and evaluation were the problematic areas in this process and were weak (A7).
	Inability to feel sounds	Sometimes, depending on the quality of the internet and sometimes on the quality of the device used during distance education, sounds are not always transmitted very clearly on the distance education platform . This may cause the child to mishear and mispronounce the sound (A9).
Benefits of Technology Use in the Covid-19 Pandemic for Teachers	Enriching content	The positive part is that we had a lot of material . We were able to make use of visuals a lot. I could easily open any image we wanted from any website and show it to the children, or, I don't know, songs about sounds, visuals, or when something suddenly came to our mind during the lesson, it was easy to open it from the internet and show it (T7).
	Attracting attention	When we examined the opinions about the advantages of using educational technologies in teaching reading and writing, we found that it facilitates the transfer of course content, makes the lessons more attractive , is effective in achieving the learning outcomes, is helpful in repeating the subjects, provides permanence in learning and saves time (A6).
	Permanent learning	While the distance education process was just experienced at the primary school level, the activities uploaded to the platforms made the process much easier, made the students more excited, enjoyable, and active, and increased their productivity (A7).
	Making the students active	

According to Table 4, the theme of general problems related to the use of technology in literacy teaching during the COVID-19 pandemic consisted of the codes "disadvantaged families, lack of hardware, inability to access the internet, online course times, not feeling like a student and insufficient content". When this theme was analyzed, children from disadvantaged families could participate less in online course due to infrastructure and internet access problems. Again, due to the low level of online interaction compared to a real classroom and the inability to give feedback, students did not feel like students in digital environments, classroom management was difficult, and effective measurement and evaluation problems were experienced. In addition, the long duration of the course and the insufficient content of the digital materials caused difficulties in the use of technology during the pandemic period.

According to Table 4, problems related to the use of technology in the literacy teaching process



in the COVID-19 pandemic theme are problems directly related to literacy teaching. These problems consisted of the codes "not being able to do dictation studies, not being able to give feedback, having difficulty in syllable, word, and sentence formation stages, writing letters incorrectly, measurement and evaluation problems, and not being able to make sounds felt". It is seen that these problems are related to the use of technology during the pandemic. The fact that the desired learning could not be realized in writing the letters due to the difficulty of giving feedback in the distance education process and the problems in making the sound felt due to Internet connection problems can be given as examples of this situation.

According to Table 4, the technology used in literacy teaching during the COVID-19 pandemic also benefits classroom teachers. These are "enriching the content, attracting attention, permanent learning, making the student active" codes. While literacy teaching in the pandemic, the use of technology provided teachers with ease in accessing materials and transferring course content, making the lessons fun, attracting attention, and ensuring participation and permanent learning due to motivating students. As a result, according to the results of the studies using technology in literacy teaching included in the meta-synthesis, the teacher stated that although there were some problems in the process, there were also some benefits.

Recommendations Emerging from the Studies

The recommendations given in the studies using technology in literacy teaching from Türkiye, which were included in the meta-synthesis, consisted of two titles as: "recommendations for the availability of technology" and "recommendations for the availability of technology during the pandemic period". The recommendations for technology usability consist of recommendations given to teachers, institutions, researchers, and educational technologists. The recommendations for technology usability are shown in Table 5.

Table 5 Suggestions for Teachers, Institutions, Researchers, and Educational Ethnologists in General Regarding the Use of Technology in Literacy Teaching

Themes	Codes	Example Phrases
Recommendations for Teachers	Duration Interaction	Computer usage time can be adjusted according to students' attention and motivation. Student-teacher and student-student communication and sharing can be increased in classroom applications in computer-assisted literacy teaching (A1).
Recommendations to Institutions	Organizing in-service training	Teachers can be introduced to the use of computers in literacy teaching and the computer materials prepared. In-service training can be organized for teachers on computer-assisted teaching practices (A1).
	Encouraging teachers to use technology	It is evident that the educational software used in the literacy teaching process contributes positively to the overall learning experience. For this, teachers can use this software actively, and encouraging studies can be carried out in this direction (T3).
Recommendations for Researchers	Conducting generalizable studies Conducting experimental studies	A new study can be conducted on the software used in the literacy teaching process by utilizing a more inclusive or generalizable sample (T3) . There is also a need to investigate the contribution of literacy CDs to students' achievement and their applicability to different learning theories (T1).

	Assessing the impact of different variables	The effect of educational software on reading skills can be evaluated by considering gender and pre-school education variables (T2).
Recommendations for Educational Technologists	Using content appropriate to student level	Music and pictures in presentations can be selected according to the level of the students. In literacy activities, instead of presentations containing only sounds and pictures, richer and more advanced professional software with animations and cartoon characters known to children can be used (A1).
	Develop user-friendly interfaces	The interfaces of the educational software prepared for use in teaching processes can be simplified in order to ensure easy use and access to the content in a short time (T3).
	Developing applications for multiple participation	Software and educational games to be developed for freehand interactive technologies should be equipped with features allowing more than one student to participate. Similarly, competitive games to be played in groups or pairs can be developed for freehand interactive technologies (T4).
	Developing a student progress tracking system	The educational software to be developed for freehand interactive technologies should be equipped with reporting and progress monitoring features. This requirement was emphasized by the educational technology experts who participated in this study (T4).

According to Table 5, teachers were provided with suggestions to consider "duration and interaction" regarding the use of technology in literacy instruction. These suggestions include adjusting the duration by taking into account the developmental characteristics of students when using technology in teaching literacy in online or hybrid environments, increasing the interaction of students with each other and the teaching material, and planning the lesson according to the use of technology. Teachers stated that primary school students cannot stay in front of the screen for a long time to listen to the lesson due to the nature of their development. Suggestions for institutions were mostly about organizing in-service training to promote the use of technology in literacy teaching and encouraging teachers to use technology. In this theme, suggestions were given for researchers to conduct research to improve and popularize the technology used. Researchers were recommended to conduct generalizable studies, experimental studies, and studies in which the effects of different variables were evaluated. Finally, in this theme, educational technologists were given different suggestions such as "using content appropriate to student level, developing user-friendly interfaces, developing applications for multiple participation, and developing a system for tracking student progress". In general, suggestions were made for educational technologists to develop content and materials for the effective use of technology in the literacy teaching process.

The recommendations on the use of technology in literacy teaching during the pandemic in Turkish studies included in the meta-synthesis are given in Table 6.

Table 6 Suggestions on the Use of Technology in Literacy Teaching During the Covid-19 Pandemic

Theme	Codes	Example Phrases
Recommendations to Institutions	Equal opportunity in education	Regarding equality of opportunity in education , students should have equal opportunities in terms of informatics, equipment and materials and these opportunities should be increased (T7).
	Raising awareness of parents	Based on the conclusion that parental support is important in children's literacy success and that parents need both literacy and digital literacy training; authorities may need to organize trainings for parents (A4).
	Organizing in-service training	With the COVID-19 pandemic, the methods used by teachers in the literacy process in distance education remained in a teacher-centered approach. In-service trainings on technological pedagogical content knowledge can help teachers overcome the literacy process in a healthier way (T6).
	Improving infrastructure	Technical equipment and infrastructure should be provided to avoid any problems in implementing distance education (T8).
	Organizing course durations	Based on the results that the lessons could not be taught efficiently due to the short duration of the live lessons and that there was not enough time for measurement and evaluation, it can be said that the Ministry of National Education authorities should consider making improvements to the duration of live lessons (A4).
	Reducing class sizes	Appropriate authorities can intervene to make courses more effective by identifying the steps needed, including reorganizing class quotas with experts in the field (A8).
	Updating course schedules	Course programs and contents should be reconsidered in line with current developments , and by making necessary changes and additions, they can be made suitable for immediate distance education and future distance education models (A8).
Recommendations for Educational Technologists	Making Apps free of charge	Access to EBA- Zoom applications can be completely free (A10).
	Enriching content	Considering the importance of literacy teaching and the lack of materials and content experienced by classroom teachers in the distance education process, content-enriched educational platforms can be created (T6).
	Developing measurement and evaluation tools	Measurement and evaluation processes of student achievement in distance education applications should be well designed, and technology-supported alternative measurement and evaluation approaches and tools should be developed (A7).
	Develop free interactive Apps.	When we look at distance education applications, we see that they are limited in terms of interaction between teachers and students and between students themselves. Applications that enable students to interact with their teachers and friends should be free of charge and should not have a time limit (A6).
	Recording courses	Live courses can be recorded so that students who do not attend the lessons regularly can watch them in the future (A10).
	Improving student tracking systems	There is a need to determine the extent to which students can follow, participate in, and benefit from TV, EBA, etc. platforms and to organize the system accordingly (A7).

	Considering cognitive and affective characteristics	Considering students' cognitive and affective characteristics , such as attention and motivation in preparing electronic education platforms; providing techno-pedagogical preparation training for stakeholders; organizing training for teachers on preparing effective interactive lessons and interactive assessment and evaluation content (A4).
Recommendations for Researchers	Working with different data collection methods	In this study, the views of teachers and parents on literacy teaching during the Covid-19 pandemic period were examined. The impact of the pandemic on the education system and all stakeholders can be analyzed with different data collection methods (A6).

According to Table 6, suggestions for using technology in literacy teaching during the pandemic were given to institutions, educational technologists, and researchers. The suggestions given to institutions were about "equal opportunity in education, raising awareness of parents, organizing in-service training, improving infrastructure, regulating lesson times, reducing class sizes, updating course schedules, and making applications free of charge." The suggestions given to the institutions for improving the use of technology in teaching reading and writing during the pandemic consist of eliminating technology-based educational inequalities, strengthening the technological infrastructure, making course times, class sizes, and curricula suitable for the use of technology, empowering teachers and parents, and providing free technological applications to be used in teaching. In cases such as the pandemic, educational technologists were recommended to "enrich the content, develop assessment and evaluation tools, develop free interactive applications, record lessons, develop student tracking systems, and consider cognitive and affective characteristics" to improve literacy teaching in the distance education process. In this theme, it was suggested that researchers conduct studies on literacy teaching in the urgent distance education process with samples other than teachers and parents with data collection tools other than interviews.

As seen in Table 6, the recommendations given in the studies using technology in the literacy teaching process included in the meta-synthesis consist of recommendations for the use of technology in the literacy teaching process and the use of technology in the pandemic. While similar recommendations were given under both titles, no recommendation was made to teachers for the use of technology in the pandemic. This may be due to the fact that the participants of all the studies examined were teachers.

Discussion and Conclusion

It was determined that the researchers conducted their research with two main purposes in the studies using technology in literacy teaching included in the meta-synthesis. The first objective was to evaluate the availability of various technologies (educational software, computer-assisted instruction, free interactive technologies) in literacy teaching. With the developments in technology, there are many studies evaluating their effectiveness and function in literacy teaching (Gonzalez & Mohamad, 2022; Özkaya Yüksel, 2020; Taylor et al., 2020). Therefore, it is necessary to conduct studies aiming to evaluate the use of technology in literacy teaching. Therefore, it is seen that this finding of the study coincides with the literature. The second reason the researchers wanted to investigate the studies in which technology was used in literacy teaching was to understand how this process was carried out and what kind of problems they experienced during the COVID-19 pandemic. How literacy teaching is conducted during emergency distance education in extraordinary situations like pandemics,



how technology is integrated into this process, and the challenges encountered are important research topic classroom teachers used different technologies and platforms in literacy teaching before the pandemic for different reasons. The difference of the pandemic process is that classroom teachers had to use technology and platforms in literacy teaching. The participants in all the studies included in the meta-analysis were classroom teachers. Research findings indicate that the majority of classroom teachers used interactive whiteboards and computers in their classrooms before the pandemic (Safa, 2019) and utilized educational platforms through the available technology in their classrooms (Özkaya Yüksel, 2020). However, it can be said that the classroom teachers had to use different technologies in literacy teaching during the emergency distance education process during the COVID-19 pandemic, because the technology was used without adequate planning for emergency and distance education, especially in terms of literacy teaching, the targeted goal and the actual goal were different. However, despite everything, it is understood that classroom teachers reflected their experiences of using technology in teaching before the pandemic to literacy teaching during the pandemic. It shows that the results of the studies included in the meta-synthesis generally overlap with the purposes of technology use in different studies (Kızıldağ & Çetinkaya-Özdemir, 2021; Urhanoğlu et al., 2021; Karadağ-Yılmaz et al., 2022) examining the distance education experiences of classroom teachers including literacy teaching during the pandemic period.

Another important finding of the study is that utilizing technology in literacy teaching has positive results for classroom teachers and students. Accordingly, the benefits of using technology in literacy teaching for classroom teachers include facilitating, enriching, and concretizing teaching and using it as an auxiliary material. For students, the technology used in literacy teaching leads to positive results such as paying attention, liking reading, motivation, appealing to multiple senses, permanent learning, learning with fun, active participation and improving reading skills. Since multimedia tools in literacy teaching appeal to multiple senses and allow interaction, they can attract students' attention and ensure active participation. Again, technologies used during reading activities can attract students' attention and increase their motivation (Yıldız, 2015). It can be stated that instructional software increases students' attention span, facilitates learning, increases retention (Demirer & Dikmen, 2018; Kabaran et al., 2015), enriches the teaching environment and saves time. As revealed by research, the use of technology in teaching provides some benefits to teachers and students. It is understood that this has positive reflections on literacy teaching.

It was stated that the most important variables that negatively affected the effective use of technology in literacy teaching before and during the pandemic were the lack of hardware and software, the high cost of the technology to be used, and the presence of students with disadvantaged families. The economy is an important variable in using technological equipment in teaching. In fact, cost is one of the primary factors that negatively impact teachers' use of technology (Sarı & Akbaba Altun, 2015). During the emergency distance education process, it was revealed that cost not only affects teachers in schools but also hinders the overall educational and literacy teaching processes for children from disadvantaged families at home.

One of the important problems in literacy teaching using technology in the emergency distance education process is that feedback and assessment, which are very important in literacy teaching, cannot be done correctly. When the studies in the literature are examined, it is seen that there are inadequacies in the areas of feedback, measurement, and evaluation in the distance education process carried out on television (Can, 2020), the percentage of classroom teachers who can perform measurement and evaluation is 25% (Saygı, 2021), and measurement and evaluation in the distance education process is a general problem. In the urgent distance

education process in the pandemic, problems such as not being able to perform dictation studies, which have an important place especially in literacy, not being able to give feedback to students, having difficulty in syllable, word and sentence formation stages, misspelling of letters and not being able to make the sounds felt, could not be done effectively most of the time due to technology-related reasons such as lack of technological infrastructure and interruption of internet access. In the studies included in the meta-synthesis, technologies were utilized in literacy instruction at the stages of literacy preparation, initiation and progression, and free reading. Some studies indicate that games developed with Web 2.0 tools improve letter discrimination, spelling, and reading in text skills (Başaran & Kılınçarslan, 2021), while others state that computer-assisted instruction is not effective in the development of first-grade students' literacy skills and dictation skills (Gürol & Yıldız, 2015). Again, it was found that multimedia materials in literacy teaching did not affect writing skills (Şahin, 2015). There may be different reasons why technology is ineffective in literacy teaching. For example, the level of teachers' technological competencies is an important variable. In some studies, in Türkiye examining the digital teacher efficacy of classroom teachers in the emergency distance education process, classroom teachers perceived their digital teacher efficacy as high (Aksoy et al., 2021; Demiröz & Dağ, 2024), while a study conducted in Portugal before the pandemic found that they perceived it at a medium level (Dias-Trindade & Moreira, 2018). Therefore, teacher efficacy and the ability to reflect this efficacy into practice can be decisive in successfully using technology in teaching.

Among the important results that emerged from the analysis of the studies included in the meta-analysis are the fact that primary school students cannot feel like students in distance education environments, that the course duration is not suitable for them, and that the insufficient or lack of digital content negatively affects the literacy process come to the fore. In literacy teaching in the pandemic, the long duration of online lessons for primary school students posed a significant problem. Online environments made primary school students do not feel like students in a real classroom environment. The addition of inadequate digital content and lack of appropriate equipment distanced primary school students from their role as students. While students' inability to participate in the distance education process may be due to their lack of adequate equipment and inability to access the internet (Sertkaya Dinler & Dündar, 2021), some studies indicate that classroom teachers experience various problems in including students in the distance education process (Kızıldaş & Çetinkaya-Özdemir, 2021; Kultas & Çalışkan, 2021). In 2019, it was determined that when 1st-grade students moved to 2nd grade in 2020, they could not acquire the gains in writing skills of 1st grade sufficiently, they made a lot of mistakes in writing rules, and writing errors increased in 2nd grade (Kasa Ayten & Ekmekçi, 2021).

In analyzing the studies included in the meta-synthesis, recommendations were made to institutions, educational technologists, and researchers regarding the use of technology in literacy teaching. The most prominent recommendations from the institutional level are the development of policies to eliminate disadvantages in the use of technology in teaching and the dissemination of technological applications free of charge. These two suggestions were seen to be the most important obstacles to education during the pandemic. Educational technologists were recommended to develop rich content and consider students' developmental characteristics in the applications they develop.

One of the interesting results of the research is that teachers did not make any suggestions about themselves since all the participants of the studies in the meta-analysis were teachers. This is because in matters such as professional development, improvement of teaching, and



development of the process, teachers' feedback on their teaching is very important. In addition, teachers' self-reflective statements and reflections can provide important data for themselves and researchers. It can be said that one of the most important reasons why teachers did not suggest themselves and, therefore, about teachers is culture. In some cultures, self-reflections and critical feedback are not typical, and their educational value may not be appreciated. As a result of the studies on the use of technology in the process of literacy teaching included in the meta-synthesis addressed to Türkiye between 2012-2022, the following recommendations were made:

- Classroom teachers can benefit from technology at every stage of literacy teaching.
- With the transition to emergency distance education, classroom teachers experienced problems in dictation studies, writing skills, and syllable, word, and sentence formation during literacy teaching due to technological reasons. Mobile applications can be developed to overcome these problems.

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