JOINER

JOURNAL OF INCLUSIVE EDUCATIONAL RESEARCH

Vol. 3, No. 1 · JUNE 2023

OPEN ACCESS

joinetr.com

JOURNAL OF INCLUSIVE EDUCATIONAL RESEARCH

Volume 3, Issue 1, 2023

Editor-in-Chief: Prof. Dr. Hasan KARAL, Prof. Dr. Fahriye ALTINAY, Assoc. Prof. Dr. Ali Kürşat ERÜMİT
Editor: Prof. Dr. Hasan KARAL, Prof. Dr. Fahriye ALTINAY, Assoc. Prof. Dr. Ali Kürşat ERÜMİT
Publisher Editor: Prof. Dr. Hasan KARAL, Prof. Dr. Fahriye ALTINAY, Assoc. Prof. Dr. Ali Kürşat ERÜMİT
Redaction: Academic Gülbahar Merve ÇAKMAK ŞILBIR
Typographic: Academic Gülbahar Merve ÇAKMAK ŞILBIR
Cover and Page Design: Academic Gülbahar Merve ÇAKMAK ŞILBIR
Contact: Assoc. Prof. Dr. Ali Kürşat ERÜMİT

JOINER is published regularly twice a year since 2021.

Contact Information

Web: http://joinetr.com/
E-Mail: journal.joiner@gmail.com
Adress: Trabzon/Turkey

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The Reflections of Teachers' Experiences in Use of Technology in The Process of Distance Education on Face-To-Face Education

Melek EREN[1], Ali Kürşat ERÜMİT[2]

Article History
Received: 27.12.2022
Received in revised form: 28.12.2022
Accepted: 29.06.2023

Abstract

In March of the 2019-2020 academic year, distance education was started in all schools affiliated to the Ministry of National Education. This process continued for approximately 1.5 years until the end of the 2020-2021 academic year. The aim of this research is to reveal the situation of teachers reflecting their technology use experiences in the distance education process to face-to-face education. In this study, the survey model, which is one of the quantitative research methods, was used and the data obtained from the survey responses created by the researcher were analyzed with the SPSS 22 package program. As a result of the analyzes made, it was determined that the teachers reflected the technology usage experiences they gained during the distance education process after the distance education.

Keywords: Distance education process, after distance education, use of technology, Covid19, pandemic

1. Introduction

Pandemic was declared by the World Health Organization (WHO) on March 11, 2020, this date is also the date when the first case of COVID19 was seen in our country. Pandemic; it is defined by the TR Ministry of Health as "the spread of a disease or an infectious agent over a very wide area such as countries, continents and even the whole world". DDE to the epidemic, problems were encountered in important areas such as health, economy and education, and these areas went to different solutions to survive the epidemic (Aslan, 2020). Like many other countries, our country has been affected by this epidemic. DDE to the aforementi1d global epidemic, some changes have occurred in education and training activities. Many countries have suspended their education and training activities and have sought to produce new solutions. After the declaration of the epidemic, distance education was started as much as possible in all countries of the world, where different practices were adopted. These applications are in the form of internet applications, radio and television broadcasts (Eken, Tosun and Tuzcu Eken, 2020). In the world; While 199,421,116 students were affected by the closure of schools dDE to the COVID-19 epidemic, 18,108,860 students were affected during the 49-week distance education period in our country (Unesco, 2021). The number of teachers working in this process in Turkey is 1,117,686 (MEB).

In March of the 2019-2020 academic year, it was announced that the second midterm holiday, which will be applied on 6th-10th April in educational institutions affiliated to the Ministry of National Education, was withdrawn to 16th-20th March, and that distance education will be started from 23th March. As a result of the decisions taken by the Ministry of National Education (MEB), the 2020-2021 academic year continDEd with partial closures from time to time. In this process, education and training was carried out through the Education Information Network (EBA) and with the help of EBA TV channels. Assignments were sent to students via EBA, an instructional management system, and live lessons were held simultaneously. EBA support points were established at schools to provide support to students who do not have internet and devices at home.

According to the EBA report with the numbers published by the MEB; From 23th March 2020, the start date of distance education, to 18th June 2021; EBA has been visited 23,769,308,322 times. Again, between these dates, a total of 12,182 hours of broadcast was broadcast on EBA TV Primary School, EBA TV Secondary School and EBA TV Lise channels, which were shot in 13 different studios in Ankara and Istanbul, and the total broadcast time of these broadcasts was 18,377 hours. During the distance education period, a total of 11,523 lesson videos and 1,049 extracurricular activity videos were prepared. 7,197 of the lecture videos and 828 of the extracurricular activity videos were prepared for the 2020 - 2021 academic year. On the other hand, the EBA Mobile application

[1]Teacher, TURKEY, melekeren67@gmail.com, orcid: 0000-0001-9475-9410

[2]Assoc. Prof, Department of Computer Education and Instructional Technology, Fatih Faculty of Education, Trabzon University, Trabzon, TURKEY, kursaterumit@gmail.com, orcid: 0000-0003-4910-4989

was downloaded 31M times on Android devices and 3.1M times on iOS devices. 12,873,739 students and 1,005,980 teachers; EBA Academic Support was also actively used by 836,384 students and 177,344 teachers. Moreover, a total of 287,183,328 Live Lessons were held at pre-school, primary, secondary and high school levels. The number of EBA Support Points established for students who need internet access and device support during the distance education process is 15,352 and the number of mobile EBA Support Points created is 189. In addition, 664,157 tablet computers with 25 GB GSM internet service and webcams for 105,000 classrooms were distributed (YEGITEK, 2021).

National and internationally accredited distance education programs with certificates were opened for application by the General Directorate of Teacher Training and Development to support the professional and individual knowledge and skills of approximately 500 thousand teachers and school administrators. Prepared in cooperation with Google, Apple, TUBITAK, Ankara University, AFAD-JICA, Autodesk , Cisco, Oracle ; synchronous and asynchronous trainings on digital entrepreneurship, computational thinking skills, project consultancy, English teaching, museum and disaster training, artificial intelligence, digital security, and application development for teachers in many fields such as artificial intelligence, embedded systems, robotics, and big data, project development. It is aimed to raise awareness about museums and disasters.

Studies carried out with the idea that education is a basic need that should be d1 under all circumstances have changed the way we perceive, experience and interpret education in general and distance education in particular (Aksoy, Bozkurt and Kurşun, 2021). Distance education is a method that has a different structure from traditional education and has its own promises, problems and opportunities (Valentine, 2002). It is obvious that teachers gain new experiences in the distance education process, which is quite different from face-to-face education . Some educators and school administrators who do not have sufficient knowledge about internet, computer, communication tools and video conferencing tools (such as Zoom) that can be used in distance education suddenly faced the necessity of using these tools (Akarsu, 2021) and thousands of teachers opened up by ÖYGM. He tried to improve his professional knowledge and skills and digital competencies through trainings. In the Education Monitoring report (2021), published by the Education Reform Initiative (ERG), it was stated that during the pandemic process, teachers made great efforts individually to get the support they needed, and in this process, teachers mostly feed off each other. In addition, according to the ERG report; It is stated that professional learning communities also play an important role in increasing the motivation and digital skills of teachers in this process.

Teachers communicated with their students through technology during the distance education process, which is quite new and different for them, and they also carried out preparation, implementation and evaluation through technology in order to carry out the education and training processes. When the literature is examined, there are many studies on teachers' views and attitudes towards distance education. However; No study has been found on the reflections of the approximately 1.5-year distance education process, which started in March of the 2019-2020 academic year and lasted until the end of the 2020-2021 academic year, on the face-to-face education that started in the 2021-2022 academic year. Whether the teachers use the digital tools they use in this process in face-to-face education and how the use of these tools differ, the variability of screen time; Communication with students, their experiences of using EBA, digital tools, video conferencing tools in the preparation, application and evaluation stages for the courses, and whether they use them in face-to-face education, and their views on distance education in general have been a matter of curiosity. The purpose of this research; The aim of this study is to determine the tools that teachers use in the distance education process and their purposes of use, and to reveal the situation of reflecting them to face-to-face education. In line with this purpose, an attempt was made to seek answers to the following questions.

- Teachers, during and after distance education; What are the daily device usage times for the course?
- What are the daily device usage times for the course during and after the distance education process, according to the professional seniority of the teachers?
- What are the daily device usage times for the lesson during and after the distance education process, according to the school levels in which the teachers work?
- What are the daily device usage times for the lesson during and after the distance education process according to the branches of the teachers?
- Teachers, during and after distance education; What are the tools they use for education?
- Is there a significant difference in the technology usage experiences of the teachers during and after the distance education process?
- Is there a significant difference in the technology use experiences of teachers according to their professional seniority after distance education?
- to the school levels they work after distance education?
- Is there a significant difference in the technology usage experiences of the teachers after distance education according to their branches?
- Is there a significant difference in the technology usage experiences of Turkish, Mathematics, Foreign Language, Classroom and Skills teachers during and after the distance education process?

2. Method

In this study, the survey model, which is 1 of the quantitative research methods, was used. Survey research is a research method in which researchers collect information by conducting a survey or interview to explain the attitudes, behaviors, views or characteristics of a whole universe or a group of people (Özdemir, 2014; Creswell , 2017). In this study, the scanning model was used because it was aimed to describe the reflections of the technology use experiences of teachers during the distance education process on face-to-face education. The survey model is a suitable model for research that aims to describe a past or present situation as it is (Karasar, 1999).

2.1. Working Group

The research population of this study consists of teachers working in schools affiliated to the Ministry of National Education in the distance education process throughout Turkey. DDE to the impossibility of reaching the entire universe due to the size of the universe, the sample was chosen by random sampling method. The main feature of this method is that the selected sample has a high representativeness of the universe (Creswell , 2017). As a result of random sampling, 468 teachers were reached. The demographic information of the teachers participating in the research is as follows:

Table 1. Demographic characteristics of the participants

Variables	Groups	f	%
Gender	Female	358	76.5
	Male	110	23.5
Educational status	Licence	90	19.2
	Graduate	378	80.8
Branch	Turkish, Turkish Language and Literature	53	11.3
	Maths	44	9.4
	Science (Science, Physics, Chemistry, Biology)	29	6.1
	Social Sciences (History, Geography, Philosophy, Social Studies)	23	4.9
	Foreign Language (English, German)	124	26.4
	Class Teacher	83	17.7
	Pre-school	17	3.6
	Religion KAB	7	1.4
	Guidance	9	1.9
	BIT	15	3.2
	Art/Skill (Music, Art, PE, TechDsgn)	45	9.6
	Special education	5	1.06
	Vocational Courses (Office Management, Accounting, Food and Beverage, Electric Electronics, Automotive, Handicrafts, Ceramic and Glass)	14	2.9
Professional Seniority	1-5 years	47	10.1
	6-10 years	112	23.9
	11-15 years	1	21.4
	16-20 years	hundred	22.1
	21-25 years	103	15
	26 years and above	70	7.7
		36	
Tasked Training Level	Pre-school	16	3.4
	Primary school	107	22.9
	Middle School	188	40.3
	High school	157	33.6

When Table 1 is examined, 358 of the teachers in the sample are female, 110 are male; 90 of them are postgraduate and 378 of them are undergraduate graduates. In addition, when the branch distribution of the teachers was examined, it was determined that they were in 13 different branch groups. Looking at the professional seniority of the participants; It is seen that the number of teachers working between 1-5 years is 47, between 6-10 years is 112, between 11-15 years is 100, between 16-20 years is 103, between 21-25 years is 70, between 26 years and above the number of teachers is 36. According to their education level; 16 teachers from pre-school, 107 from primary school, 188 from secondary school and 157 from high school participated in the study.

2.2. Data Collection Tool

In this study, a questionnaire consisting of two parts was created by the researcher and converted into digital format. Then, the survey link was sent to the groups in the messaging applications, including the teachers, to the teacher groups in the social media accounts, and as individual messages and e-mails, and the data was collected. The first part of the questionnaire, a part containing demographic information; The second part consists of a 5-point Likert -type q questionnaire with 30 questions. In the first part of the research form, the participants were asked to mark demographic information about gender, education level, branch , seniority, and the schools they work at. In addition, in the first part, they were asked to mark the device usage times, technology usage purposes, and tools they use outside of the classroom and for the course, both during and after distance education. In the second part of the research form; There is a 5- point Likert -type section with the items "totally agree, agree, partially agree, disagree and strongly disagree". In this section, general questions about communication, preparation, implementation, evaluation and post-distance education constitute the dimensions of the survey questions.

At the stage of creating the research form, the dimensions related to the research subject were determined by first scanning the literature. Then, as a result of the literature review, an item pool was created, and new items were created from the items selected from this pool. Finally; In order to ensure the validity of meaning, scope and written language, the items were read to 10 different people, consisting of measurement and evaluation, language and field experts, and necessary arrangements were made.

3. Results

Technology use experiences of teachers during and after distance education were examined in terms of various variables through descriptive statistics, t-tests and ANOVA tests. The findings obtained in this section are presented in tables.

3.1. Teachers' Daily Device Usage Periods for the Lesson During and After the Distance Education Process

The daily device usage times of 468 teachers participating in the study were examined and their findings are given in the table below.

Table 2. During and after distance education; Distribution of daily device usage times for the course

	In the distance education process		After distance education	
Usage Period	f	Percentage (%)	f	Percentage (%)
less than 2 hours	66	14.1	235	50.2
between 2-4 hours	109	23.3	146	31.2
between 4-6 hours	170	36.3	60	12.8
more than 6 hours	123	26.3	27	5.8

When teachers' daily device usage times are examined for lesson preparation, in-class activities or evaluation; While 14.1% of the teachers used a device for less than 2 hours during the distance education process, the rate of teachers using the device during this period increased to 50.2% after the distance education. In the distance education process; While 36.3% of the teachers used the device for 4-6 hours for the lesson, the rate of teachers using the device during this period decreased to 12.8%. When the table given above is examined, it is seen that the device usage times of teachers have decreased after distance education.

3.1.1 . Daily Device Usage Periods for the Lesson During and After the Distance Education Process, According to the Seniority of the Teachers

The daily device usage times of the teachers participating in the research were examined for the preparation, application and evaluation stages of the course according to their years of professional seniority in the distance education process and after the distance education, and the findings are given in the table below.

Table 3. Distribution of daily device usage times for the course during and after distance education according to professional seniority

	During and after distance education Daily device usage times for the course								
	less than 2 hours		2-4 hours		4-6 hours		more than 6 hours		
Seniority	In the DE* process	DE post-	DE in the process	DE post-	In the DE process	DE post-	In the DE process	post DE	Total
1-5 years	11th	28	9	9	16	6	11th	4	47
6-10 years	23	61	27	37	34	8	28	6	112
11-15years	13	58	23	28	36	8	28	6	100
16-20years	9	51	23	32	41	16	30	4	103
21-25years	6	24	14	25	31	15	19	6	70
26 and +	4	13	13	15	12	7	7	1	36
Total	66	235	109	146	170	60	123	27	468

DE* = Distance education

Considering the daily device usage times for the lesson according to the professional seniority of the teachers; It is seen that while using a device for 4-6 hours on average in the distance education process, this time is reduced to less than 2 hours after distance education, and teachers of 6-10, 11-15 and 16-20 years generally use more devices in the distance education process. Again, after distance education, the most variation in device usage times is 6-10, 11-15 and 16-20 year teachers. It is seen that device usage time decreases after distance education in all professional seniority.

3.1.2. Daily Device Usage Times for the Lessons During and After the Distance Education Process, According to Teachers' School Levels

The daily device usage times of the teachers participating in the research for the preparation, implementation and evaluation stages of the course were examined according to the school levels they worked during the distance education process and after the distance education, and the findings are given in the table below.

Table 4. Daily device usage times for the course during and after the distance education process

	During and after distance education Daily device usage times for the course								
	less than 2 hours		2-4 hours		4-6 hours		more than 6		
Level	DE*	PDE**	DE		DE		DE		Total
Pre-school	6	10	5	5	4	1	1	0	16
Primary school	12	54	24	37	46	9	25	7	107
Middle School	26	103	38	55	68	23	56	7	188
High school	22	68	42	49	52	27	41	13	157
Total	66	235	109	146	170	60	123	27	468

*DE=Distance education process

**PDE= post distance education

Considering the device usage times for the lesson according to the school levels of the teachers; with the use of devices for 4-6 and more than 6 hours in the distance education process; it is seen that this period decreases in all school levels after distance education. The group whose device usage time decreased the most in all time intervals is again secondary school teachers.

3.1.3. Daily Device Usage Times for the Lessons During and After the Distance Education Process, According to the Branches of the Teachers

Stages of the course during the distance education process and after the distance education were examined, and the findings are given in the table below.

Table 5. Daily device usage times for the course during and after distance education according to their branches

Branch	During and after distance education Daily device usage times for the course								Total
	less than 2 hours		2-4 hours		4-6 hours		more than 6		
	DE*	PDE**	DE		DE		DE		
Turkish, Turkish Language and Literature	7	30	10	13	22	7	14	3	53
Maths	3	25	8	10	15	6	18	3	44
Science (Science, Physics,Chemistry, Biology)	3	12	2	1	12	3	12	3	29
Social Sciences(History, Geography, Philosophy, Social)	5	13	6	3	8	4	4	3	23
Foreign Language (English, German)	8	62	31	40	48	19	37	3	124
Class Teacher	9	37	16	30	36	10	22	6	83
Pre-school	6	10	7	6	4	1	0	0	17
Religion	2	4	1	3	3	0	1	0	7
Guidance	6	5	2	3	1	0	0	1	9
BIT	1	5	7	8	3	2	4	0	15
Art/Skill (Music, Art, PE, TechDsgn)	12	25	8	8	16	7	9	5	45
Special education	2	2	3	3	0	0	0	0	5
Vocational Courses	2	5	8	8	2	1	2	0	14
Total	66	235	109	109	170	60	123	27	468

*DE=Distance education process
**PDE= post distance education

Considering the device usage times for the lesson according to the branches of the teachers ; It is seen that foreign language teachers use devices the most in all time intervals, followed by classroom teachers. Minimum device usage; It is seen in guidance, special education, pre-school and vocational course teachers. It is observed that device usage time decreases after distance education in all branches .

3.2. Tools Used by Teachers for Education During and After the Distance Education Process

The tools used by 468 teachers participating in the study for educational purposes were examined and their findings are given in the table below.

Table 6. Tools used for education during and after distance education

	In the distance education process		After distance education	
Tools Used for Educational Purposes	f	Percentage (%)	f	Percentage (%)
Teleconferencing tools (Zoom , Microsoft Teams etc)	422	90.2	370	72.6

EBA	423	90.4	381	81.4
Google Tools	301	64.3	304	65
Assessment tools (kahoot , quizizz etc)	160	34.2	160	34.2
Canva	5	1.06	2	0.4
Other (Web 2.0 tools)	19	4.05	19	4.05

When the tools that teachers use for education are examined; in the distance education process, observed that this rate, where more than 90% of the teachers use teleconference tools and EBA, decreased to 72.6% for teleconference tools and 81.4% for EBA use after distance education. Increase from 64.3% to 65% in Google tools; It is seen that the use of evaluation tools remained the same with 34.2%. Teachers indicated Canva and various Web 2.0 tools in the other option in the survey. It is seen that there are great changes in their usage rates.

3.3. Reflections from Distance Education Process to Post-Distance Education: Communication, Preparation, Application, Evaluation and Views on Distance Education

The questionnaire items prepared for the purpose of this study, both for the distance education process and after the distance education, teachers' communication with their students; The preparation, implementation and evaluation stages of the courses and questions that enable them to reflect their general views on distance education. In this chapter; The t-test and ANOVA tests were used to determine whether there was a significant difference in these dimensions after the distance education period of the teachers.

3.3.1 Technology Usage Experiences of Teachers After Distance Education Process

Communication with students about teachers' use of technology, during and after distance education; The preparation, application and evaluation stages of the course and general views on distance education were examined by t-test and the findings are given in the tables below.

Table 7. The t-test results of the distance education process and after the communication dimension

	Test Value = 0			
Dimensions	t	df	Sig . (2-tailed)	mean difference
Communication in the DE Process	56,029	467	,000	2,49893
Communication After DE	69,588	467	,000	2,24573

As can be seen from the table, there is a significant difference in the communication dimension of teachers' technology use during and after the distance education process ($p<.01$).

Table 8. The t-test results of the distance education process and after the preparation dimension

	Test Value = 0			
Dimensions	t	df	Sig . (2-tailed)	mean difference
Preparation for the DE Process	79,029	467	,000	2,28579
Preparation After DE	86,765	467	,000	3.11538

As can be seen from the table, there is a significant difference in the preparation dimension of teachers' use of technology during and after the distance education process ($p<.01$).

Table 9. T-test results of the distance education process and post-implementation dimension

	Test Value = 0			
Dimensions	t	df	Sig . (2-tailed)	mean difference
Implementation in the DE Process	88,377	467	,000	2,62222
Application After DE	37,169	467	,000	1,94872

As can be seen from the table, there is a significant difference in the application dimension of teachers' technology use during and after the distance education process (p<.01).

Table 10T-test results during and after distance education in the evaluation dimension

	Test Value = 0			
Dimensions	t	df	Sig . (2-tailed)	mean difference
Evaluation in the DE Process	59,455	467	,000	2,01795
Evaluation After DE	46,569	467	,000	2,19444

As can be seen from the table, there is a significant difference in the evaluation dimension of teachers' technology use during and after the distance education process (p<.01).

Table 11. The t-test results of the distance education process and post-distance education in the dimension of general opinions about distance education

	Test Value = 0			
Dimensions	t	df	Sig . (2-tailed)	mean difference
General in the DE Process	67,909	467	,000	2,27849
General After DE	48,042	467	,000	1,89886

As it can be understood from the table, there is a significant difference in terms of general opinions about distance education in teachers' use of technology during and after distance education (p<.01).

3.3.2. Technology Usage Experiences After Distance Education Process by Teachers by Seniority

Regarding the use of technology by teachers, communication with their students during and after distance education, according to their seniority; The preparation, application and evaluation stages of the course and general views on distance education were examined by using the ANOVA test and the findings are given in the table below.

Table 12. Distance education process and post ANOVA test results by seniority

Dimensions		Sum of Squares	df	mean square	F	Sig .
Communication	between Groups	4,571	5	,914	2,108	,063
	within Groups	200,387	462	,434		
	total	204,958	467			
Preparation	between Groups	1,412	5	,282	,871	,500
	within Groups	149,697	462	,324		
	total	151,109	467			
Application	between Groups	5,594	5	1,119	4,002	,001
	within Groups	129,159	462	,280		
	total	134,752	467			
Evaluation	between Groups	,515	5	,103	,196	,964
	within Groups	242,613	462	,525		
	total	243,128	467			
General	between Groups	5,688	5	1,138	2,277	,046
	within Groups	230,860	462	,500		
	total	236,548	467			

It was examined whether there was a significant difference in the use of technology by the teachers according to their seniority, and a significant difference was observed in the application dimension ($p<.01$). There was no significant difference in the dimensions of communication, preparation, evaluation and general views on distance education ($p>.01$).

3.3.2.1. Technology Usage Experiences in Distance Education Process by Teachers' Seniority

According to the seniority of the teachers in their use of technology, communication with their students in the distance education process; The preparation, application and evaluation stages of the course and general views on distance education were examined by using the ANOVA test and the findings are given in the table below.

Table 13. Distance education process ANOVA test results by seniority

Dimensions		Sum of Squares	df	mean square	F	Sig .
Communication	between Groups	5,670	5	1,134	2,360	,039
	within Groups	221,947	462	,480		
	total	227,616	467			
Preparation	between Groups	2,066	5	,413	1,056	,384
	within Groups	180,772	462	,391		
	total	182,838	467			
Application	between Groups	8,665	5	1,733	4,357	,001
	within Groups	183,744	462	,398		
	total	192,409	467			
Evaluation	between Groups	,544	5	,109	,200	,962
	within Groups	251,225	462	,544		
	total	251,769	467			
General	between Groups	2,256	5	,451	,855	,511
	within Groups	243,781	462	,528		
	total	246,037	467			

When the distance education process is examined, according to the seniority of the teachers in the use of technology; There was also a significant difference in the application dimension of the course (p<.01). There is no significant difference in the dimensions of communication, course preparation, evaluation and general views on distance education (p>.01).

3.3.2.2. Technology Usage Experiences After Distance Education by Teachers' Seniority

Communication with students on the use of technology by teachers, after distance education, according to their seniority; The preparation, application and evaluation stages of the course and general views on distance education were examined by using the ANOVA test and the findings are given in the table below.

Table 14. ANOVA test results after distance education by seniority

Dimensions		Sum of Squares	df	mean square	F	Sig .
Communication	between Groups	7,088	5	1,418	1,531	,179
	within Groups	427,661	462	,926		
	total	434,749	467			
Preparation	between Groups	1,143	5	,229	,376	,865
	within Groups	280,626	462	,607		
	total	281,769	467			
Application	between Groups	4,252	5	,850	,659	,655
	within Groups	596,517	462	1,291		
	total	600,769	467			
Evaluation	between Groups	4,467	5	,893	,858	,509
	within Groups	480,838	462	1,041		
	total	485,306	467			
General	between Groups	13,323	5	2,665	3,752	,002
	within Groups	328,112	462	,710		
	total	341,435	467			

When examined after distance education, according to the seniority of the teachers in the use of technology; There was also a significant difference in the dimension of general views on distance education (p<.01). There is no significant difference in the dimensions of communication, preparation, application and evaluation of the lessons (p>.01).

3.3.3. Technology Usage Experiences of Teachers After the Distance Education Process, by School Level

Regarding the use of technology by the teachers, the school levels they work communication with students during and after distance education; The preparation, application and evaluation stages of the course and general views on distance education were examined by using the ANOVA test and the findings are given in the table below.

Table 15. Distance education process and post-ANOVA test results according to school levels

Dimensions		Sum of Squares	df	mean square	F	Sig .
Communication	between Groups	2,143	3	,714	1,635	,181
	within Groups	202,815	464	,437		
	total	204,958	467			
Preparation	between Groups	,290	3	,097	,297	,828
	within Groups	150,819	464	,325		
	total	151,109	467			
Application	between Groups	1,630	3	,543	1,893	,130
	within Groups	133,123	464	,287		
	total	134,752	467			
Evaluation	between Groups	,680	3	,227	,434	,729
	within Groups	242,448	464	,523		
	total	243,128	467			
General	between Groups	1,310	3	,437	,861	,461
	within Groups	235,238	464	,507		
	total	236,548	467			

School levels when teachers worked in technology use, and no significant difference was found in terms of communication, preparation, application, evaluation and general views on education (p>.01).

3.3.3 .1. Technology Usage Experiences of Teachers in Distance Education Process by School Levels

Communication with students in the distance education process, by grade, on the use of technology by teachers; The preparation, application and evaluation stages of the course and general views on distance education were examined by using the ANOVA test and the findings are given in the table below.

Table 16. Distance education process ANOVA test results according to school levels

Dimensions		Sum of Squares	df	mean square	F	Sig .
Communication	between Groups	2,596	3	,865	1,784	,149
	within Groups	225,021	464	,485		
	total	227,616	467			
Preparation	between Groups	,602	3	,201	,511	,675
	within Groups	182,236	464	,393		
	total	182,838	467			
Application	between Groups	2,333	3	,778	1,899	,129
	within Groups	190,076	464	,410		
	total	192,409	467			
Evaluation	between Groups	,483	3	,161	,297	,827
	within Groups	251,286	464	,542		
	total	251,769	467			
General	between Groups	,986	3	,329	,622	,601
	within Groups	245,051	464	,528		
	total	246,037	467			

When the distance education process is examined, according to the level of teachers' use of technology; there is no significant difference in the dimensions of communication, preparation, application, evaluation stages of the courses and general views on distance education (p>.01).

3.3.3.2. Technology Usage Experiences of Teachers to School Levels, After Distance Education

Communication with students on teachers' use of technology, by grade, after distance education; The preparation, application and evaluation stages of the course and general views on distance education were examined by using the ANOVA test and the findings are given in the table below.

Table 17. ANOVA test results after distance education by school levels

Dimensions		Sum of Squares	df	mean square	F	Sig .
Communication	between Groups	5,146	3	1,715	1,853	,137
	within Groups	429,603	464	,926		
	total	434,749	467			
Preparation	between Groups	,269	3	,090	,148	,931
	within Groups	281,500	464	,607		
	total	281,769	467			
Application	between Groups	2,042	3	,681	,528	,664
	within Groups	598,727	464	1,290		
	total	600,769	467			
Evaluation	between Groups	3,462	3	1,154	1,111	,344
	within Groups	481,844	464	1,038		
	total	485,306	467			
General	between Groups	2,537	3	,846	1,158	,325
	within Groups	338,898	464	,730		
	total	341,435	467			

When examined after distance education, according to the level of teachers' use of technology; there is no significant difference in the dimensions of communication, preparation, application, evaluation stages of the courses and general views on distance education (p>.01).

3.3.4. Technology Usage Experiences of Teachers According to Their Branches, Before and After the Distance Education Process

Regarding the use of technology by teachers, according to their branches , during and after distance education; The preparation, application and evaluation stages of the course and general views on distance education were examined by using the ANOVA test and the findings are given in the table below.

Table 18. Distance education process and post ANOVA test results by branch

Dimensions		Sum of Squares	df	mean square	F	Sig .
Communication	between Groups	10,764	12	,897	2,102	,016
	within Groups	194,194	455	,427		
	total	204,958	467			
Preparation	between Groups	6,311	12	,526	1,652	,075
	within Groups	144,798	455	,318		
	total	151,109	467			

Application	between Groups	4,083	12	,340	1,185	,291
	within Groups	130,670	455	,287		
	total	134,752	467			
Evaluation	between Groups	8,371	12	,698	1,352	,186
	within Groups	234,757	455	,516		
	total	243,128	467			
General	between Groups	12,372	12	1,031	2,093	,016
	within Groups	224,175	455	,493		
	total	236,548	467			

It was examined whether there was a significant difference in the use of technology by the teachers according to the branch and communication with their students; There was no significant difference in the dimensions of the preparation, implementation and evaluation stages of the course and general views on distance education (p>.01). Post-hoc analysis was made in ANOVA and teachers were found among branches. communication with students; It was observed that there was no significant difference between the preparation, implementation and evaluation stages of the course and their general views on distance education (p>.01).

3.3.4.1. Technology Usage Experiences of Teachers in Distance Education Process by Branches

Communication with students in the distance education process, according to their branches , on the use of technology by teachers ; The preparation, application and evaluation stages of the course and general views on distance education were examined by using the ANOVA test and the findings are given in the table below.

Table 19. Distance education process by branch ANOVA test results

Dimensions		Sum of Squares	df	mean square	F	Sig .
Communication	between Groups	13,379	12	1,115	2,368	,006
	within Groups	214,237	455	,471		
	total	227,616	467			
Preparation	between Groups	7,440	12	,620	1,608	,086
	within Groups	175,398	455	,385		
	total	182,838	467			
Application	between Groups	5,328	12	,444	1,080	,375
	within Groups	187,081	455	,411		
	total	192,409	467			
Evaluation	between Groups	7,993	12	,666	1,243	,250
	within Groups	243,776	455	,536		
	total	251,769	467			
General	between Groups	15,177	12	1,265	2,493	,004
	within Groups	230,860	455	,507		
	total	246,037	467			

Branches in the use of technology by the teachers; There was a significant difference (p<.01) in the dimension of communication, and there was a significant difference in the dimension of general views on distance education (p<.01). There was no significant difference in the dimensions of preparation, implementation and evaluation (p>.01).

3.3.4.2. Technology Usage Experiences of Teachers After Distance Education by Branches

On the use of technology by teachers, according to their branches after distance education; The preparation, application and evaluation stages of the course and general views on distance education were examined by using the ANOVA test and the findings are given in the table below.

Table 20. ANOVA test results after distance education by branch

Dimensions		Sum of Squares	df	mean square	F	Sig .
Communication	between Groups	17,666	12	1,472	1,606	,087
	within Groups	417,083	455	,917		
	total	434,749	467			
Preparation	between Groups	7,472	12	,623	1,033	,417
	within Groups	274,297	455	,603		
	total	281,769	467			
Application	between Groups	16,204	12	1,350	1,051	,401
	within Groups	584,565	455	1,285		
	total	600,769	467			
Evaluation	between Groups	13,947	12	1,162	1,122	,340
	within Groups	471,359	455	1,036		
	total	485,306	467			
General	between Groups	14,627	12	1,219	1,697	,064
	within Groups	326,808	455	,718		
	total	341,435	467			

When examined after distance education, according to the branches of teachers' use of technology , communication with their students; there is no significant difference in terms of preparation, implementation and evaluation stages of the course and general views on distance education (p>.01).

3.3.5. Technology Usage Experiences of Turkish, Mathematics, Foreign Language, Classroom, Skills Teachers After Distance Education Process

In this section, Turkish (53), Mathematics (44), Foreign Language (124), Classroom (83) and the skill course (Music, Physical Education, Visual Arts and Technology and Design courses) which have the highest number among 468 teachers participating in the research (45) communication of teachers with students during and after distance education; The preparation, application and evaluation stages of the course and general views on distance education were examined by t-test and the findings were given.

3.3.5.1. Technology Usage Experiences of Turkish Teachers After Distance Education Process

Of the 53 Turkish and Turkish Language and Literature branch teachers participating in the research; Communication with students, preparation, implementation and evaluation stages of the courses and general views on distance education, technology usage experiences during and after distance education were examined by t-test and the findings are given in the table below.

Table 21. T-test results of Turkish teachers' technology use experiences during and after distance education

Dimensions	mean	t	df	Sig . (2-tailed)
Communication	-,54245	-4,106	52	,000
Preparation	-.86321	-6,658	52	,000
Application	,66415	4,105	52	,000
Evaluation	-,09811	-,809	52	,422
General	,44717	5,402	52	,000
Total	-,04019	-.552	52	,583

When the table is examined, it is seen that the teachers of Turkish and Turkish Language and Literature branches in the communication dimension during and after the distance education (p<.01), in the preparation dimension of the lessons (p<.01), in the application dimension of the lessons (p<.01) and in the teachers' general information about distance education. significant difference was observed in the dimension of opinions (p<.01). However, no significant difference was observed in the evaluation dimension (p>.01). Looking at the whole of the survey; no significant difference was observed. (p>.01).

3.3.5.2. Technology Usage Experiences of Mathematics Teachers After Distance Education Process

Of the 44 Mathematics teachers participating in the research; Communication with students, preparation, implementation and evaluation stages of the courses and general views on distance education, technology usage experiences during and after distance education were examined by t-test and the findings are given in the table below.

Table 22. T-test results of mathematics teachers' technology use experiences during and after distance education

Dimensions	mean	t	df	Sig . (2-tailed)
Communication	-.35795	-2,464	43	,018
Preparation	-,87500	-7,299	43	,000
Application	,41818	2,349	43	,024
Evaluation	-,22273	-1,970	43	,055
General	,24318	2,128	43	,039
Total	-,17455	-2,437	43	,019

When the table is examined, a significant difference was observed in the preparation dimension of mathematics teachers during and after distance education (p<.01). However; There was no significant difference in the dimensions of communication, preparation, implementation and evaluation of the lessons and teachers' general views on distance education (p>.01). In addition, there was no significant difference when looking at the whole questionnaire. (p>.01).

3.3.5.3. Technology Usage Experiences of Foreign Language Teachers After Distance Education Process

124 foreign language teachers participating in the research; Communication with students, preparation, implementation and evaluation stages of the courses and general views on distance education, technology usage experiences during and after distance education were examined by t-test and the findings are given in the table below.

Table 23. T-test results of foreign language teachers' technology use experiences during and after distance education

Dimensions	**mean**	**t**	**df**	**Sig . (2-tailed)**
Communication	-.25000	-3,234	123	,002
Preparation	-,84073	-11,525	123	,000
Application	,84677	7,899	123	,000
Evaluation	-,20161	-2,565	123	,012
General	,49726	8,010	123	,000
Total	-,02839	-,690	123	,491

When the table is examined, a significant difference was observed in the communication dimension of the Foreign Language teachers during and after the distance education (p<.01). In addition, there was a significant difference in the preparation dimension of the lessons (p<.01), there was also a significant difference in the implementation dimension of the lessons (p<.01), and there was also a significant difference in the dimension of teachers' general views on distance education (p<.01). . However, there is no significant difference in the evaluation dimension of the courses (p>.01). Looking at the whole of the survey; no significant difference was observed (p>.01).

3.3.5.4. Technology Usage Experiences of Classroom Teachers After the Distance Process

Of the 83 classroom teachers who participated in the research; Communication with students, preparation, implementation and evaluation stages of the courses and general views on distance education, technology usage experiences during and after distance education were examined by t-test and the findings are given in the table below.

Table 24. T-test results of classroom teachers' technology use experiences during and after distance education

Dimensions	**mean**	**t**	**df**	**Sig . (2-tailed)**
Communication	-.29819	-2,640	82	,010
Preparation	-,81024	-9,353	82	,000
Application	,60000	5,466	82	,000
Evaluation	-,17831	-1,933	82	,057
General	,44988	5,941	82	,000
Total	-.06554	-1,262	82	,210

When the table is examined, a significant difference was observed in the communication dimension of classroom teachers during and after distance education (p<.01). In addition, a significant difference was observed in the evaluation dimension of the courses (p<.01). However, there was a significant difference in terms of teachers' general views on distance education (p<.01). However, there was no significant difference in the dimensions of communication, preparation and implementation of the lessons (p>.01), and there was no significant difference when the whole qPDEtionnaire was examined. (p>.01).

3.3.5.5. Technology Usage Experiences of Skills Lesson (Music, Physical Education, Visual Arts, Technology and PDEign) Teachers After Distance Education Process

45 skill courses (Music, Physical Education, Visual Arts, Technology and PDEign) participated in the research your teacher; Communication with students, preparation, implementation and evaluation stages of the courses and general views on distance education, technology usage experiences during and after distance education were examined by t-test and the findings are given in the table below.

Table 25. T-test results of technology use experiences of skill lesson teachers during and after distance education

Dimensions	mean	t	df	Sig . (2-tailed)
Communication	,07222	,611	44	,545
Preparation	-,70000	-5,668	44	,000
Application	,80444	4,778	44	,000
Evaluation	-.21333	-1,761	44	,085
General	,13422	1,200	44	,237
Total	-.02600	-.498	44	,621

When the table is examined, skill course (Music, Physical Education, Art, Technology and Design) There was a significant difference in the dimensions of preparation and practice of teachers during and after distance education ($p<.01$). However; There was no significant difference in the dimensions of communication, evaluation and teachers' general views on distance education ($p>.01$), and there was no significant difference when the whole questionnaire was examined. ($p>.01$).

4. Discussion and Conclusion

In this section, the results will be discussed in the light of the findings obtained from the answers of 468 teachers participating in the research to the survey questions. Branch, professional seniority, the school level they work at, the daily device usage times and the digital tools they use during and after the distance education process. The daily device usage times of the teachers for the lesson after the distance education period were examined, and it was observed that although the duration of using the device in the distance education process was quite high on a daily basis, this period decreased considerably after the distance education. The duration of daily device use was also examined according to the variables of school level, seniority and branch of the teachers, and it was observed that the duration of device use decreased in terms of all these variables. From a more detailed point of view, the following can be said:

It has been observed that teachers with the least (1-5 years) and the most (26 and above) years of seniority use less devices both in the distance education process and after the distance education, compared to the teachers with other seniority. It is seen that the time of using the device in the distance education process of the teachers with high device usage (with a seniority between 6-25 years) decreased considerably after distance education. When the device usage times of the teachers are examined according to the school levels they work, it is seen that the secondary school teachers use the device the most. It is thought that this rate is high due to the fact that there are 7 hours of lessons per day in secondary schools (MEB TTKB) and diluted distance education practices. It is thought that the duration of the device is less because the age group of the students who will be given distance lessons in the preschool level, where the use of the device is the least, makes it difficult to conduct distance lessons. Moreover; It can be said that the fact that the classes of the school levels are opened and closed at certain periods during the distance education period and the education is diluted and the number of daily lessons in each school level is different (MEB TTKB) causes the difference in device usage times according to the levels.

Looking at the daily device usage status according to the branches; It is seen that foreign language teachers mostly use devices in the distance education process. According to the results of the research conducted by Arabacı and Smart (2019) on the use of technology in education by English teachers; It was concluded that English teachers mostly use online test, presentation and word clouds tools, and they develop materials by reinterpreting classical methods with the support of technology. It is thought that the findings of the study conducted by Arabacı and Smart (2019) support the finding of this study. Most of the devices are used by Foreign Language teachers. followed by the classroom teachers. The branches that use the least device; guidance, special education, pre-school and vocational course teachers. Different from other branch teachers, the fact that the weekly lesson hours of the classroom teachers are 30 hours and the lesson hours of the other branches differ according to the schools they work in are thought to explain the difference in device usage time here. The fact that guidance teachers who use fewer devices do not do weekly lessons like other branches (MEB TTKB) explains this situation. It is thought that special education and preschool teachers cannot do enough lessons in the distance education process due to reasons such as the need for parent support for their students to participate in distance lessons, and the inability to use technology al1. In addition, according to the research conducted by Öner (2020); the use of information and

communication technologies in pre-school education; It is stated that preschool children are against internet use and preschool children are against digital games. However; According to the research conducted by Gülen (2021), the average of the attitude scores of the teachers who received training or seminars towards the use of technological equipment in pre-school education was higher than those who did not, and it was observed that the attitude levels of the preschool teachers towards the use of technological equipment did not differ according to the distance education situation.

It is thought that the device usage time of the vocational course teachers is low due to the fact that since 05 October 2020, the face-to-face training of the practical gains from Vocational and Technical Anatolian High Schools, Multi-Program Anatolian High Schools, Vocational Education Centers, Sports High Schools and Fine Arts High Schools (MEB MTEGM, 2020) has started.

When we look at the tools that teachers use for education during and after the distance education process, it can be said in the light of the data that they continue to use the Teleconference tools, EBA, Google tools, evaluation tools and various web 2.0 tools they use during the distance education process, although they have decreased very little. In this context; It can be said that teachers' use of technology is high in the distance education process and they reflect these experiences after distance education.

In the second part of the questionnaire, teachers were asked about their communication with their students; The use of messaging applications such as WhatsApp and Telegram during and after the distance education process , effective communication, preferring to use messaging applications and continuing to use them are included in the preparation phase of the lessons; Regarding the use of digital resources, being aware of them and continuing to use them while preparing course content on the subject, the implementation phase of the courses; The cases of using different platforms such as Zoom , Microsoft teams for the conduct of the courses , the status of continuing to use them and the preference status of the EBA about the effective use, adequacy, continuation of use and preference situations, the evaluation phase of the courses; Regarding the effectiveness of those who do not evaluate with digital tools such as Kahoot , Quizziz , Zipgrade , Eba exams, their continued use, and their general views on distance education; In this process , questions were asked about the increase in the experience of using technology, enjoying the use of technology, continuing to use them after distance education, their desire to have live lessons, and the effectiveness of distance education. In the sub-dimensions of the answers given to these questions, communication with the students of the teachers, the preparation, implementation, evaluation stages of the courses and the views on distance education, it was examined whether there was a reflection of the teachers after the distance education process according to the variables of seniority, school level and branch . Metin, Gürbey and Çelik (2021); It was stated that teachers mostly did not find the distance education application positive in terms of teachers, students and courses. However, in this study, it has been concluded that there is a reflection of the teachers' technology use experiences in communication with their students, in the preparation, implementation, evaluation stages of the lessons and in their general views on distance education after the distance education process.

It has been concluded that there is a reflection after the distance education process in the communication with the students, the preparation and evaluation stages of the courses, and the general views of the teachers with different teaching experience periods on the use of technology, but there was no reflection in the implementation phase of the courses. While there is a difference between seniority in the application dimension of the courses in the education process, it is seen that there is a difference in their general views on distance education after distance education. From this point of view, it can be said that the experience of teachers in the profession makes a difference in the application of the courses on the use of technology in distance education. In addition, it can be stated that teachers' views on distance education have changed after distance education.

It is seen that there is a reflection after the distance education process in terms of technology usage experiences according to the school levels of the teachers. It is seen that there is reflection in all sub-dimensions both in the distance education process and after the distance education. In the research conducted by Sırakaya (2019); It was concluded that the level of employment did not differentiate the technology acceptance of the teachers and the teaching experience, which was researched as seniority in the same study, did not differentiate the technology acceptances of the teachers. In the study conducted by Aktürk and Delen (2020), it was stated that the technology acceptance levels of primary and secondary school teachers were higher than those of high school teachers. In the same study, it was determined that the technology acceptance levels of teachers with professional seniority of 0-10 years and 11-20 years were higher than teachers with professional seniority of 21 years and above. The findings of this study regarding seniority and level variables differ from previous studies. The fact that previous studies were only about the distance education process, but this study also included post-distance education may be the reason for this difference.

Teachers according to their branches, but there is a reflection in the preparation, implementation and evaluation stages of the courses and their views on distance education. In this context; It can be said that while teachers do not prefer the use of technology after distance education when communicating with their students, they continue to use technology at all stages of the lessons and they differ in their views on distance education. Although there are differences in the communication dimension and the views on education in the distance

education process, it is seen that the teachers reflect their technology use in all sub-dimensions after distance education.

When the technology usage experiences of the teachers of Turkish, Mathematics, Foreign Language, Classroom, Skills lessons were examined, it was observed that there was a general reflection in all dimensions in these branches during and after the distance education process.

When the technology usage experiences of Turkish teachers after the distance education process were examined, it was found that Turkish teachers reflected their technology usage experiences after distance education in the evaluation of the courses during the distance education process. However, it can be said that while communication with students uses technology in the preparation and application stages of the courses, their technology experiences are not reflected after distance education. In addition, it was found that their views on distance education did not differ after distance education. In the research conducted by Yürektürk and Çoşkun (2020), Turkish teachers' views on using technology effectively in their lessons were examined and it was seen that half of the teachers participating in the research stated that they used technology effectively in Turkish lessons. Most of the teachers, who evaluated the effectiveness of the Turkish lessons on technology from their own perspective, stated that technology provide convenience in the teaching process. However, the majority of teachers stated that they had difficulties in technology-supported studies with students at home. In the study conducted by Özgül, Ceran and Yıldız (2020), it was stated that all Turkish teachers use EBA because they find it reliable because the state has its own program. Again in this study, Turkish teachers emphasized audio books, increasing the duration of the lessons and different activities in creating rich content, and stated that they gave homework in measurement and evaluation, used ready-made tests and taught the lessons with questions and answers.

When the technology use experiences of mathematics teachers after the distance education process are examined, it can be said that mathematics teachers reflect their technology use in the communication with their students, preparation, application and evaluation stages of the lessons after the distance education process. In addition, it is seen that there are differences in their views on distance education. However, it can be said that mathematics teachers do not reflect their technology use experience in the preparation dimension of the lessons afterward. Tican and Toksot Gökoğlu (2021) stated that the teaching materials used in distance education mathematics course are z-books, materials in EBA and published by MEB, Web 2.0 tools (Geogebra , Microsoft white board, Math playground , LearningApps) and multiple choice tests. . Assigning homework for measurement and evaluation in distance education mathematics course, sending subject-unit evaluation tests from Google form and EBA , sending questions from WhatsApp and Telegram application, taking online practice exams, solving tests in z-book, with Web 2.0 tools (Kahoot , LearningApps) It is stated that question solving is in the form of creating an exam in EBA . Again in this study, it is stated that the interaction between the teacher and the student is partially provided.

When the technology usage experiences of the foreign language teachers are examined after the distance education process, it is seen that the foreign language teachers continue to use the technology they use in the evaluation of the lessons during the distance education process, even after the distance education. However, it is seen that there is no difference in terms of the use of technology in terms of teachers' communication with their students, preparation and implementation of the lessons. In addition, it is seen that the views of foreign language teachers about distance education do not differ after the distance education process. According to the research conducted by Tümen Ayyıldız (2020), English teachers made documents and assignments through EBA during the distance education process. On the other hand, they used mobile technologies to try to make online lessons mostly and not to victimize the 8th graders during the exam periods. They have benefited from Whatsapp application. Cantürk and Cantürk (2021) state that English teachers use Zoom software more in distance education lessons and Eba Live Lesson application of MEB.

When the technology usage experiences of the classroom teachers after the distance education process are examined, it is seen that the classroom teachers reflect the technology experience they use in the distance education process while communicating with their students and in the preparation and application dimensions of the courses after the distance education as well. However, it is seen that there is a difference in the use of technology by classroom teachers in communicating with their students and evaluating the lessons. In addition, it can be said that the views of classroom teachers about distance education differ after the distance education process. In the research conducted by Saygı (2021); In addition to the evaluation that EBA is sufficient in terms of content and infrastructure in the evaluations of classroom teachers, it is concluded that various distance education applications are used and measurement and evaluation studies cannot be carried out completely by classroom teachers in the distance education process. It is understood that the rate of classroom teachers who use other distance education tools beside EBA is 40 percent or more. In the study conducted by Kurt, Kandemir and Çelik (2021), classroom teachers in the distance education process; It is observed that they conveyed the methods and tools they used in assessment and evaluation as a project, online multiple choice test, activity assignment, question and answer method, preparing activities with web2.0 tools, digital activities and games, evaluation of videos from parents, not knowing how to make the evaluation.

When the technology usage experiences of the skill lessons (Music, Physical Education, Visual Arts, Technology and Design) teachers are examined after the distance education process, it is seen that the teachers

reflect the technology usage experiences they gained during the distance education process in the communication with their students and in the evaluation of the lessons. However, it can be said that there is no difference in the use of technology in the preparation and application dimensions of the courses. According to the research conducted by Güven (2021) on physical education teachers; It has been frequently stated by the teachers that the students see the distance physical education lesson as a lesson where they cannot play games, play matches, and perform activities that they can have fun. In the study conducted by Akarsu (2021) on the views of music teachers on distance education, it was concluded that distance education is not suitable for music lessons.

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A Systematic Review of the Use of Augmented Reality Technology for Individuals with Special Needs

Yılmaz Bahadır KURTOĞLU[1], Yasemin KARAL[2]

Article History
Received: 27.12.2022
Received in revised form: 28.12.2022
Accepted: 30.06.2023

Abstract

In this study, studies on the use of augmented reality technology for individuals with special needs were examined. In this context, studies published between 2018-2022 were scanned. As a result of the screening, 20 studies that met the criteria were included in the study. Examined studies; publication year, subject, purpose, variable, special needs of individuals, hardware and software used for augmented reality, method, data collection tools, data analysis methods, limitations, results and suggestions were examined. When the studies are examined by years, they show an increasing trend and focus mostly on 'social interaction' as a variable. It has been seen that the studies are mostly carried out for individuals with autism and applications are made with small sample groups. In the results of the studies, it is revealed that the use of augmented reality technology in individuals with special needs is effective and motivating in general. In this study, the trend of the use of augmented reality technology for individuals with special needs in recent years has been described.

Keywords: Augmented reality, individuals with special needs, systematic review

1. Introduction

Augmented reality is defined as a three-dimensional technology that surrounds the real world with objects created in virtual environments, supporting individuals' understanding and perception of it (Leung & Blauw, 2020). In other words, augmented reality technology, which appears as a technological tool that brings together the real world and virtual objects (Azuma, 1997), is increasingly being used in educational environments as the costs of these technologies decrease and they become more usable and accessible (Somyürek, 2014). Although augmented reality technology is sometimes confused with virtual reality technology, unlike virtual reality, augmented reality provides users with an appropriate interface that combines virtual objects with the real world (Tekedere & Hoker, 2016). Virtual reality, on the other hand, is the simulation of a real or imaginary environment created from three-dimensional virtual objects presented by the computer (Fridhi et al., 2018).

Augmented reality, together with its ability to combine real objects with virtual objects, has the potential to be a useful tool for generalizing the skills learned in the virtual world to the real world (Kientz et al., 2020). In addition, augmented reality is accepted as a technology that increases students' success (Kellems et al., 2019; Carreon et al., 2019) and affects student motivation and participation (Bacca et al., 2018).

Augmented reality also enables students to improve their knowledge and skills through the combination of real world and digital information (Wojciechowski & Cellary, 2013). In addition, this technology makes it possible to safely present events that can be rarely observed in the real world and potentially dangerous experiments to the educational environment, and provides practical experiences to students by embodying abstract concepts (Shelton 2003). With all these advantages, augmented reality has found its place in the field of education with various applications. The real environment is supported by digital elements such as 3D objects, sound and multimedia, and the gap between virtual and physical elements is reduced (Yuen et al., 2011). As a matter of fact, many studies show that augmented reality-based applications increase academic achievement (Tosik & Atasoy, 2017; Petrov & Atanasova, 2020) and keep interest and motivation high (Chen et al., 2017; Bistaman et al., 2018). In addition to all these advantages, augmented reality also provides time and cost savings in educational environments (Gavish et al., 2015).

1.1 Augmented Reality for Individuals with Special Needs

When the literature is examined, many studies show that augmented reality contributes to the learning process, facilitating the integration of individuals with special needs into society and improving their social skills (Lorenzo et al., 2019; Çakır and Korkmaz, 2019; Cate et al., 2017).

Bridges et al. (2019) revealed the positive effect of augmented reality applications carried out for individuals with intellectual disabilities on their daily living skills and concluded that the augmented reality teaching

[1] Ph.D, Recep Tayyip Erdoğan University, Rize, TURKEY, yilmaz.kurtoglu@erdogan.edu.tr, orcid: 0000-0002-8552-7594

[2] Asst. Prof., Trabzon University, Trabzon, TURKEY, yaseminkaral@trabzon.edu.tr, orcid: 0000-0003-4744-4541

material was deemed appropriate to contribute to the learning development of individuals with cognitive impairment. The use of interactive and multimedia elements appealing to different senses in practices conducted for individuals with special needs can positively affect the learning experience of these individuals (Kumar and Wilson 1997). In this context, augmented reality can enrich text-based materials cost-effectively (Martín-Gutiérrez et al., 2015). The benefits of augmented reality technology for individuals with special needs can be briefly summarized as follows:

- Augmented reality technology supports the creation of a student-centered learning environment (Kamarainen et al. 2013). In this way, students with learning difficulties can be supported to learn outside of school and their understanding of the subjects can be improved.
- Augmented reality technology can help students who have attention deficit and learning difficulties in their learning processes to understand the subjects by increasing their motivation (Çakır and Korkmaz 2019).
- Augmented reality technology allows individuals with special needs to repeat what they want to learn whenever they want. Thus, it can help them solve the problem of insufficient time to practice in the classroom (Lin et al. 2016).
- Augmented reality technology makes it easier for students to learn abstract concepts by using both real and virtual objects (Bujak et al. 2013). Thus, it can facilitate the learning of individuals with special needs who have learning difficulties (Kellems et al., 2020).

1.2 Justification and Purpose of the Study

When the literature is examined, it is seen that augmented reality studies for individuals with special needs are limited. It is important for future studies to have a general idea about these studies and to know the characteristics of the studies. In addition, studies that analyze these processes in general are needed in order to make the processes for augmented reality studies being implemented more efficient. For these reasons, it is important to reveal the current situation in order to reveal the features of augmented reality applications for individuals with special needs and to offer suggestions for applications and researches planned to be implemented in the future. In this context, the problem statement of the research is “What is the scope and nature of research on augmented reality applications for individuals with special needs?” is in the form. Within the framework of the main problem, answers to the following questions are sought:

1. What are the general characteristics of augmented reality studies for individuals with special needs?
2. Which research methods were adopted in these studies?
3. What are the data collection tools used in the studies?
4. What are the limitations of the studies?
5. What are the suggestions presented in the studies?
6. What are the results of the studies?

2. Method

The main purpose of this study is to examine the augmented reality studies for individuals with special needs and to reveal the trends in the studies in the context of the basic features of a scientific research process. In order to achieve this goal, content analysis method was used in the study. This method, which is used in qualitative studies, appears as a systematic technique in which a text can be summarized with coding (Büyüköztürk et al. 2014). Çalık and Sözbilir (2014) divide content analysis into three as 'meta-analysis', 'meta-synthesis' and 'descriptive content analysis'. In this study, descriptive content analysis was used. Descriptive content analysis is a method that covers the evaluation of trends and research results by examining studies on a subject (Çalık & Sözbilir, 2014).

2.1 Data Collection and Analysis

In the study, augmented reality studies conducted for individuals with special needs in the last 5 years were examined. As a keyword while scanning the studies; In addition to the word pair 'augmented reality', searches were made where the words 'special need' and 'special disability' were used together. While scanning Turkish resources, in addition to the word group 'augmented reality', 'special education' 'individuals with special needs', detailed information on different types of special needs such as 'mental disability', 'learning difficulties', 'attention deficit', 'autism', 'hyperactivity' scans were also made.

While analyzing the studies; The publication year, subject, method, sample group, variables, special needs type, software used, hardware used, data collection tools, data analysis methods, limitations, results and suggestions were examined. In order to carry out these analyzes; a study review form was created and these criteria were added to the form categories.

The term validity emerges as the degree of reflecting the subject by using measurement tools that can fully express the researched problem (Çepni, 2009). In this study, while the study review form was being created, the forms used in content analysis studies were examined in detail in order to ensure content validity, and themes specific to the study were added. Reliability, on the other hand, is a situation that expresses the accuracy, reproducibility of the findings and the availability of the same results if the research is repeated (Çepni, 2009). In order to ensure reliability in the study, the coding made during the analysis process was re-examined by the same researcher at different times. As a result of the examinations made at different times, the necessary arrangements were made in the form, and the themes that were found to be missing during the examination of the studies were added to the form and the examinations were made again.

3. Results

Considering the inclusion criteria of the research in the screening results, 20 studies shown in Table 1 were included in the scope.

Table 1. Imprint information of the studies that make up the research sample

Code	Study Name	Authors	Year
S1	Intelligent Tutoring System in Education for Disabled Learners Using Human–Computer Interaction and Augmented Reality	Ahuja, N.J., et al.	2022
S2	'AReal-Vocab': An Augmented Reality English Vocabulary Mobile Application to Cater to Mild Autism Children in Response towards Sustainable Education for Children with Disabilities	Hashim, H. U., et al.	2022
S3	Effects of Augmented Reality-Based Dual-Task Program on Physical Ability by Cognitive Stage with Developmental Disabilities	Kang, H.Y., et al.	2022
S4	Using video modeling, explicit instruction, and augmented reality to teach mathematics to students with disabilities.	Morris, J.R., et al.	2022
S5	Enhancing joint attention skills in children on the autism spectrum through an augmented reality technology-mediated intervention	Pérez-Fuster, P., et al.	2022
S6	The effectiveness of augmented reality for English vocabulary instruction of Greek students with intellectual disability	Rapti, D., et al.	2022
S7	Comparıson Of Augmented Reality And Conventional Teaching On Special Needs Students'attitudes Towards Science And Their Learning Outcomes	Alqarni, T	2021
S8	Effectiveness of video prompting delivered via augmented reality for teaching transition-related math skills to adults with intellectual disabilities.	Kellems, R.O., et al.	2021
S9	Exploring the effect of an augmented reality literacy programme for reading and spelling difficulties for children diagnosed with ADHD.	Tosto, C., et al.	2021
S10	Augmented reality technology in science education for students with specific learning difficulties: its effect on students' learning and views	Turan, Z., & Atila, G.	2021
S11	Augmented reality for autistic children to enhance their understanding of facial expressions.	Wedyan, M., et al.	2021
S12	Use of augmented reality with a motion-controlled game utilizing alphabet letters and numbers to improve performance and reaction time skills for people with autism spectrum disorder	Antão, J. Y. F. D. L., et al.	2020
S13	Augmented reality: Teaching daily living skills to adults with intellectual disabilities	Bridges, S. A., et al.	2020
S14	Exploring the use of virtual characters (avatars), live animation, and augmented reality to teach social skills to individuals with autism	Kellems, R. O., et al.	2020
S15	Kinect-for-windows with augmented reality in an interactive roleplay system for children with an autism spectrum disorder	Lee, I. J.	2020
S16	The effectiveness of augmented reality environments on individuals with special education needs	Cakir, R., & Korkmaz, O.	2019
S17	Using an augmented reality game to teach three junior high school students with intellectual disabilities to improve ATM use	Kang, Y. S., & Chang, Y. J.	2019
S18	Preliminary study of augmented reality as an instrument for improvement of social skills in children with autism spectrum disorder	Lorenzo, G., et al.	2019

S19	Augmented reality plus concept map technique to teach children with ASD to use social cues when meeting and greeting	Lee, I. J., et al.	2018
S20	Safety and lack of negative effects of wearable augmented-reality social communication aid for children and adults with autism	Sahin, N. T., et al.	2018

3.1 General characteristics of augmented reality studies for individuals with special needs

3.1.1. Number of Studies by Years

When the studies are examined in this context, it is seen that the studies show an increasing trend over the years. Figure 1 shows the number of studies by years.

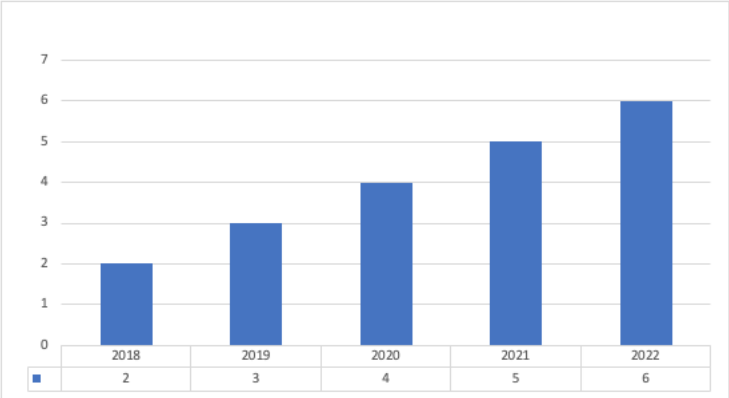

Figure 1. Number of studies by years

3.1.2. Databases of Studies

The studies were found by scanning the university online library resources. The databases of the studies found are as shown in Table 2, and there are mostly studies from the ERIC database with a rate of 30%. This is followed by Web of Science, Springer Nature Journals and Scopus with 15%, Directory of Open Access Journals with 10%, Academic Search Ultimate, Google Scholar and EBSCO with 5%.

Table 2. Databases of studies

Database	Studies	f	%
ERIC	S4, S7, S13, S15, S16, S17	6	30
Web of Science	S2, S5, S10	3	15
Springer Nature Journals	S18, S19, S9	3	15
Scopus	S3, S8, S11	3	15
Directory of Open Access Journals	S14, S20	2	10
Academic Search Ultimate	S6	1	5
Google Scholar	S12	1	5
EBSCO	S1	1	5

3.1.3. Variables Examined in Studies

The skill areas in which the studies examined are concentrated; social interaction skills, academic performance, language skills, active participation skills, daily life skills, kinesthetic skills. In general, it is seen that the studies focus on social interaction skills with a rate of 26.09%. This is followed by academic performance with a rate of 21.74%. It is seen that skills such as language learning, reading and spelling are examined with a rate of 17.39%. While it is seen that active participation and daily life skills are encountered with a rate of 13.04%, the rate of Kinesthetic skills is 8.7%. Table 3 shows the findings regarding the variables of the studies.

Table 3. Findings for the variables

Variable	Studies	f	%
Social Interaction Skills	S11, S14, S15, S18, S19, S20	6	26,09
Academic Performance	S1, S4, S7, S8, S10	5	21,74
Language skills (eg. language learning, reading-spelling)	S2, S6, S9,S12	4	17,39

Active Participation Skills (Awareness, Attention, Curiosity, Patience)	S2, S5, S7	3	13,04
Daily Living Skills	S13, S16, S17	3	13,04
Kinesthetic Skills	S3, S15	2	8,7

3.1.4. Participant's special need type

It was seen that the studies examined within the scope of the research were mostly directed to individuals with autism with a rate of 47.62%. It is seen that studies are conducted on individuals with intellectual disability and learning difficulties with a rate of 19.05%, and in addition to this, some studies (S16) also include participants with more than one type of special needs. The rate of studies on individuals with special needs such as learning disabilities, attention deficit and hyperactivity is 4.76%. The special needs types of the participants are shown in Table 4.

Table 4. Findings regarding the special needs type of the participants

Special Need Type	Studies	f	%
Autism	S2, S4, S5, S11, S12, S19, S15, S18, S19,S20	10	47,62
Mental Disability	S6, S8, S13, S17	4	19,05
Learning Disability	S1, S4, S7, S10	4	19,05
Attention Deficit and Hyperactivity	S9	1	4,76
Physical Disability	S3	1	4,76
Mixed	S16	1	4,76

3.1.5. Used Hardware

When the studies were examined, it was seen that systems were designed to use more than one hardware together in line with the application needs used in some studies. Due to the technical nature of augmented reality, although it is seen that mobile devices are mostly used, kinect etc. It is seen that the hardware devices used in terms of integration with other technologies have diversified. When smartphones and tablet computers are evaluated together in the mobile device category, their usage rate is 43.48% in total, and it is the most used type of hardware. This is followed by kinect device with 17.39%, computer with 13.04%, projector, interactive board, laptop and google glass with 4.35%. Findings regarding hardware usage are shown in Table 5.

Table 5. Findings for the used hardware

Used Hardware	Studies	f	%
İpad, Tablet Pc	S4, S6, S8, S13, S16, S19	6	26,09
Smart phone	S2, S10, S17, S18	4	17,39
Kinect device	S3, S5, S11, S15	4	17,39
Computer	S5, S9, S12	3	13,04
Projector	S5	1	4,35
Interactive board	S5	1	4,35
Laptop	S14	1	4,35
Google Glass	S20	1	4,35
Unspecified	S1, S7	2	8,7

3.2 Methods and models of studies

When the methods and models of the studies are examined, it is seen that there are studies that have adopted the quantitative method the most with a rate of 50%. In general, we see that the total rates of qualitative and mixed methods are equally distributed as 25%.

Table 6. Findings regarding the methods and models of the studies

	Studies		f	%
Qualitative	Case Study	S2, S6, S13	3	15
	Single subject multiple probe model	S8	1	5
	single subject model	S19	1	5

Quantitative	Experimental	S3, S4, S5, S12, S14	5	25
	Quasi-experimental	S1, S7, S9, S11, S18	5	25
Mixed		S10, S15, S16, S17, S20	5	25

3.3 Data Collection Tools

When the data collection tools of the studies are examined, it is seen that the scales are used the most with a rate of 29.27%. Many scales such as social communication scales for individuals with special needs, social skills scales, and attitude scales towards practices have been used in studies. Observation forms and achievement tests are the other most used data collection tools with a rate of 21.95%. Interview forms were used with a rate of 12.2%. This is followed by video recording with 9.76%, field notes and application evaluation test with 2.44%. Table 7 shows the data collection tools used in the studies.

Table 7. Data collection tools used in the studies

Data collection tool	Studies	f	%
Scale	S1, S4, S5, S7, S10, S13, S14, S15,S17,S18,S19,S20	12	29,27
Observation Form	S4, S6, S8, S9, S11, S13, S14, S15, S16	9	21,95
Achievement test	S1, S3, S4, S7, S8, S9, S12, S15, S19	9	21,95
Interview form	S1, S2, S6, S10, S20	5	12,2
Video recording	S5, S10, S14, S20	4	9,76
Field Notes	S2	1	2,44
Application Evaluation Test	S1	1	2,44

3.4 Limitations of studies

The limitations stated in the studies were examined in general and themes were formed. When examining within the framework of the themes created, we encounter the situation of 'working with a small sample group' with a rate of 31.25%. With a rate of 15.63%, it is seen that 'the extent to which the skills observed during the application are applied in real life (school, classroom, social environments)' and 'limitations about the data collection tool (low sensitivity, inconvenience, etc.)' are observed. These are followed by 'limited practice time', 'inhomogeneity of the sample group' and 'limited content (work on limited skill)' with a rate of 6.25%. Other limitations include 'studying without a control group' with a rate of 3.13% and 'inability to fully verify the data observed and transmitted by others'. The rate of studies in which limitations are not specified is 12.5%. The limitations of the studies are shown in Table 8.

Table 8. Limitations in the studies

Limitations	Studies	f	%
Small sample group	S5, S6, S7, S8, S11, S13, S15, S16, S18, S19	10	31,25
Inability to generalize to real life	S6, S15, S16, S17, S19	5	15,63
Limitations of the data collection tool (low sensitivity, inappropriateness, etc.)	S4, S5, S8, S9, S18	5	15,63
Limited application time	S7, S13	2	6,25
Sample group is not homogeneous	S12, S18	2	6,25
Limited content (work on limited skill)	S3, S19	2	6,25
Data observed and transmitted by others not fully verified	S14	1	3,13
Studying without a control group	S3	1	3,13
Unspecified	S2, S10, S16, S20	4	12,5

3.5 Recommendations presented in studies

The themes were formed by examining the recommendations presented in the studies. Examinations were made again around the themes created, and the most suggested recommendations with a rate of 25% was 'examination of the development of other skills'. This is followed by the recommendation of 'doing more detailed research' with a rate of 18.75%. The case of sample smallness, which is also highly indicated in the limitations, was stated with a rate of 15,63% in the recommendations of the studies as 'working with a larger sample' in order to eliminate this limitation. With a rate of 12.5%, we come across the recommendation of 'working for different special needs groups'. Recommendations of 'doing research on other age groups' and 'longer-term practice' were presented with a rate of 6.25%. The least suggested recommendations were 'Using different research methods' and 'doing more research' with 3.13%. In 9.38% of the studies, no recommendations were presented.

Table 9. Distribution of studies according to the recommendations presented

Recommendations	Studies	f	%
Examining the development of other skills	S4, S6, S8, S9, S10, S12,S17,S19	8	25
Making more detailed research	S1, S8, S11, S13, S19, S20	6	18,75
Working with a larger sample	S4, S13, S15, S18, S19	5	15,63
Working on different special needs groups	S3, S4, S8, S10	4	12,5
Conducting research on other age groups	S7, S10	2	6,25
Longer application time	S12, S18	2	6,25
Using different research methods	S7	1	3,13
Doing more research	S1	1	3,13
Unspecified	S2, S5, S14	3	9,38

3.6 Results from studies

The results of the studies were examined and themes were formed. When the results presented in the studies within the framework of these themes are re-examined, the result of "being effective in the targeted skill development" is the most mentioned result with a rate of 42.86% among the themes. In fact, this result was obtained in all but 2 of the studies, and this result was obtained when the other themes and frequency of use were looked at proportionally. Results such as 'ensuring willingness' and 'being effective in attracting attention' were obtained with a rate of 9.52%, followed by 'increasing motivation' with a rate of 7.14%. Other themes and their acquisition rates are shown in Table 10.

Table 8. Results from the studies

Results	Studies	f	%
Being effective in targeted skill development	S1,S2,S3,S4,S5,S6,S7,S8,S10,S11, S12, 13,S14,S15,S16,S17,S19,S20	18	42,86
Ensuring willingness	S7,S10,S14,S16	4	9,52
Being effective at attracting attention	S2,S11,S14,S15	4	9,52
Increasing motivation	S3,S7,S15	3	7,14
Increasing readiness levels	S7,S16	2	4,76
Overall satisfaction	S1,S4	2	4,76
Generalization of skills to real life	S5	1	2,38
Maintaining skills	S8	1	2,38
To be Funny	S6	1	2,38
Developing positive thoughts about learning environments	S7	1	2,38
Ensuring independent work	S6	1	2,38
Not encountering any problems	S10	1	2,38
Providing practical use	S13	1	2,38
No difference in skill development (between experimental and control groups)	S9, S18	2	4,76

4. Discussion

In this section, the general characteristics of the studies examined within the scope of the research and the research problems are summarized within the framework of the findings and discussed with their similar and different aspects in the literature.

When we look at the skill areas in which the studies examined within the scope of the research are concentrated, we come across predominantly social interaction skills with a rate of 26.09%. Similarly to this situation, it was concluded that the subjects examined in the review of studies conducted on individuals with autism by Khowaja et al. (2020) were "social skills" with the highest rate.

When we look at the participant characteristics of the studies, we see that individuals with autism constitute the largest participant group with a rate of 47.62%. In general, when the screening studies for individuals with special needs are examined, it is seen that augmented reality applications are mostly made for individuals with autism (Yenioğlu et al., 2021; Köse, H., and Güner-Yildiz, 2021). In addition, when the screening studies are specialized in terms of special needs, it is seen that more screening studies are conducted for individuals with autism (Khowaja et al., 2020). The features of augmented reality environments such as being away from the difficulties of face-to-face learning environments that require face-to-face interaction and helping these individuals overcome the difficulties they encounter in real environments (Fridhi et al., 2018) can be counted as one of the most common reasons for using this technology for individuals with autism.

When the studies are examined in terms of the hardware used, it is seen that mobile devices such as smart phones and tablet computers are mostly used as content display tools. When these devices are evaluated in a common category as mobile devices, their usage rate reaches 43.48%. These findings are actually technical features of augmented reality, transportation costs to devices, etc. It is related to situations and is valid not only for individuals with special needs, but also for most studies using augmented reality in education (Akçayır & Akçayır, 2017). Although the use of mobile devices is common due to the structure of augmented reality, some studies have also used equipment such as projectors, interactive boards, google glass and kinect devices. Researchers have also designed systems in which more than one hardware device is used together by diversifying the hardware used according to the content of the application and the targeted behavioral skills.

When the methods and models of the studies are examined, it is seen that the qualitative and quantitative methods are generally distributed equally. When the literature is examined, it is seen that the studies generally intensify qualitatively when considering the difficulties of conducting quantitative research on individuals with special needs. This situation is supported by the findings that mostly single-subject studies are carried out, as determined in the review study conducted by Berenguer et al. (2020).

When the data collection tools of the studies are examined, it is seen that the scales are used the most. It is seen that scales such as social communication scales, social skill scales, performance scale, learning outcomes test, attitude scales are used to monitor the skill development of individuals with special needs. In fact, the rate of studies stating that observation forms are used as data collection tools is 21.95%, although observation-based data is collected in most of the studies. In the literature, it is seen that data based on observation are generally collected. In the compilation study conducted by Khowaja et al. (2020), it is seen that observation-based data is the most used data collection method.

When the limitations of the studies are examined; It is seen that the cases of applying with a small sample group and not being able to observe the generalization of skills to real life are clearly mentioned in the studies. As Lee (2020) stated in his study; It is seen that the studies were conducted with a small sample group due to situations such as the necessity of spending more manpower and time in order to direct the research in the studies conducted for individuals with special needs, and the difficulty of working with these individuals.

In the suggestions of the studies, it was seen that suggestions were made to eliminate the situations stated in the limitations in general. When the findings are examined, it is seen that most suggestions are made for 'examination of other skill developments', 'working with a larger sample' and more detailed research. As mentioned before, the situations that could not be carried out in studies on this subject due to the difficulties, cost and time disadvantages of working for individuals with special needs were presented as suggestions.

When the results of the studies are examined, it is seen that the themes created are for positive situations. It has been concluded that in augmented reality supported learning environments for individuals with special needs, there is a general improvement in the targeted skills, individuals are willing to practice, the application draws their attention and interest, and increases their motivation. In 2 studies (S9 and S18), it was observed that there was no significant difference between the experimental and control groups in the skill development of individuals. Although there was no significant difference between the groups in this study, improvement was observed in the skills of the individuals in both groups. In all of the other studies, it is seen that there is an improvement in the skills of the individuals and that there are significant differences in favor of the augmented reality supported environments in the studies with experimental control groups.

5. Conclusion

Within the scope of the research, current augmented reality studies for individuals with special needs were examined. Along with the examinations, an overview of the studies carried out in this field was provided and information on the current situation was presented.

It has been observed that individuals with special needs are willing to practice, have fun while using the application, and their motivation and readiness levels increase with learning environments supported by augmented reality technology applications. It has also been observed that augmented reality is effective in the development of targeted skills and that these skills can be generalized to real life in some studies. As a result of all these examinations, it can be said that augmented reality technology can be an effective learning tool for individuals with special needs.

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"Transformation Begins With Me" In The Eyes Of The Littles

Derya ATAY[1]

Article History
Received: 26.04.2023
Received in revised form: 28.06.2023
Accepted: 29.06.2023

Abstract

The research was carried out in order to improve the self-awareness levels of preschool children by increasing their sensitivity to the environment. Simple Experimental Method, one of the Quantitative Research methods, was used in the study. Before and after the training, a five-question pre-test and post-test were administered to the students. Findings were obtained by analyzing with the Wilcoxon Signed Rank Test program. The sample group in the research was 11 students aged 5 years, studying in Kindergarten in Rize Province, and were chosen as the Simple Random Sampling Group. Before the research, students were asked to collect waste paper with their families. Before the activity, a pre-test was applied to the children. Practices have been made about recycling and reuse of wastes with videos and visuals and their benefits to the environment. Each child produced a new paper from the waste paper they collected and a joint story book was prepared by making a picture on the environment. They gave messages to teachers and students in other classes by making introductions to parents. At the end of the study, the findings obtained by applying the post-test were analyzed. As a result of the research, a significant difference was found between the pre-test scores applied before the education and the post-test scores applied after the education [z= -2.958, p<.05, r= 0.89]. Accordingly, the measurements of the posttest (median=4) are higher than the pretest (median=1). In other words, it was observed that the recycling, environment and paper production activity from waste paper applied to Kindergarten 5 year old students increased their sensitivity to the environment and had an effect on the development of their self-awareness levels.

Keywords: Waste paper, recycling, environmental awareness, self awareness

1. Introduction

One of the most important problems of our world today is the deficiencies and attitudes in education on the basis of gaining sustainable environmental awareness. Preschool education is a period in which the personality development of the child is formed and shaped, covering the 0-6 age group. For this reason, self-awareness awareness towards the environment, which will be gained at a young age, will ensure the formation of sustainable behavior in children in the future. Many researches have been made on environmental education, but it is seen that there is not enough work in the pre-school area, which is the basis of education and the formation of behaviors. The environmental awareness that will be brought to the students in early age education institutions is important in terms of preventing the environmental problems that our world will face in the future. The inclusion of values education in the Pre-School Program of the Ministry of National Education can be interpreted as the necessity of raising the awareness of responsibility and self-awareness of children of this age. For this reason, it is important for the future of our world to raise children's self-awareness towards the environment by recycling and using their own waste at an early age. It is thought that this research will improve the existing literature on raising awareness and individual responsibility awareness through waste evaluation and environmental protection activities to be carried out at the preschool education level and will shed light on the studies. With this research, it is aimed to improve the self-awareness levels of children in early childhood education institutions by increasing their sensitivity towards the environment.

The natural resources in our world are decreasing day by day due to the rapid increase in the population, the change in the consumption habits of people, and the unconscious and excessive consumption of natural resources. Responsible consumption and production, which is one of the goals of sustainable development, is waste

[1] Corresponding author, EducationalSciences Specialist, Teacher, Ardeşen Vocational and Technical Anatolian High School, Rize, Turkey, deryaatay78@gmail.comorcid:0000-0002-7352-6973

management, one of the important sub-titles of sustainable development. Waste is interpreted not as a substance to be disposed of, but as a resource to be recovered. The aim of sustainable waste management is to cycle the use of resources and profitably reuse the waste generated at the final consumption stage. (Tezel, Yıldız, 2020).

The concept of environmental education was first used at the International Union for Conservation of Nature Conference held in Paris in 1948. Later, in 1970, the Environmental Education Council in England and Nevada in the USA defined environmental education. (Kahyaoglu, 2016). The concept of the 3Rs of UNEP (United Nations Environment Programme) as a remedy for the conservation of natural resources. (Reduce, Reuse, Recycle) (reduce, reuse, recycle) has been set as the main target. Preventing the unnecessary use of resources by people, ensuring the reuse of wastes by recycling, and reducing the amount of waste by separating the wastes at the source are some of the main purposes of recycling. (Unesco, 1992). Therefore, it comes to the fore to investigate the possibilities of reuse of wastes in order to prevent carbon emissions caused by both the excessive use of natural resources and industrialization (Ilgar, 2020). For this reason, it is necessary to realize the importance of gaining social awareness and individual attitude.

T.R. The Ministry of Environment and Urbanization has implemented the zero waste project on 26.09.2017 in order to keep the wastes under control and to leave a more livable universe for future generations within the scope of sustainable development goals.

Zero Waste Project (Ministry of Environment and Urbanization) Zero waste is a waste management policy that aims to prevent unnecessary use and efficient consumption of resources, to prevent or minimize waste generation, and to collect and recover waste by separating it at the source in cases where it occurs (Environment and Urban Planning). Ministry of Urbanization, General Directorate of Environment, Zero Waste Handbook, 2017).

The "Zero Waste" resolution submitted by Turkey within the scope of combating climate change and sustainable development plans was accepted at the UN General Assembly. With this decision, the General Assembly declared March 30 as International Zero Waste Day.

As in the rest of the world, action plans on waste management, protecting the environment and developing individual attitudes in Turkey show once again the importance of studies on this subject.

Since the main source of environmental problems is people's attitudes and behaviors, the main source of solving environmental problems is through effective environmental education given to people. Especially early childhood is a critical period in which personality is formed and positive habits are acquired. In this context, environmental awareness should be created in early childhood in order to create a livable and healthy environment. (Karaca, 2018). Studies have shown that the effect of environmental education given at an early age can be sustained throughout life.

Values education in our country was emphasized in the decisions of the 18th National Education Council held in 2010 and by the Ministry of Education Board of Education and Discipline, and it was stated that it should be included in every education level starting from the pre-school period. It has been stated that it should be integrated and based on learning by doing (Dönmez, Sözen, Demirkaya Demirtaş, 2020).

Values education was not considered as a separate field in the Pre-School Education Program, but it was emphasized holistically in the achievements and indicators (T.R. Ministry of National Education General Directorate of Basic Education Pre-School Education Program, 2013). early childhood education Implementation of environmental education to be implemented in institutions by integrating them with values education will lead to permanent behavioral changes in students.

Environmental education raises awareness on this issue by providing correct personal values in attitudes and behaviors and helping students to reveal and evaluate their thoughts about their contribution to environmental and environmental problems (Celik, M, G et al., 2010). The results of the research show that environmental awareness awareness that will be gained to children in the preschool period is important in the formation of behavior.

(Kartal and Ada, 2020) in their study, it was determined that preschool children included in the research had limited perceptions about recycling.

(Uzun, Köse, 2017) In his study, it was seen that kindergarten teachers thought it was necessary to start education about values in pre-school education and most of them included the values of love, respect, honesty, responsibility, patriotism, cooperation and tolerance. It has been determined that there are reasons why values affect personality development, that values are difficult to acquire in the future, that what is learned in the pre-school period is permanent and this period directly affects the child's future life.

(Author and Erkuş, 2013) In their study, it was concluded that they thought that the values of respect, love and sharing should be taught to children predominantly in pre-school education. According to the kindergarten teachers, it was determined that the values education in the preschool education program was realized at the initiative of the teacher and was found to be insufficient

(Aküzüm and Ergenekon, 2021) In their study, it was determined that kindergarten teachers showed positive attitudes towards values education and stated that values education should be given in this period, and they used the values of responsibility, cooperation, respect, tolerance and love more..

(Bayırlı, Doruk and Tüfekçi, 2020) in their study, it is determined that values education activities have a positive effect on students.

It is important and necessary in terms of individual attitude to raise environmental awareness by raising awareness about the responsibility of the child towards the society and himself in the preschool period. This study was prepared and implemented with the thought that individuals who are sensitive to environmental problems should be raised at a young age in order to leave a livable world to future generations.

2. Method

In this study, which aims to increase the level of self-awareness of children in early childhood education institutions by increasing their sensitivity to the environment, 11 students in the 5-year-old group studying in Kindergarten were selected as Simple Random Sample Group. Simple Experimental Method from Quantitative Research Methods was used as data collection tool. The data obtained were analyzed with the Wilcoxon signed-rank test, scoring 1 for those who answered the pre-test and post-test questions correctly, and 0 for those who could not. Wilcoxon signed-rank test is used to test the direction of difference scores of two related measurement sets (Boyraz, Serin,2015).

A four-month work plan has been established. After testing new paper making and usability from waste paper before the research, students were asked to collect waste paper with their families. Before the activity, the children were given a five-question pre-test. The prepared questions were prepared in accordance with the age level of the children, explaining the purpose of the project best and aiming at the achievements in the preschool education program book.

1. What is recycling and what does it do?
2. Do you know the recycling symbol?
3. Which materials are recycled?
4. What can we do with waste papers?
5. What happens if we don't recycle the waste materials and throw them away?

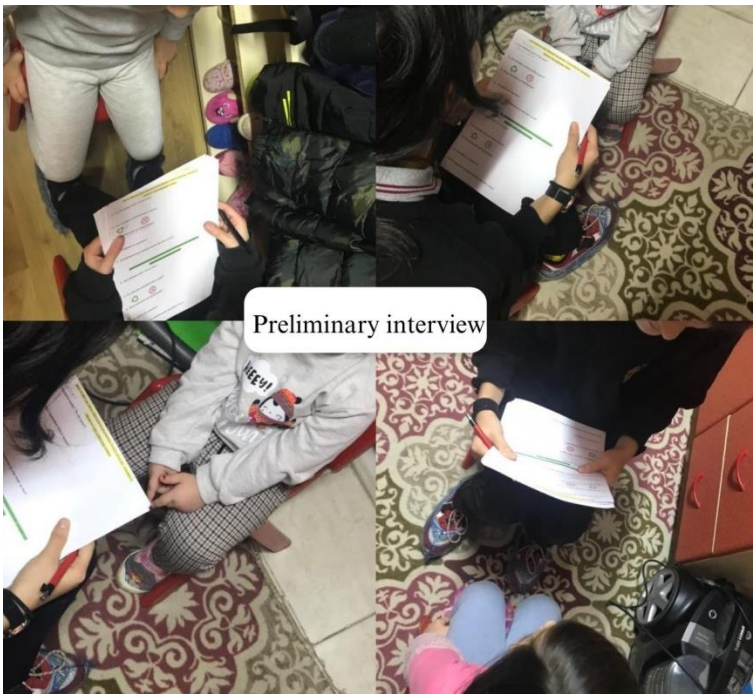

Figure 1. The image of the preliminary interview with the students

Brainstorming was conducted to produce solutions for problem prevention, for environmental protection, recycling and awareness of individual responsibility. Information about recycling, reuse of wastes and benefits were given with videos and visuals.

Figure 2. The image of the environment-themed activity

New paper was produced from the waste paper they collected, and each stage was applied individually.

Figure 3. Image of new paper production from waste paper

A common storybook was prepared by each child by making a picture of the environment on their own paper.

Figure 4. The image of the production of an environment-themed picture on the papers produced

They created the name of their book with a common slogan.

Figure 5. The image of the created storybook

They gave messages to teachers and students in other classes by making introductions to parents. At the end of the study, the findings obtained by applying the post-test were analyzed.

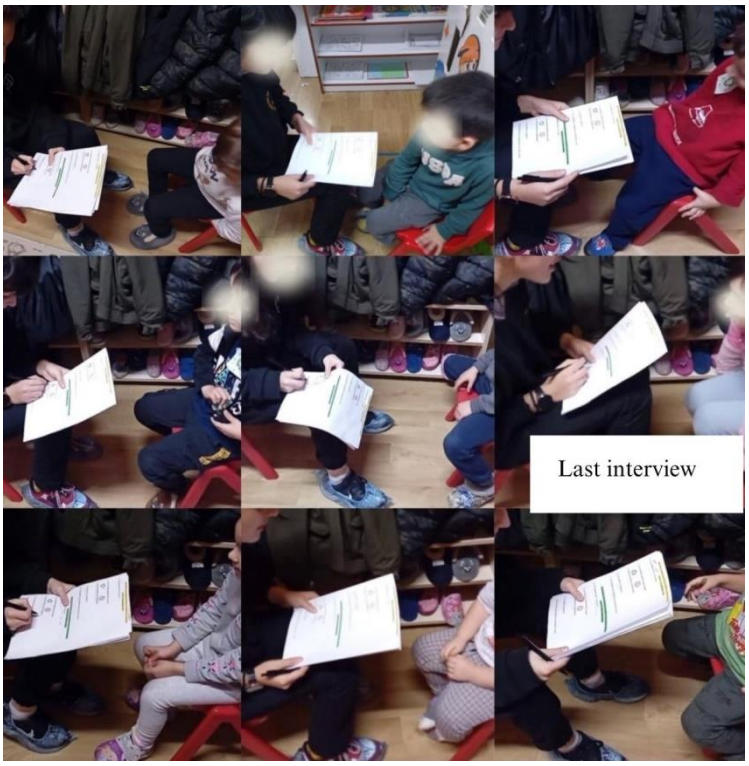

Figure 6. The image of the last interview after the event

3. Working Work-Time Sheet

Table 1. "Transformation Begins with Me" Work Plan for Children

Name of the event	Student Achievements / Goals and Behaviors	Duration
Literature review	Ability to conduct scientific research on environmental problems.	1 month
Obtaining parental permissions and survey permissions	To know the importance of obtaining the necessary permissions in terms of scientific work ethics	15 days
Paper production trial from waste paper before the study	Observing the validity and reliability of the study by experimenting	15 days
Requesting waste paper work from parents and data	Taking responsibility for waste management and recycling	
Preliminary interview	Realizes the importance of survey analysis studies in scientific studies.	15 days
Displaying images and videos about environmental education and recycling to children	Recognizes environmental problems and understands the importance of taking individual responsibility.	
Production of new paper from collected waste paper	He knows that the paper he uses will be recycled.	
Painting and creating a book about the environment with the papers produced	Understands the importance of recycling	15 days
	Creates a story book on the environment with group work on the papers they produce.	
Presentation of the created book		
Making the last meeting		
Data Analysis and Reporting	Realizes the importance of survey analysis and report preparation studies in scientific studies, can analyze the results of their studies.	1 month

4. Findings

By increasing the environmental awareness of children in early childhood education institutions The findings obtained in this study, which aimed to improve self-awareness levels, are shown in Table 2.

Table 2. Wilcoxon Signed Rank Test Results of Pretest Posttest Scores

		Descriptive statistics				Wilcoxon signed-row test	
		average.	Standard. deflection	Skewness	Kurtosis	z	p
Test	Pretest	1.00	0.301	.733	-.133	-2.958	.000
	posttest	3.45	0.454	-.322	-.158		

Effect size

R=-0,89

In this study, it was tried to determine the effect of activities on waste recycling and environmental issues on the development of students' self-awareness by increasing their sensitivity to the environment. As a result of the analyzes, the subjects were asked about the production of new paper from waste paper and environmental issues. A significant difference was found between the pre-test scores applied before the training and the post-test scores applied after the training [z= -2.958, p<.05, r= 0.89]. Accordingly, the measurements of the posttest (median=4) are higher than the pretest (median=1). In other words, it has been seen that the recycling environment and the efficiency of paper production from waste paper applied to kindergarten 5 year old students increase their sensitivity to the environment and have an effect on the development of their self-awareness levels.

5. Conclusion and Discussion

As a result of the research, it was seen that the recycling environment and paper production activities from waste paper applied in early childhood increased their sensitivity to the environment and had an effect on the development of their self-awareness levels. This result supports the conclusion made by Tosun and Demir (2018) that the creative drama positively affects the learning awareness of students such as cooperation, self-confidence, creativity, respect for the environment and nature, recycling. It supports the conclusion made by Saribiyik (2022), that preschool children show great interest in environmental activities and that environmental activities affect children's attitudes and behaviors positively. The study conducted by Albayrak and Tukaşlı (2017) supports the conclusion that environmental activities in kindergarten support children's environmental awareness, enrich children's environmental awareness and broaden their perspectives. It has been determined by Onur, Çağlar and Salman (2016) that preschool children have awareness about the environment, recycling and environmental protection. The results of the research support the purpose of the research in terms of revealing the importance of raising children's self-awareness about recycling and environmental awareness in the early period.

Early childhood is an important period for the formation and sustainability of permanent behaviors along with personality development. For this reason, in order to make our world, which is one of the biggest problems of our time, more livable, individuals with environmental awareness should be raised. For this purpose, the environmental education given to the students and the new paper production process from waste papers enabled them to see and use it, to realize environmental problems and to produce solutions. At the same time, a joint book was created by making pictures about the environment using the papers they produced and they gave messages by promoting their books. Thus, by living by doing, their awareness of individual responsibility has developed. They realized that many materials in nature can be recycled and reused. They have gained the awareness that the way to protect the environment is to recycle waste. Drawing the recycling symbol, recycling factory, waste, recycling bins, clean environment, dirty environment objects in the pictures they made on the paper they produced shows that they gained individual awareness. Informing their parents about the study has shown that family participation is also important in the formation of behavior.

6. Recommendations

- It is an important period in which self-awareness consciousness will be formed in early childhood education. In this period, environmental awareness and recycling activities can be integrated with the achievements of the development areas in the preschool education program.
- Projects and Symposiums targeting early childhood can be created on Environmental Education and individual awareness.
- By combining the recycling system with Stem applications in preschool children, Environmental-Science

activities can be organized for children to realize the problem situation, produce solutions and explore through trial and error.

- In order to raise environmental awareness and individual awareness in children, maid training can be given to improve teachers' knowledge and practice skills.
- In terms of education, europeanschoolnetacademy where teachers can participate. They can improve themselves by following exemplary training events held in the world at https://www.europeanschoolnetacademy.eu/about
- Parent support is very important in the preschool period. In order to create sustainable behavioral change in children, parent trainings can be organized on environmental awareness in their families.
- This study showed the importance of the methods used in the education of preschool children in gaining behavior.

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Motor Skills in Hearing Impaired Children

Cemil Temel ODABAŞI[1], Bekir Erhan ORHAN[2]

Article History
Received: 27.12.2022
Received in revised form: 28.12.2022
Accepted: 29.06.2023

Abstract

The aim of this review is to give information about the current situation of hearing-impaired children in terms of motor skills and their differences from hearing children in the light of the studies conducted in the last 20 years and to draw attention to the importance of physical education and sports for motor skill development in hearing-impaired children. With this aim, in this systematic review study, Google Scholar, Ulakbim/TR Index, and the Council of Higher Education (YÖK) Thesis Search Center databases were searched with Turkish and English keywords in order to reach the studies on motor skills of hearing-impaired children. The studies were screened according to the inclusion and exclusion criteria and 25 studies were included in the study. From the findings obtained, it was concluded that hearing-impaired children lag behind their hearing peers in terms of balance and some motor skills, but supporting these children with physical education and sports lessons in schools and physical activities outside of school in accordance with their needs would make significant contributions to their physical and motor development. For this reason, it is important to plan and conduct physical education and sports lessons in schools for hearing-impaired children in accordance with their needs.

Keywords: Motor skills, hearing-impaired children, physical education

1. Introduction

People use senses to perceive the world around them and interact with other people. The sense of hearing enables people to experience the world through sound. Inability to hear sounds as well as someone with normal hearing is defined as hearing impairment (WHO, 2023). According to this definition, hearing impairment can be considered as only related to an inability to process sound. Therefore, one can expect that it does not affect the capacity for physical activity or hearing impaired people can participate in physical activities without any limitations (Barboza et al., 2015; Hoffman et al., 2010). However, although a deaf or hearing-impaired individual may look like a person without any disability, hearing impairment negatively affects different developmental areas of the child and brings along a number of secondary issues with it.

Development in children can be examined in four areas: physical, emotional, mental, and motor (Gallahue et al., 2012). These developmental areas interact with each other. In other words, one area that is affected negatively can negatively affect other areas. Accordingly, hearing impairment may negatively affect emotional, cognitive, and motor development. It is known that individuals with partial or complete hearing loss have difficulties in learning their mother tongue, pursuing primary education, participating in age-appropriate activities, and performing most of the tasks required in daily life (WHO, 2023). Studies have shown that hearing impairment, especially in infancy and early childhood, negatively affects speech and language skills, and accordingly, emotional, social, cognitive, and academic developments are also affected negatively (Mavilidi et al., 2018; Peterson & Siegal, 1995). These children also show delays in physical development compared to their hearing peers (Engel-Yeger & Weissman, 2009; Horak et al., 1988; Melo et al., 2017; Rine et al., 2000; Wiegersma & Vander, 1983) and have some physiological differences (Shavel et al., 2021; Veena et al., 2015). In particular, they are reported to have higher pulsation rates and lower blood pressure levels than hearing people, and they have lower lung capacity due to their lack of voice utilization (Shavel et al., 2021; Veena et al., 2015). In addition, due to their body's decreased ability to cope with hypoxic states, their physical performance level is limited (Shavel et al., 2021; Sit et al., 2007).

In terms of motor development and balance, it has been shown in many studies that hearing-impaired children show lower performance than their hearing peers (Gheysen et al., 2008; Güven & Bal, 1992; Schmidt, 1985; Suarez et al., 2007; Rajendran & Roy, 2011; Rine et al., 1996; 2000; 2004; Vidranski & Farkaš, 2015; Wiegersma & Van der Velde, 1983). It has been reported that hearing loss negatively affects the vestibular and

[1] *Corresponding Author: MSc. Student*, Istanbul Aydın University, Institute of Graduate Study, Physical Training and Sports Programme, cemilodabasi@stu.aydin.edu.tr, orcid: 0009-0004-7466-7091

[2] *Assist Prof. Dr.* Istanbul Aydın University, Faculty of Sports Science, Department of Sports Management, bekirerhanorhan@aydin.edu.tr, orcid: 0000-0002-3149-6630

kinesthetic senses and accordingly, hearing-impaired children face many problems in terms of balance and motor skills compared to their hearing peers (Goodman & Hopper, 1992; Rajendran & Roy, 2011). In addition to sensorineural hearing loss, these problems are even more severe in children with vestibular disorders due to damage to the vestibular structures in the inner ear (Engel-Yeger & Weissman, 2009; Rine et al., 1999; 2000; 2004).

Balance and postural control are the foundation of all movement. Similarly, basic motor skills are necessary for children's interaction with the world and all kinds of movements, as well as mental skills, attention span, and social skills (Gallahue et al., 2012). For this reason, it is important to determine the current status of hearing-impaired children in terms of motor skills compared to their hearing peers and the areas where they lag behind in order to provide guidance for the preparation of appropriate intervention and educational programs.

Examining the literature on disabilities it is seen that studies on motor skills and sports have an important place. Regarding the motor skills of hearing-impaired people, there are studies on the comparison of hearing-impaired people with hearing people, on monitoring the motor development of hearing-impaired people, the effects of factors such as cochlear implants, and the degree and cause of hearing loss on motor development and the implementation of exercise and sports programs for the development of motor skills. In Turkey, the number of studies on disabilities, including those on motor skills and sports, has increased especially after the year 2000 (Ciğerci, 2011; Gültekin, 2012; Kalan, 2007).

There are review studies in the literature on the motor performance of the hearing-impaired (Goodman & Hopper, 1992; Rajendran & Roy, 2011). These studies present the results of studies conducted in different countries until the start of the year 2000. The aim of this study is to provide information about the current motor skills of hearing-impaired children and their differences from hearing children in the light of the studies conducted in the last 20 years in the literature, including the studies conducted in Turkey, and to draw attention to the importance of physical education and sports in terms of motor skill development in hearing-impaired children. Thus, in addition to providing an up-to-date and comprehensive national and international literature review on the basic motor skills of hearing-impaired children, the study will contribute to all relevant persons and institutions, especially physical education teachers, administrators, program developers, and those working in the field of rehabilitation, who are responsible for the education of hearing-impaired children, in terms of understanding the current situation and needs of hearing-impaired children regarding their motor skill performances and providing information that they will take as a basis for preparing appropriate programs for them.

2. Method

In this study, based on the studies conducted from the start of the year 2000 up to May 2023, it is aimed to reveal the current situation of hearing-impaired people in terms of their motor skills and their differences from hearing people. For this purpose, this study is a systematic review study carried out in accordance with the qualitative approach. A systematic review is defines as the process of gathering and synthesizing data from the studies suitable for the purpose of the research within the framework of predetermined inclusion and exclusion criteria (Yılmaz, 2021).

In order to collect data for this study, the Google Scholar, Ulakbim/TR Index, and the Council of Higher Education (YÖK) Thesis Search Center databases were searched in Turkish and English using various combinations of the keywords "hearing impairment/loss", "deaf", "motor skills/performance", "balance" and "postural control". In addition, the reference lists of the selected articles were examined to identify further appropriate publications. In the screening results, the language of the studies (Turkish or English), access to the abstract or full text, being conducted with humans, having children and adolescents as the sample group, not including intervention, and being published after the year 2000 were taken as the inclusion criteria. As a result, 25 studies that met the specified criteria were found.

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3. Findings

As a result of the literature review, 25 studies that fit the specified criteria have been identified. Information about these studies is summarized in Table 1 below. Among these studies, there are 11 studies on balance skills, 9 studies on both motor and balance skills, 2 studies on physical fitness and balance, 1 study on fine motor skills (Kamel et al., 2021), 1 study on walking (Melo, 2017), and 1 study on motor skills (Gkouvatzi, 2010).

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Table 1. Studies on Motor Skills and Balance in the Hearing Impaired since the Year 2000

Author (Year)	Aim	Sample	Method	Conclusion
		MOTOR SKILLS		
Kamel et al. (2021)	To examine the effect of sensorineural hearing loss on fine motor skills	200 children and adolescents with sensorineural hearing loss aged between 7-18 years old. They were compared with the values of 200 hearing children equivalent in terms of age and gender	Bruininks-Oseretsky Motor Skills Test .	In terms of fine motor precision and fine motor integration, children with hearing loss performed significantly lower than the hearing children. Sensorineural hearing loss affects fine motor skills.
Shavel et al. (2021).	To determine the physical characteristics of hearing-impaired children and to develop a physical education program to correct these characteristics.	72 deaf children and 28 hearing children aged between 6-10 years old.	Summative and formative pedagogical experimentation, medical and biological methods (blood pressure, electrocardiography, echocardiography, pulse measurement, physical work capacity test, measurement of catecholamines according to the Matlina method (1972), anthropometry and statistical methods).	Deaf children are weaker than hearing children in terms of physical performance and postural control. Their lung capacity and respiratory system functions are low Adrenaline and noradrenaline secretion is 2-3 times lower than hearing peers. This leads to impaired movement coordination and poor physical performance.
Stepanchenko et al. (2020).	To determine the psychomotor disorders of hearing-impaired children and the level of motor learning compared to hearing children.	94 children with hearing loss (51 hard-of-hearing and 43 deaf) and 54 hearing children aged between 7-8 years old.	A total of 10 tests based on Bernstein's theory of movement formation. The tests are as follows: static motor coordination (1 test), dynamic motor coordination (3 tests), performance speed (2 tests), motor memory and movement coordination (2 tests), and purposeful movement (2 tests).	Significant developmental delay was found in deaf and hard-of-hearing children in terms of all measured characteristics. It was concluded that hearing impairment may lead to problems manifested by motor learning and developmental delays.
Melo (2017)	To compare the gait performance of sensorineural hearing-impaired and hearing children and adolescents	48 deaf and 48 hearing children and adolescents aged between 7-18 years old.	Dynamic Gait Index (Castro et al., 2006)	The hearing impaired performed very poorly in terms of gait compared to the hearing. Performance decreased as the degree of hearing loss increased.
Gültekin	To compare the	30 hearing impaired	Body mass index,	Hearing impaired people

(2012).	physical fitness levels of hearing impaired and hearing children.	(17 girls -13 boys) and 27 hearing students aged between 9-15 years old	body fat percentage, body density, sit-stand flexibility, standing long jump, grip strength, flamingo balance, active jump, squat jump and reaction time tests	showed lower performance than their hearing peers in balance, strength, power and reaction time determination tests.
Ciğerci et al. (2011)	To compare hearing impaired and hearing children in terms of some physiological and motoric characteristics	11 volleyball players and 27 hearing sedentary and 9 hearing-impaired volleyball players and 20 hearing-impaired sedentary students between the ages of 9 and 15 years old who regularly play sports at school or in club teams	Eurofit test battery Illinois agility test Height and body weight	Hearing impairment negatively affects some motoric characteristics such as standing long jump, reaction time, balance paw strength, agility, and anaerobic power.
Livingstone and McPhillips (2011)	To determine motor skill disorders in hearing impaired children.	25 deaf children aged between 6-12 years old, 26 hearing children of the same IQ level and 27 hearing children of the same age.	Movement Assessment Battery for Children (MABC) The Wechsler Nonverbal Scale of Ability The Brown Attention-Deficit Disorder Scale The NeuroCom Balance Master system	Hearing impaired children showed significant motor impairments. These impairments were particularly pronounced in tasks related to balance. In activities requiring the use of multiple sensory systems, deaf children with cochlear implants are at greater risk of motor delay.
Gkouvatzi et al. (2010).	Comparison of motor performance of the hearing impaired in relation to reaction time, visual-motor control and upper limb coordination.	7 deaf and 17 hard-of-hearing children aged between 6-14 years old. Comparisons were made by gender and age (7-8, 9-10, 11-12, 13-14).	Bruininks-Oseretsky Motor Skill Test	No significant difference was found between the deaf and the hard-of-hearing. There was an improvement in motor skills according to age. No difference was found in terms of gender.

Engel-Yeger and Weissman (2009)	To compare hearing-impaired and hearing children in terms of motor skills and self-efficacy perception.	22 deaf and 26 hearing children aged between 5-9 years old	Children Activity Scales for Teachers Movement Assessment Battery for Children	Hearing impaired children performed lower than hearing children in terms of motor skills, but statistically significant differences were found only in dynamic and static balance skills. No statistically significant differences were found in gross motor skills (ball skills) or manual skills. There were also no statistically significant differences among children with cochlear implants or hearing aids.
Gheysen et al. (2008)	Comparison of the motor development of deaf (with and without cochlear implant) and hearing children	36 deaf (20 with implants) and 43 hearing children aged between 4-12 years old	Motor skills: Movement Assessment Battery for Children Gross motor coordination: Körperkoordinationstest für Kinder Balance: standing on one leg	Deaf children were found to lag behind in terms of motor and balance skills compared to hearing children. There was no difference between the balance skills of deaf children with and without cochlear implants. In the backward walking test, deaf children without implants performed better than those with implants.
Kalan. (2007)	To compare hearing-impaired and hearing children in terms of motor development and physical fitness.	Children with profound hearing loss (15) and hearing children (15) aged between 7-14 years old	Posturography assessment: Neurocom Smart Balance Master posturography device For physical fitness: static balance, ball throwing, 20m run, sit-ups and sit-stand tests Motor function assessment: GMFM test battery	Deaf children showed gross motor developmental delay and had lower posture scores. Hearing impaired children showed lower performance in static balance, ball throwing, 20m run and sit-ups tests compared to hearing children.
Horn et al. (2006)	Determining fine and gross motor skills in children with prelingual hearing loss	22 children and infants under 5 years of age with prelingual hearing loss.	Vineland Adaptive Behavioral Scales (VABS).	In contrast to gross motor skills, children with prelingual hearing loss show a decline in fine motor skills as they get older, even after cochlear implantation.

Zwierzchowska et al. (2004).	To determine the physical fitness levels and coordination skills of deaf children	Deaf children aged between 6-18 years old	Eurofit (1989) Test battery	The effect of hearing loss on coordination was significant in all age groups. The effect of the cause of deafness (lesion) on coordination skills was significant. No difference was found according to gender. Hearing loss has a significant effect on coordination skill level. Hearing loss may lead to motor coordination impairment.
		BALANCE		
Ebrahimi et al. (2017).	To compare hearing impaired children with hearing children in terms of postural control.	30 children with sensorineural hearing loss and 37 hearing children aged between 7-12 years old.	Bruininks-Oseretsky Motor Skills Test	Deaf children had lower postural control than hearing children.
Melo et al. (2017)	To compare children with sensorineural hearing loss with their hearing peers in terms of static and dynamic performance.	48 students with sensorineural hearing loss and 48 hearing students aged between 7-18 years old	Romberg, Romberg-Barré and Fournier tests for static equilibrium Unterberger test for dynamic balance	Static and dynamic balance changes were observed more in children with hearing loss compared to hearing children. It has been stated that this change may be related to the inadequacy of sensory organization with the effect of the vestibular system.
Akyüz et al. (2016)	To examine the balance abilities of children with congenital or acquired hearing impairment.	13 hearing-impaired children aged between 14-18 years old	Measurements were made with the Technobody PK 252 Prokin device, standing on both feet, with eyes open and shut.	Hearing impairment negatively affects the balance and movement system. In both groups, open-eye balance performance was significantly better than closed-eye balance performance.
Ebrahimi et al. (2016)	To determine the balance performance of deaf children with or without cochlear implants	145 children aged between 7-12 years old (85 with congenital or acquired bilateral profound sensorineural hearing loss; 60 hearing) In the hearing loss group; 50 without	Bruininks-Oseretsky Motor Skills Test	The total motor and balance skill scores of the group with hearing loss, especially the implanted group, were significantly lower than the hearing group. The non-implant group scored significantly higher than the implant group except for one

		cochlear implant, 35 with unilateral cochlear implant		skill (standing blindfolded on the selected foot on the balance board). Children with hearing loss, especially those with cochlear implants, are at risk of motor and balance impairment.
Ayanniyi et al. (2014)	Comparison of hearing impaired and hearing children in terms of static and dynamic balance performances	80 hearing-impaired and 80 hearing students aged between 8-17 years old	Standing on one leg test Functional reach test	The hearing impaired showed significantly lower static balance performance than the hearing. There was no difference between the groups in terms of dynamic balance performance.
Melo et al. (2015)	To evaluate hearing impaired and hearing peers in terms of postural control and to determine the effect of gender, age and degree of hearing loss on postural control.	48 students with sensorineural hearing loss and 48 hearing students aged between 7-18 years old	Balance Error Scoring System (Riemann et al., 1999)	Children with hearing loss showed significantly lower performance in terms of postural control. As the degree of hearing loss increases, postural control performance weakens.
Melo et al. (2012)	To compare hearing impaired and hearing children in terms of balance and walking performance.	44 students with sensorineural hearing loss and 44 hearing students aged between 7-17 years old	Tinetti Balance and Mobility test (Tinetti, 1986) Timed Up and Go Test (Podsiadl et al., 1991)	Hearing impaired students scored lower than hearing students, but the difference between the groups was not statistically significant.
Tan et al. (2011).	To compare the balance control of hearing impaired and hearing children.	A deaf and a hearing child, both 7 years old	Balance tasks	The balance performance of the hearing-impaired child was weaker than that of the hearing child.
de Sousa et al. (2012).	To describe postural control behavior in children with advanced sensorineural hearing loss	43 deaf and 57 hearing children aged between 7-10 years old	Force platform (AccuSway Plus)	Hearing impaired children showed lower performance in terms of postural control/balance than their hearing peers. No difference was found according to gender. Hearing impaired children may have a special sensory organization disorder, therefore early diagnosis and intervention is important.
Cushing et al. (2008)	Evaluation of static and dynamic balance skills of hearing-	Sensorineural hearing impaired and 14 hearing	Bruininks-Oseretsky Motor Skills Test 2	Static and dynamic balance performance of children with cochlear

	impaired children with and without cochlear implants	children aged between 4-17 years old		implants is lower than their hearing peers Having an implant gives children an advantage in balance tests.
Wong et al. (2013)	To determine the balance performance of hearing-impaired children.	28 children aged between 6-11 years old (6 unilateral, 22 bilateral hearing loss)	Bruininks–Oseretsky Motor Skills Test Pediatric Functional Reach Test (FRT) Pediatric Version of Clinical Test for Sensory Interaction of Balance (P-CTSIB) Test of Postrotary Nystagmus (PRN)	The balance performance of hearing-impaired children is significantly lower.
Zwierzchowska (2008)	To investigate whether hearing impairment has an effect on motor development in children and adolescents	190 deaf children between the ages of 10 and 15 years old	Eurofit test battery	There was a correlation between coordination skills and the degree and cause of hearing loss.
Suarez et al. (2007)	To determine postural control skills in children with advanced hearing loss and cochlear implants.	36 children with sensorineural hearing loss (13 children with unilateral cochlear implants) and 22 hearing children aged between 8-11 years old	Postural control test	There was no difference between children with normal vestibular response and hearing children. Postural control performance of children with low vestibular response was lower than that of hearing children with normal vestibular response.
Yağcı et al. (2004)	To compare hearing impaired and hearing children in terms of balance skills and to determine the effects of hearing impairment on balance skills	181 deaf and 79 hearing children aged between 10-13 years old	Lowett's manual muscle testing method for lower extremity, abdominal and back muscle strength. Static and dynamic balance abilities were measured on moving and immobile surfaces (Flamingo Balance Test).	Deaf children have lower dynamic and static balance abilities and muscle strength than hearing children. Children with congenital hearing impairment had the lowest performance.

As can be seen from the table, the studies analyzed focused mostly on balance among motor skills in hearing-impaired people. Balance is defined as the adaptation to the composition of the body against gravity during rest or movement (Gökmen et al., 1995). The ability to maintain a static posture (sitting, standing) is defined as static balance and the ability to maintain a dynamic posture (walking) is defined as dynamic balance (Gallahue et al., 2012). Both static and dynamic balance are important for and necessary to perform movement. In the studies,

overall, static balance assessment included one-leg-standing, balance beam standing and heal-too-toe standing, while abilities like jumping over rope, balance beam walking, squatting, kicking and hopping were assessed for dynamic balance.

In the table, there are 11 studies comparing hearing-impaired children and adolescents with their hearing peers in terms of balance performance. In these studies, comparisons were made in terms of postural control, dynamic balance, and static balance. In general, the common result obtained in studies comparing the motor skills of hearing-impaired and hearing children and adolescents is that the balance skills of hearing-impaired children and adolescents are significantly weaker than hearing children and adolescents (Gheysen et al., 2008; Ebrahimi et al., 2017; Wong et al., 2013).

Ebrahimi et al. (2017) compared children with sensorineural hearing loss aged between 7-12 years old with their hearing peers in terms of postural control and found that hearing children had better performance. Similarly, Melo et al. determined that children with hearing loss performed significantly lower than hearing children in terms of dynamic and static balance skills (2014) and postural control (2017) in their study with children with sensorineural hearing loss aged between 7-18 years old.

Similar results were found in studies conducted in Turkey regarding balance skills. Yağcı et al. (2004), who applied static and dynamic balance tests to 181 children with congenital and acquired hearing impairment and 79 hearing children, found that hearing-impaired children showed lower performance than hearing children in terms of both dynamic and static balance skills and muscle strength, and the lowest performance belonged to children with congenital hearing impairment. They concluded that hearing impairment has a negative effect on balance and movement abilities. Similarly, Akyüz et al. (2016) examined the static balance levels of 13 hearing-impaired children aged between 14-18 years old and reported that hearing impairment negatively affected the balance and movement system. As a result of the measurements carried out with children with congenital and acquired hearing impairment that involved standing on both feet with their eyes open and closed, it was determined that the balance performance involving open eyes was better than the balance performance involving closed eyes in both groups. From this, they concluded that the presence of visual data positively affects the balance performance in hearing-impaired people, and the removal of visual stimuli from the environment leads to a decline in balance performance (Akyüz et al., 2016; Lindsey & O'Neal, 1976).

A different finding related to balance performance was reported by Ayanniyi et al. (2014). In their study with hearing-impaired and hearing children aged between 8-17 years old, the researchers reported that there was a significant difference in favor of hearing children in terms of static balance performance, but there was no difference in terms of dynamic balance performance.

As can be seen from the studies above, hearing-impaired children showed significantly lower performance in terms of balance than hearing children. In all of the studies analyzed in terms of static balance skills and in all of the studies except one study (Ayanniyi et al., 2014) in terms of dynamic balance skills, hearing-impaired children showed lower performance compared to hearing children.

Balance is a skill that affects movement entirely. Therefore, impairments in balance in the hearing impaired may negatively affect other motor skills. Although most of the studies in the literature on hearing-impaired people have focused on balance, there are also studies on gross motor skills, fine motor skills, and physical fitness parameters. However, the results of these studies are not as clear as those related to balance. In other words, different results are reported in the studies regarding the motor performance of the hearing impaired. In general, although there are many studies indicating that hearing-impaired people are at a lower level than hearing people in terms of motor skills (Ciğerci, 2011; Gheysen et al., 2008; Gültekin, 2012; Horn et al., 2006; Kalan, 2007; Kamel et al, 2021; Livingstone & McPhillips, 2011; Melo, 2007; Melo et al., 2012; Stepanchenko et al., 2020), there are other studies indicating that there is no significant difference in terms of some motor skills (Engel-Yeger & Weissman, 2009) or that they perform similarly (Horn et al., 2005; Kuntz et al., 2003).

In terms of gross motor skills, Kalan (2007) reported that hearing-impaired children were behind hearing children. In a study conducted with children with severe hearing loss (15) and hearing children (15) aged between 7-14 years old, the researcher found that hearing-impaired children showed a delay in gross motor development and had lower posture, static balance, ball throwing, 20m running, and sit-up test scores than hearing children. Similarly, Gheysen et al. (2008) conducted a study with deaf and hearing children aged between 4-12 years old and found that deaf children were significantly behind in terms of motor skills and balance compared to hearing children. Melo (2007) and Melo et al. (2012), who investigated the gait performance of the hearing impaired, determined that the hearing impaired showed significantly lower performance than the hearing children in their studies with children aged between 7-18 years old with sensorineural hearing loss. It was also reported that the hearing impaired were at risk of falling due to gait disturbance (Melo et al., 2012).

Studies conducted with children with hearing loss in terms of fine motor skills report that they mostly lag behind their hearing peers (Horn et al., 2006; Kamel et al., 2021). Kamel et al. (2021) compared the performance values of 200 children and adolescents with sensorineural hearing loss between the ages of 7-18years old with the results of their hearing peers in a study conducted to examine the effect of hearing loss on fine motor skills.

At the end of the study, they found that children with hearing loss performed significantly lower than hearing children in terms of fine motor precision and fine motor integration. They concluded that sensorineural hearing loss affects fine motor skills. Similarly, Horn et al. (2006), in a study conducted with children and infants under 5 years of age to determine fine and gross motor skills in children with prelingual hearing loss, found that, unlike gross motor skills, children with prelingual hearing loss showed a decline in fine motor skills with increasing age, even after cochlear implantation.

On the other hand, there are other studies reporting that there is no significant difference between hearing and hearing-impaired children in terms of motor skills or that they are similar. Engel-Yeger and Weissman (2009) conducted a study with 22 hearing-impaired and 26 hearing children aged between 5-9 years old and found that although hearing-impaired children performed lower than hearing children in terms of gross motor skills (ball skills) and manual skills, the difference was not statistically significant. In addition, they reported that there was no statistically significant difference between the motor skills of children with cochlear implants or hearing aids. In support of this result, Kutz et al. (2003) and Horn et al. (2005) also reported similar results with hearing children at the end of their studies examining the fine and gross motor skills of children and infants under 5 years of age.

Although there are few studies on the physical fitness characteristics of hearing-impaired children, these studies provide evidence that they show a delay in physical development compared to their hearing peers. In studies comparing hearing-impaired children with hearing children in terms of physical characteristics such as height, body weight, body fat percentage, muscle strength, endurance, and posture, it is reported that hearing-impaired children generally have lower scores and show a delay in physical development (Gheysen et al., 2008; Gültekin, 2012; Shavel et al., 2021; Zwierzchowska, 2008). In a study conducted by Zwierzchowska et al. (2004) with deaf children aged between 6-18 years old, they found that there was a correlation between coordination skills and the degree and cause of hearing loss. Four years later, in another study conducted to determine the physical fitness levels of 190 deaf children aged between 10-15 years old, especially the effect of hearing loss on coordination skills, they found that the effect of hearing loss on coordination was significant in all age groups (Zwierzchowska et al., 2008).

Studies supporting these results were reported by Gültekin (2012) and Ciğerci et al. (2011). Gültekin (2012) compared the physical fitness parameters of hearing-impaired and hearing children aged between 9-15 years old and reported that hearing-impaired children showed lower performance in balance, strength, power, and reaction time determination tests compared to their hearing peers. Ciğerci et al. (2011) compared hearing and hearing-impaired athletes and sedentaries in the same age group and found that hearing impairment had negative effects on balance, paw strength, reaction time, anaerobic power, standing long jump, and agility.

Similarly, Shavel et al. (2021) reported that in addition to a delay in physical development and related postural disorders in hearing-impaired primary school children, height, body weight, and chest circumference measurements were lower than their hearing peers. In addition, hearing-impaired children were found to be significantly weaker than hearing children in terms of physical performance.

As can be seen, although different results are reported in terms of gross motor skills in studies comparing hearing-impaired children and adolescents with their hearing peers, mostly hearing loos is reported to effect motor skills and physical performance.

In addition to the studies comparing hearing and hearing impaired children in the table, there are also other studies comparing the motor characteristics of deaf and hard-of-hearing children. Gkouvatzi et al. (2010) compared some motor skills of 34 deaf and hard-of-hearing children aged between 6-14 years old and found that the deaf were better at upper limb speed and dexterity than the hard-of-hearing but the difference between the groups were not statistically significant. This result was attributed to the use of sign language by the deaf. It was reported that the school attended by the hard-of-hearing students who participated in the study used verbal language in communication, not sign language. In the study, it was also noted that speed/quickness improved with increasing age. It was also reported by Melo (2017), who evaluated gait performance in the hearing impaired, that the performance decreased as the degree of hearing loss increased.

In summary, the studies presented so far have shown that hearing-impaired people are generally inferior to hearing people in terms of balance and some motor skills.

4. Discussion and Conclusion

In this study, it was aimed to determine the current situation of hearing-impaired children and adolescents in terms of motor skills based on the studies on motor skills of hearing-impaired children and adolescents after the year 2000 and to provide information to the relevant people and institutions, especially teachers and those working in the field of rehabilitation, about the differences and developments of hearing-impaired children and adolescents. The important findings of the literature review are listed and discussed in this section.

The common conclusion arrived in the studies reviewed is that hearing-impaired children and adolescents lag behind their hearing peers in terms of balance skills. In the studies, damage to the vestibular system is mostly mentioned as the main cause of lower performance in balance in the hearing impaired (Crowe & Horak, 1988;

Inoue et al., 2013; De Kegel, 2012). Studies show that 30-70% of hearing-impaired children have vestibular end organ disorders (Cushing et al., 2008), and the incidence of vestibular test abnormalities is higher in the individuals with advanced sensorineural hearing loss, and acquired deafness (meningitis) (Köroğlu & Horasanlı, 2022). There is even information that cochlear implant carries an additional risk of vestibular damage (0.33-75%) (Bayat et al., 2020; Buchman, 2004; Ibrahim, 2017; Katsiari et al., 2013; Rah et al., 2016).

Another cause of lower balance performance in the hearing impaired as indicated in the studies is related to the absence of sound input. Hearing individuals use auditory cues for postural control (Vitkovic et al., 2016). Hearing-impaired individuals also develop appropriate postural control strategies due to the need to compensate for their natural lack of balance due to the absence of sound input or to turn towards sound due to the difficulty in hearing (Thomas et al., 2018). This is seen as a reason for the prevalence of postural control disorders in the hearing impaired.

In terms of physical performance, deaf children were found to be significantly weaker than hearing children. This weakness of the hearing impaired may be related to delay in the development of the respiratory system, lungs and sympathoadrenal systems (Shavel et al., 2021; Zebrowska & Zwierzchowska, 2006). As a matter of fact, researchers report that due to the underdevelopment of the vocal system of hearing-impaired children, the delay in development in the lungs and respiratory systems and the secretion of adrenaline and nor-adrenaline are 2-3 times lower than their hearing peers, which leads to the weakness in their physical performance (Shavel et al., 2021).

With regard to other motor skills, although it is generally reported that the hearing impaired perform lower than the hearing, there are also studies that report different results. These differences between the results of the studies, especially regarding the gross motor skills of the hearing impaired, may be due to the differences in the type of the scale used, the characteristics of the children in the sample, and the tasks applied. For example, Horn et al. (2005) and Kutz et al. (2003) both used the Vineland Adaptive Behavioral Scale, which is a standardized scale that measures according to the opinions of parents/caregivers. This scale is an instrument that requires interviewing children's families about children's daily routines, communication, social and motor skills. Therefore, as Horn et al. (2006) pointed out in their later study, this instrument may not provide fully objective measurements, and performance on motor tasks may be evaluated without making a distinction between gross/fine or simple/complex. Therefore, it is possible to obtain different results from more objective instruments. In addition, the age of the children participating in the study and the simplicity or complexity of the performance tasks may also be considered among the reasons for the differences between the results of the studies. Researchers have shown that age has an effect on motor skills, and even after cochlear implantation, there are developmental delays especially in fine motor skills (Schlumberger et al., 2004; Horn et al., 2006). In a study conducted with children between 5-9 years old, Schlumberger et al. (2004) reported that there was a developmental delay with increasing age, especially in complex tasks. Therefore, the differences between the ages of the samples and the scales used may have contributed to the differences between the results of the studies, especially in gross motor skills.

Although different results have been reported in the studies, in general, it is clear that hearing-impaired children need improvement in terms of motor skills. Studies have shown that delays in motor development in hearing-impaired children can be prevented and the difference between these children and their hearing peers in terms of motor skills can be minimized with physical education classes and exercise programs structured in accordance with the needs of the child (Elieyüboğlu, 2014; Eliöz et al., 2013; Hatipoğlu, 2005; Rajendran et al., 2013; Şirinkan, 2011; Yıldız & Gürsel, 2008). Such effect of physical education is mostly explained as leading hearing impaired/deaf children learn to compensate the vestibular deficit, adapt to it by using the information from other senses, which will result in improved balance and physical performance (Butterfield, 1991; Curthoys, 2000; Potter & Silverman, 1984; Rajendran et al., 2013). This also explains why vestibular response is normal in some hearing-impaired children while it is absent or very low in others as Potter & Silvermen (1984) indicate. Therefore, adding specific trainings to the physical education courses may help improve motor development and the quality of life of the hearing impaired. Langdale (1984) suggests practicing basic body movements to improve balance. It is stated that dance is an ideal activity for the hearing impaired due to its emphasis on static and dynamic balance (Hottendorf, 1989; Reber & Sherrill, 1981; Widyoseptiani & Sumanto, 2021). Especially teaching dancing to preschool children with simple and repetitive figures contributes to the development of gross motor and especially balance skills (Widyoseptiani & Sumanto, 2021). In addition, Asian exercise systems such as karate, kung fu, and tai chi, which require balance, are also recommended as they contribute to the child's awareness of his/her own body (Kasum et al., 2011).

At this point, it is clear that physical education classes carried out in accordance with the needs of the hearing impaired children with providing rich opportunities for the development of motor performance are important for the development of motor skills of these children. Although basic movements are thought to develop automatically when the child is ready, the influence of the environment on the development cannot be ignored (Gallahue et al., 2012). In addition to the child's maturation, the support from the environment, motivation,

opportunities, and, most importantly, structured physical education programs implemented consistently and regularly are necessary to ensure mastery of basic skills (Gallahue et al., 2012).

The effect of early intervention on balance disorders in hearing-impaired children is also important (Ebrahimi et al., 2017; Siegel et al., 1991). Newborn hearing screenings enable early diagnosis and treatment of hearing loss in infants (Genç et al., 2005). Early diagnosis of childhood hearing loss is vital for normal speech, language, cognitive and social development (Genç et al., 2005; Siegel et al., 1991). However, when these routine screenings do not include an assessment of balance and motor impairments, physical therapy interventions are not included in educational programs unless a significant neurological or orthopedic disorder is diagnosed. This means that the deaf child's developmental delay persists and the chance for early intervention is prevented.

As a matter of fact, it is stated that the relationship between development and disability status in early childhood has important effects on the development and later life of the individual (WHO, 2023). Therefore, physical education teachers can implement appropriate sports and exercise programs at and outside of the school, with the support of physiotherapists, if necessary, in preparing age-appropriate programs for children.

As a result, based on the studies reviewed it was determined that hearing-impaired children and adolescents lagged behind their hearing peers in terms of balance skills and performed significantly worse in terms of physical performance, and other motor skills, although there were other studies indicating that they were at the similar level. Regular participation in structured physical education and sports programs prepared according to these children's needs will significantly contribute to their physical and motor development.

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Evaluation of Graphic Tablet Use in Mathematics Lessons in Emergency Distance Education Process

Yusuf ÇAKAR[1], Alper ŞİMŞEK[2]

Article History
Received: 22.06.2023
Received in revised form: 23.06.2023
Accepted: 29.06.2023

Abstract

In the process of the global epidemic Covid-19, radical changes have been experienced in all parts of society. Education is one of the institutions most affected by change. As in the whole world, educational institutions in our country have suspended face-to-face education and have started the distance education process to the extent that the conditions allow. The unpredictable course of the global epidemic prevented institutions from making long-term decisions, and the learning and teaching parties in education tried to adapt to the new situation to a large extent with their own means. In this process, teachers who were on the side of the teacher and used information technologies well adapted to the process more easily, while teachers who could not use it well were the group that felt the most difficult in this process. Some of the teachers, who find themselves in emergency distance education, have been in search of how to be productive in the distance education lessons they will teach. Mathematics teachers, who are the group of teachers who use the traditional board and tools most frequently in face-to-face education, also searched in this process. During the Covid-19 emergency distance education process, writing and drawing type operations with computer mice in mathematics lessons negatively affected the motivation and interest of teachers and students in the lesson. Graphic tablets, which are mostly used for graphic design purposes, have emerged as a result of this search. The ease of use and the fact that it can be used on computers and mobile devices have caused teachers to prefer this technology in distance education classes. In this study, the evaluation of the use of graphic tablets in mathematics lessons in the emergency distance education process and the evaluation of the use of graphic tablets in distance education lessons to be held for any reason in the future were made. In the study carried out in the context of the qualitative approach, the data were collected with a semi-structured questionnaire prepared by the researchers by making purposeful sampling from 18 mathematics teachers who used graphic tablets in primary school mathematics lessons during the Covid-19 emergency distance education period. The obtained data were analyzed with content and descriptive analysis methods. Results such as making mathematical operations easier, writing lessons effectively, lecturing and using it as a blackboard, mostly for the purpose of solving questions, were obtained regarding the graphic tablet. In general, it has been understood that the limitations and difficulties encountered in the use of the graphic tablet are very few.

Keywords: Distance education, Covid-19, graphic drawing tablet, mathematics education

1. Introduction

Covid-19 disease, which was included in the pandemic category by the World Health Organization, first started in December 2019 in Wuhan, China's Hubei province (Tesini, 2020). In addition to the negative effects of the Covid-19 epidemic, which has been expressed as the most important health problem worldwide in recent years, on public health, it has also been effective in issues such as democracy, internal security, the structure of the state and public policies (Orçun and Ayhan, 2020). One of the most important and radical decisions taken for public order and health was to take a break from face-to-face education and switch to distance education. According to

[1] Teacher, National Education, Trabzon, TURKEY, yc193012@gmail.com, orcid: 0009-0007-8913-5719

[2] Asst. Prof., Department of Computer Education and Instructional Technology, Fatih Faculty of Education, Trabzon University, Trabzon University, Trabzon, TURKEY, alpersimsek@trabzon.edu.tr, orcid: 0000-0001-5793-6334

the UNESCO report; 1.6 billion students in 191 countries have been severely affected by the temporary closure of educational institutions (UNESCO, 2020).

This long struggle with the global epidemic has negatively affected the education sector, like many other sectors. In this process, while face-to-face education was suspended in schools around the world, different solutions were created in order to continue education. Following the date of March 11, when the first case was seen in Turkey, it was announced that face-to-face education was suspended in educational institutions, as a result of the increase in cases, as a result of the pandemic experienced all over the world on March 23, 2020, face-to-face education was stopped and instead it was decided to continue with online education (Özdogan and Berkant, 2020).

With the development of technology, distance education has emerged as a field that can be reached to larger masses compared to previous years, and where effective and permanent education can be made, which increases the motivation and interest of learners thanks to the digital materials used. Distance Learning; It is expressed as a system where learning and teaching activities are carried out by bringing education services to more people, bringing together learners and instructors in different places and creating equal opportunities (Yalın, 2001; Gelişli, 2015). UNESCO states that preparations should be made in technological, content, pedagogical and monitoring-evaluation issues in order to ensure that distance education offers quality and equal education opportunities for all (UNESCO, 2020). In this context, it is an important requirement to create quality education environments that provide equal opportunities for everyone while conducting distance education activities. While carrying out emergency distance education activities, some negativities were encountered in all levels and branches of education. The lack of social and individual interaction and the inability to reach the teacher are among these difficulties (Tryon & Bishop, 2009; İşman, 2011). The high initial setup cost of distance education systems (Bolliger & Wasilik, 2009), problems in accessing the internet (İşman, 2011) are the disadvantages of distance education that are frequently expressed. While conducting distance education activities in Turkey and around the world, we encounter four main problems. These are, respectively, economic problems, social problems, accessibility and quality of the distance education provided.

In the distance education process, there have been many educational problems in all disciplines that are a part of distance education. There have been cases where the innovations brought by technology in terms of making the learner active and motivating in the course are insufficient. This situation has been encountered especially in disciplines involving mathematics and mathematical operations. It has been stated by some researchers that distance education environments cannot provide the necessary supportive tools for discussion and problem solving in educational environments that include mathematics and mathematical operations (Myers et al., 2004; Smith & Ferguson, 2004).

Today, in distance education, technological tools, software and documents that will support the teacher in every sense and provide the learner's motivation and permanent learning are increasing rapidly. One of these technologies is graphic drawing tablets. Graphic drawing tablets can be used in all areas of education and positive results can be obtained in terms of the quality and efficiency of education. According to the data obtained in a research on graphic drawing tablets; The common view of teachers and students about graphic drawing tablets is that they are suitable for use in all lessons (Akçayır & Kılıç Çakmak, 2017). Graphic drawing tablets can be used effectively especially in numeric-weighted courses. Because the math lesson consists of many formulas, shapes and functions. When the literature is examined, it is emphasized that drawing shapes in different colors, making markings on texts, have positive results for the mathematics course, which is a numerical course, and increase student motivation (Galligan et al., 2010). One of the most important situations in distance education is the low participation and motivation of the students in the course. This negativity can be eliminated by increasing the interaction within the course. According to the students, only audio narration in the lesson causes the lesson to be boring. Because for distance education to be effective and efficient, the course should be as interactive as possible (Oviatt et al., 2000). Graphic drawing tablets, which will establish a bond between the learner and the teacher in educational tools such as z-book, pdf and zoom used in distance education mathematics lessons, and which will enable the teacher to contact the student in some way, have taken an important place in the distance education of the mathematics course during the Covid-19 pandemic period. It is an easy technology to install and use graphic drawing tablet on computers. It is a hardware that allows the user to write or draw by hand. Graphic drawing tablets offer the user the opportunity to draw easily, thanks to their digital pen. What is done to the screen of the tablet is also seen on the computer screen simultaneously. Today, graphic drawing tablets are used to make lessons more effective. Graphic drawing tablets in distance education enabled educators to use handwriting while conveying the course contents and question-solving methods to students, and with the help of their features, communication between the student and the teacher emerged (Loch & McDonald, 2007).

In this study, the views and experiences of distance education mathematics teachers regarding the use of graphic drawing tablets in mathematics lessons during the Covid-19 pandemic period were investigated. Based on their experiences during the Covid-19 period, the reflections of the graphic drawing tablets they used in distance education on mathematics teaching were examined. At the time of this study, the negative effects of the Covid-19 epidemic continued, and the lessons were conducted as hybrids from time to time in line with the quarantine

conditions. This situation has been maintained for a long time as one of the measures implemented in schools in order to avoid the negative effects of the pandemic in different countries of the world as well as in our country. This situation has made the use of graphic drawing tablet a necessity as a specific technology at the point of showing and performing mathematical operations in the distance education process. In this context, it is necessary to investigate the use cases of graphic drawing tablets used in mathematics lessons conducted in distance education environments during the pandemic period, and to reveal their reflections on the teaching process. This study is important in terms of getting better efficiency from the graphic drawing tablets used in distance education mathematics courses, revealing the difficulties and problems of in-class use and the opportunities it provides in the context of learning. In this context, the aim of the research is to evaluate the reflections of the use of graphic drawing tablets in mathematics lessons on the teaching process in the emergency distance education process that emerged with the Covid-19 pandemic and to make suggestions for the future. In this context, the research seeks answers to the following questions:

1. What are the reasons for using graphic drawing tablets in mathematics lessons conducted in virtual classroom environment?
2. What are the educational opportunities provided by the use of graphic drawing tablets in mathematics lessons conducted in virtual classroom environment?
3. What are the difficulties and limitations that arise during the use of graphic drawing tablets in mathematics lessons conducted in the virtual classroom environment?
4. What are the suggestions for maintaining and using graphic tablet after distance education?

2. Method

2.1 Research Method

This research, which examines the use of graphic drawing tablets in mathematics lessons in virtual classroom environments, was conducted based on a qualitative approach. Qualitative research is concerned with constructing the meaning that emerges as a result of an event. Basic qualitative research is concerned with the interpretation of these meanings that people create. Basic qualitative research reveals and examines the meanings created by people with research questions (Merriam, 2013). In this study, the reflections of the graphic drawing tablets used in the mathematics lessons carried out in the emergency distance education process on the teaching activities were taken online with a semi-structured questionnaire. The obtained data were analyzed with content analysis and descriptive analysis techniques in the context of research questions.

2.2 Research Group

This research was conducted with 18 mathematics teachers who used graphic drawing tablets in secondary school mathematics lessons during the Covid-19 epidemic period. The mathematics teachers participating in the research were determined by the criterion sampling method, one of the purposive sampling methods. Criterion sampling, which is one of the purposive sampling types, is the determination of the participants according to the criteria previously determined by the researcher (Yıldırım & Şimşek, 2016). Participants are secondary school mathematics teachers who had to conduct their lessons with distance education for more than a year with the Zoom virtual classroom application in line with the regulations and measures of the Ministry of National Education during the emergency distance education process. The main feature of the participants is that they include graphic drawing tablets in the mathematics lessons in the emergency distance education process in line with their own experiences, possibilities and preferences. Demographic information about the participant group from which the data were taken within the scope of the research is presented in Table 1.

Table 1. Demographic Characteristics of Participating Teachers

Variable (N=18)		f	%
Gender	Woman	7	39
	Male	11	61
Seniority Year	4-8 years	8	44
	9-14 years	2	11th
	15 Years and above	8	44
Where You Work	District	8	44
	City Center	9	50
	Rural	1	6
Education level	Licence	13	72
	Degree	5	28
Where You Conduct Distance Education	House	17	94

	School	1	6
Internet Package Used	Fiber	13	72
	Adsl	5	28
	Mobile	1	6
Information Technologies In-Service Training	Yes	4	22
	No	14	78

2.3 Data Collection Tools

In this study, a semi-structured questionnaire was used as a data collection tool. Semi-structured interview technique stands out as a more suitable technique for educational science research due to the standardization in its structure and flexibility in time. In semi-structured interviews, the researcher prepares the questions he/she intends to ask in advance. In this type of interview, the researcher asks the questions he has prepared in accordance with the flow of the interview and may ask for explanations about his answers when necessary (Bogdan & Biklen, 2007). The first draft form was created in the context of research questions by scanning the relevant literature. In order to ensure the validity of the questionnaire in the context of the relevant subject, the questions were rearranged in line with the opinions of academicians who are experts in the field of information technologies and mathematics education. The prepared form was read to two different mathematics teachers and the clarity of the questions was checked. The form prepared in this study was presented to the designated teachers online via Google Forms. The teachers were informed that the data obtained would not be used outside of the research and that the necessary ethical rules would be followed. Filling the form was done on a voluntary basis by the teachers. Any questions (school, age, branch, etc.) that could reveal the identities of the teachers participating in the survey were not included, thus it was tried to provide the teachers with the opportunity to give sincere and sincere answers.

2.4 Analysis of Data

The data collected with Google form in the online environment were first analyzed with content analysis in the context of research questions. The first step codes were made from the answers given by the teachers to the questions, and then the codes related to each other were collected under the themes determined in accordance with the theoretical structure of the research. Content analysis is the systematic analysis of printed or visual materials in terms of certain categories. The data obtained through content analysis were classified between each other and certain themes, thus revealing the relationships between the data (Yıldırım & Şimşek, 2011). Content analysis focuses on the origins of the phenomenon or event. The concepts revealed by the coding and the data and how these concepts are related are analyzed. It is in an effort to find the themes related to the problem from the descriptive and detailed data collected in qualitative research, to transform the obtained data into meaningful and systematic structures, to form a theory based on these data or to provide a theory. By coding the data, the concepts underlying the data and the relationships between the concepts were revealed. The findings obtained through content analysis in the research were supported by the findings obtained through descriptive analysis. The MAXQDA qualitative data analysis program was used in the analysis of the data obtained qualitatively, and the relationship between the code and the themes was provided to be revealed more clearly.

2.5 Validity and Reliability

Validity and reliability are expressed with numerically calculated values in quantitative studies. However, in qualitative research, validity and reliability cannot be expressed with numerical values. For this reason, validity and reliability are handled in different ways in qualitative research, and sometimes even with different names (Noble & Smith, 2015; Shenton, 2004). When the literature is examined, the concept of persuasiveness for qualitative research emerges. In qualitative research, we come across various strategies to ensure this credibility. In qualitative research, it is stated that four evaluations, namely credibility, transferability, consistency and impartiality, should be taken into account in order to ensure credibility, which is used instead of validity and reliability (Guba, 1981).

To ensure credibility in this study; Volunteering was taken as a basis in the selected participants and before the application of the interview form, necessary information was given to the participants about the purpose of the research and the questions in the interview form. In addition, the confirmation of the participants was provided as the interview forms were filled by the participants themselves. In order to ensure the transferability of the study, participants who teach distance education mathematics at all levels of education and use graphic tablets were selected. In addition, the characteristics of the participants who participated in the interview in the study were given in detail.

The biggest limitation of this study is the inability to generalize to the population by making use of the findings obtained due to the small number of participants in qualitative studies. Another limitation is to move away from the flexibility of face-to-face interviews, which occur because the interview is not conducted face-to-face with the participant.

3. Findings

The effect of the use of the graphic drawing tablet on the mathematics teaching process in the secondary school mathematics lessons conducted in virtual classroom environments during the emergency distance education process and the limitations and difficulties arising in the process due to the use of the graphic drawing tablet were analyzed and presented in parallel with the research questions. In this process, the data obtained with the semi-structured questionnaire form from the participating mathematics teachers were analyzed with the content analysis method with the help of the MAXQDA qualitative data analysis program, and the findings were also tried to be explained with the help of the findings obtained by the descriptive analysis method.

When the data collected from the participant group were examined, it was seen that the purpose of including the graphic drawing tablet in the mathematics lessons conducted in the virtual classroom environment differed. The aims of incorporating the graphic drawing tablet into mathematics lessons in the emergency distance education process by the mathematics teachers are summarized in Figure 1.

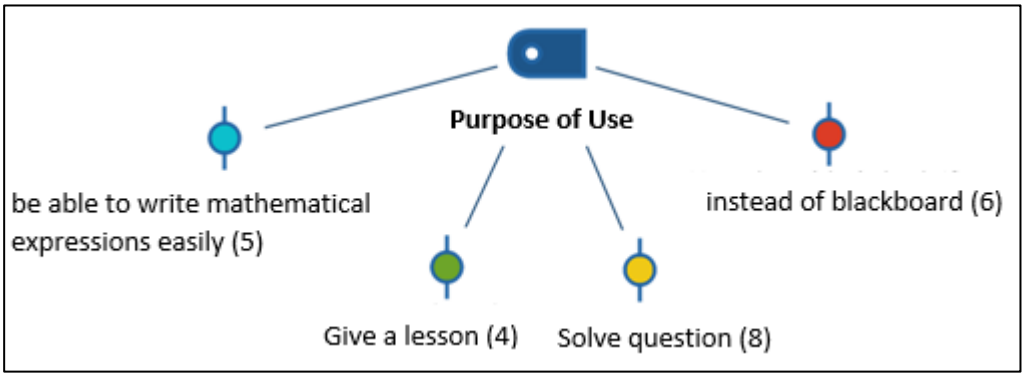

Figure 1. The purpose of using the graphic drawing tablet in mathematics lessons

When Figure 1 is examined, it is understood that the common purpose of mathematics teachers to include the graphic drawing tablet in the teaching process is to solve questions in the lesson. This is followed by using the graphic drawing tablet with the whiteboard function. It is understood that another purpose that mathematics teachers frequently express is to perform mathematical operations more easily and to make the lesson more effective. When the objectives expressed by the mathematics teachers are examined, it can be stated that the determined objectives aim to make the mathematics lesson in the virtual environment more productive for the students. The sample expression for the purposes of using the graphic drawing tablet in the online mathematics lessons conducted by the teachers in the emergency distance education process is as follows:

> *"...I used it to improve processing skills, to increase the efficiency of the course and to use time more effectively (T12)".*
>
> *"...I used it to be able to write more easily and legibly, to draw shapes more beautifully and quickly (T17)".*

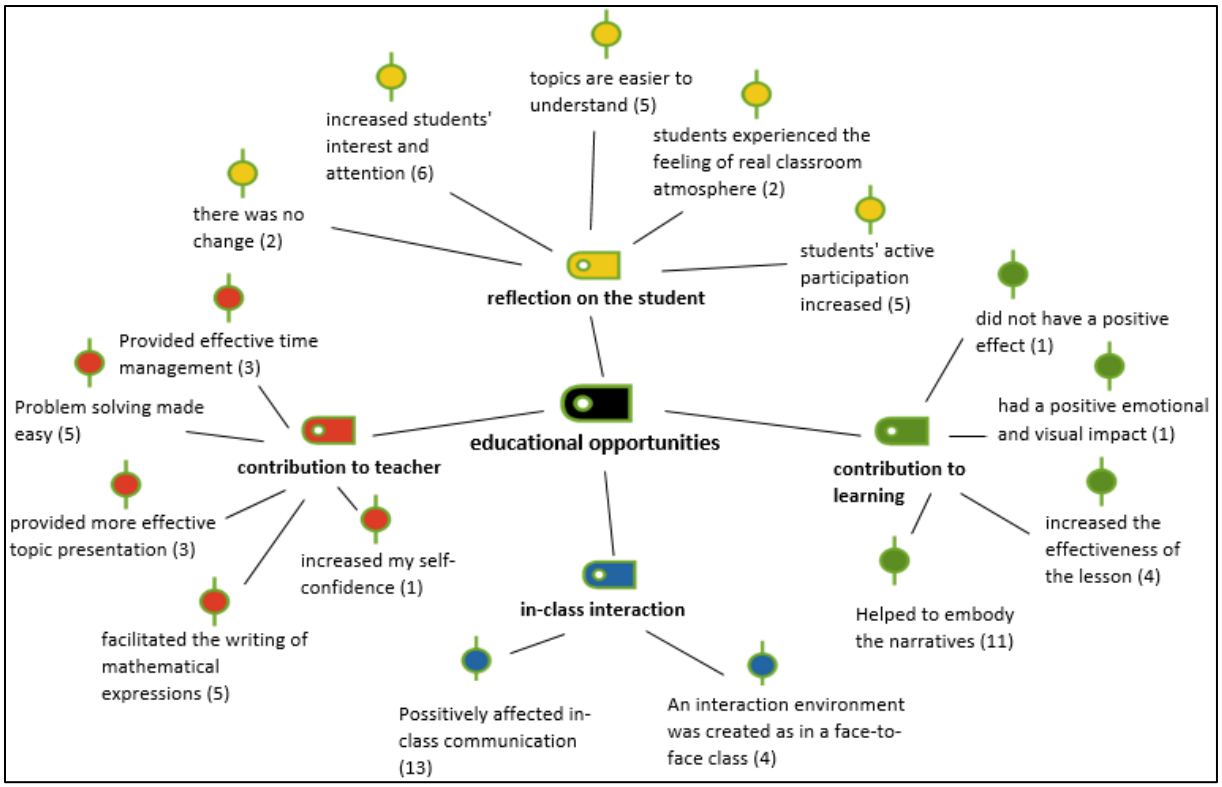

Figure 2. Educational advantages of using a graphic drawing tablet

When Figure 2 is examined, it has been determined that the inclusion of the graphic drawing tablet in the mathematics lessons in the virtual classroom environment in the emergency distance education process contributes to the emergence of educational opportunities for the teaching process. When the opinions of the mathematics teachers were examined, it was seen that the student, teacher, learning and interaction dimensions of the educational opportunities that emerged with the use of graphic drawing tablets came to the fore.

When the opportunities created by the use of graphic drawing tablets are examined in terms of students; It is understood that the interest and attention of the students' increase, it contributes to the feeling of a real classroom environment, the active participation of the students in the lesson increases, and the students understand the lesson more easily thanks to mathematical operations and graphic drawings. However, two of the participating teachers stated that the use of graphic drawing tablets did not contribute to any change in students' perception and attitude towards the lesson. Sample teacher views on the educational opportunities provided by the use of graphic drawing tablets in online mathematics lessons are as follows:

> *"...enabled the participation in the lesson, increased the participation in the lesson and the lesson positively (T7)".*
>
> *"... helped them understand better while solving questions (T10)".*
>
> *"... Mathematics is a lesson that requires playing with a pencil. It helped me a lot in this respect with the graphic tablet. Students felt themselves in the classroom environment. They paid more attention to the lesson (T15)".*
>
> *"...I do not think that it attracted their attention and made a change in their attitudes (T6)".*

can be summarized as using time effectively, activating lesson presentation, facilitating problem solving, and providing comfort in writing mathematical operations and drawings. In addition, one teacher stated that her self-confidence in teaching mathematics in a virtual environment increased with the use of a graphic drawing tablet. Sample teacher views on the educational opportunities provided by the use of graphic drawing tablets in online mathematics lessons are as follows:

> *"...when I wasn't using a graphic tablet, my wrist ached and I was having trouble typing. Also, what I wrote was not very clear. The use of Graphic Tablets solved all my problems (T6)".*
>
> *"...first of all, it instilled self-confidence in my lecture. It enabled me to teach my students more efficiently in this process (T7)".*
>
> *"...it allowed me to draw on the questions (T12)".*

"...it made distance education more efficient by enabling me to easily solve questions on the screen and solve many questions with my students (T15)".

When the educational opportunities that emerged in the learning dimension were examined, it was seen that the majority of the participating teachers stated that the graphic drawing tablet contributed to the easier understanding of the students by embodying the narratives. In addition, it is understood that it contributes positively to the more efficient teaching of the lesson. On the other hand, one participant stated that he could not observe any positive side of using a graphic drawing tablet in the mathematics lessons he taught. Sample teacher views on the educational opportunities provided by the use of graphic drawing tablets in the online mathematics lessons are as follows:

"... if there was not a graphic tablet, the stories would have remained in the air (T3)".
"...I think it contributes positively to students' understanding as it makes what I write and solve more legible and also facilitates geometric figure drawings (T6)".
"...it was very effective in the question-solving phase, it was especially effective in marking and writing where geometrical attention should be drawn (T14)".

When the views of the participant teachers on the effects of using the graphic drawing tablet on the in-class interaction dimension were examined, it was seen that all expressions were positive. 13 participants stated that the use of graphic drawing tablets had a positive effect on in-class interaction, while four participants stated that an interaction environment similar to the classroom environment was created. The participant teachers' views on this situation are as follows:

"...for making the lecture more practical and interactive. It provided better and more effective communication (T2)".
"... at first, the lesson progressed with video and PowerPoint presentations, then the lesson was taught with a graphic tablet just like in a classroom environment. Student activated. He started to ask more questions by getting more rights to speak (T15)".

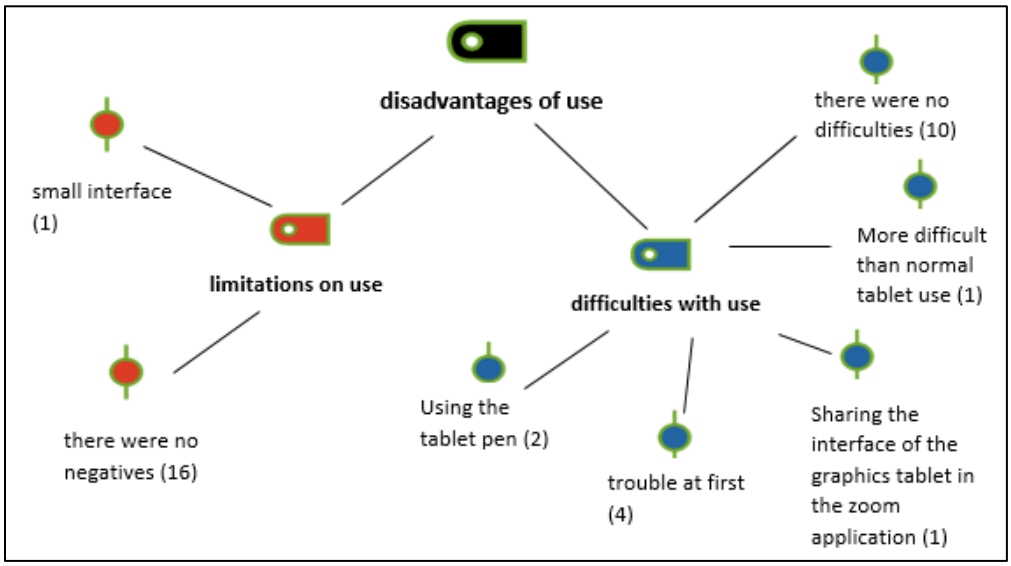

Figure 3. Disadvantages of using a graphic drawing tablet

When Figure 3 is examined, it is understood that there is not a very important limitation for the use of graphic drawing tablets in mathematics lessons in the virtual classroom environment during the emergency distance education process. However, it was observed that only one participant expressed a negative opinion about the small screen size of the graphic drawing tablet. On the other hand, when the difficulties related to the use of the graphic drawing tablet are examined, it is understood that although the majority of the participants stated that they did not have difficulty, some of them had difficulties in using the pen and sharing in the virtual environment. The sample statements of the participating teachers in the context of the negative aspects of the use of the graphic drawing tablet are as follows:

"...It took time for me to adapt to his pen at first (T7)".

"...at first, I had difficulty in providing hand and eye coordination (T14)".
"...I was never challenged. It seemed to me as if I had been using it for years (T15)".

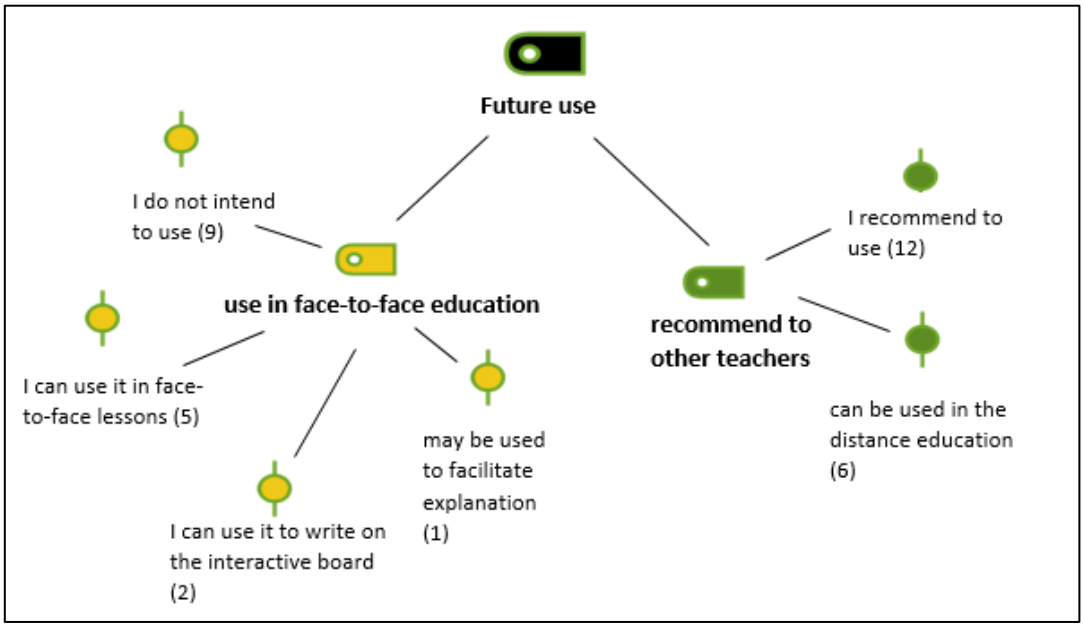

Figure 4. Continuity of graphic drawing tablet use

When Figure 4 is examined, it is understood that the majority of the participating teachers do not intend to use the graphic drawing tablet, which they have experienced in the virtual classroom environment, in face-to-face classroom environments. However, the opinions of eight participants that they can use the graphic drawing tablet in face-to-face environments came to the fore. While the views of the teachers regarding the use of the graphic drawing tablet in face-to-face education environments were divided into two groups, it was determined that they made suggestions to their colleagues to use it. However, six of the teachers who made suggestions limited it to numerical courses to be conducted in a distance education environment. The sample expressions of the participating teachers regarding this situation are as follows:

"...I plan to use it in my lectures and presentations as it provides fast and practical use (T8)".
"... yes, I intend to use it while drawing (T10)".
"... I don't plan to use it for now. But maybe in the future I can buy a better graphic tablet and make educational designs (T15)".
"...It should be the top priority tool to be used in the virtual classroom environment (T3)".
"...I have recommended it to a few friends so far. It makes it very easy to write and draw shapes. What we write is quite legible and I can write very quickly (T6)".
"...I especially recommend it to numeracy teachers. Because I became my hand and foot in distance mathematics education (T15)".

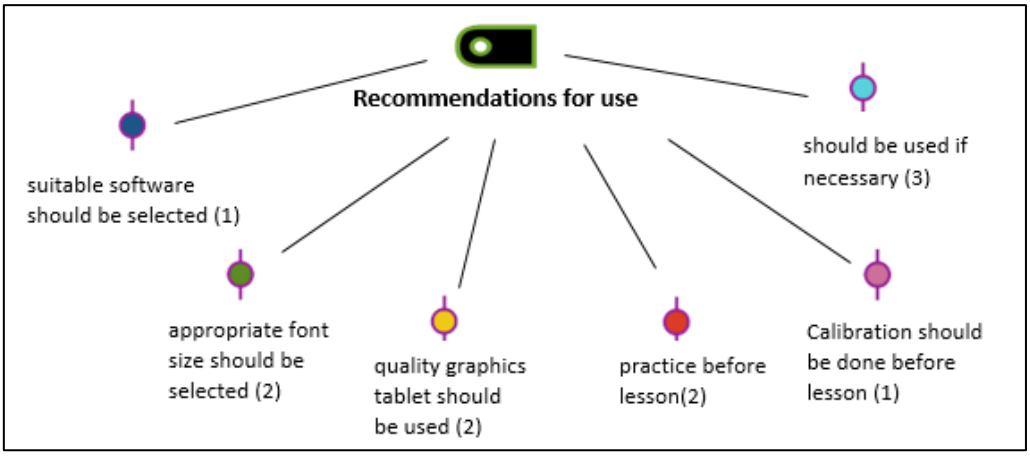

Figure 5. Recommendations for the use of the graphic drawing tablet

On the other hand, the participating teachers made suggestions about the points that should be considered during the use of the graphic drawing tablet. When Figure 5 is examined, these suggestions are; It is seen that it is enough to practice before using it in the lesson, to use quality drawing tablets, to use appropriate font size, to choose appropriate software, to make calibration adjustments. Sample participant teacher opinions on this subject are as follows:

"...the technical features of the graphic tablet should be good (T2)".

"...it should be practiced at first and learned all the features thoroughly, and then it should be used in live lessons (T6)".

"...it is necessary to master its use in the first stage. Experience is necessary to ensure hand and eye coordination (T14)".

"...for us to use the screen regularly, graphic tablet settings should be done well (T15)"

4. Discussion and Conclusion

In this study, it is aimed to evaluate the effects of the graphic tablet on the mathematics lessons held during the Covid-19 Emergency Distance Education period, the purposes of use, difficulties and limitations in the context of teachers' opinions.

Question-answer method emerges as an indispensable method in disciplines containing numerical knowledge such as mathematics. The question-answer method is a technique that is frequently used by educators and is generally useful in the application of other teaching methods. It is solving a problem, writing and explaining what you have written step by step. Asking questions is the first step of the communication between the teacher and the students (Yelken, Akay, 2015). In the context of mathematics lesson, students need to see the solution step by step in order to comprehend the solutions of their mathematical problems (Loch & Donovan, 2006). However, it is stated by many researchers that distance education environments do not offer the necessary tools for discussion and problem solving in mathematics-based disciplines (Myers et al., 2004; Smith & Ferguson, 2004). In line with the findings, it was concluded that the teachers were able to handle the question-answer activities that they had the most difficulty with in distance education lessons with the help of graphic tablets, more efficiently, and that the students could see the process for the solution of the questions step by step. Akçayır and Kılıç Çakmak (2017), in their study on the graphic tablet, concluded that the use of graphic tablets facilitated students' individual note-taking processes as well as allowing students to see the steps of mathematical operations instantly. In this context, it can be stated that there is a positive similarity between the two studies. In addition, as a result of the same study (Akçayır & Kılıç Çakmak, 2017), the main usage purposes of the teachers were determined in this study, such as teaching a lesson, teaching the lesson effectively and writing. These results can be interpreted that graphic drawing tablets are preferred by mathematics teachers in virtual teaching environments to overcome the negative reflections related to visualization and create an opportunity to easily transfer their experience of the traditional blackboard they use in face-to-face classroom environments to the virtual environment.

Another of the most important results that emerged in line with the sub-problems of the research is that the use of graphic tablets creates educational opportunities for the teaching process in the context of mathematics lessons conducted in virtual environment. Considering the reflection of the educational opportunities observed during the research process on the students, it has been concluded that it is an effective tool for the lack of interest, loss of motivation and misunderstanding that are often expressed in distance education. Motivation is of great importance for distance learning. In the literature, it is emphasized that students feel lonely when they are not sufficiently motivated in the distance education process, their learning interest and motivation decrease over time, and they actually interrupt learning due to developing dissatisfaction (Deimann & Bastians, 2010; Huett et al., 2008). According to Akçayır and Kılıç Çakmak (2017), graphic tablets, which are an easy-to-use technology, provide motivation, interaction, visuality, etc. in distance education, especially in lessons such as mathematics. It has the potential to be a solution to prominent problems such as When considered in terms of contribution to learning, the benefit of graphic tablets in terms of teaching mathematical operations and concepts to students comes to the fore. Graphic tablets also increase the efficiency of the lesson, and it has been seen that they have positive reflections in terms of contributing to the students both emotionally and visually. In face-to-face education, mathematical concepts and operations are transformed into concepts that students can associate with daily life with materials that help concretization. However, the limitations arising from the environment, competence and materials in the distance education process make this situation even more difficult. The findings can be interpreted as graphic tablets partially reduce this observed negative situation. Primary school students need materials and representations that they can interact with and experience in order to comprehend abstract concepts (Piaget, 1971). It is stated in many studies that the materials used to associate and concretize mathematics with daily life contribute positively to students' motivation, desire to participate in the lesson and their success (Byoung, 2001; Birgin & Tutak, 2006). Considering the educational opportunities that emerged in this study; It can be stated that the use of graphic tablets

contributes to the effective use of the teacher's time, to the students by easily performing the drawings and demonstrations of the mathematical operations, to reflect the students, to follow the process steps as in the traditional blackboard, and to make sense of the process. In the distance education process, when the teacher feels comfortable and self-confident, he can be more beneficial to his students in line with the goals and objectives of the course (Coşkun Şimşek, İnam, Yebrem Özdamar, & Turanlı, 2022). According to Coşkun Şimşek et al., (2022), graphic tablets, which are easy to use, provide motivation, interaction, visuality, etc. in distance education, especially in lessons such as mathematics. It has the potential to be a solution to prominent deficiencies such as In the related study, it is emphasized that teachers and students are satisfied with the use of graphic tablets in distance mathematics lessons and that graphic tablets positively affect interaction and communication in distance education. In this context, it can be stated that the results obtained in this study have similarities with different studies conducted in the literature.

The limitations and difficulties associated with the use of remote graphics tablets were also investigated in the study. It has been concluded that the limitations expressed due to the use of the graphic tablet are negligible. This situation can be related to the proficiency of the teachers who use graphic tablets regarding the use of technology, as well as the simplicity of the basic functions of graphic tablets. However, it can be stated that among the difficulties encountered are the sharing of the drawings on the graphic tablet in the zoom application and the calibration of the digital pen. However, it has been understood that these difficulties, which were encountered at the beginning, were overcome by the teachers over time.

Finally, the use of graphic tablets in mathematics lessons after distance education of the participants and their suggestions were investigated. Although some of the teachers had positive opinions about using the graphic tablet after distance education and recommending it to colleagues, it was concluded that most of them did not plan to use it when they returned to the classroom environment. When the transition process from face-to-face education to distance education is examined, it has been observed that instructors encounter different processes and roles in distance education practices (Dabbagh & Bannan-Ritland, 2005; Gülbahar, 2021). The methods and techniques used by the instructors in distance and face-to-face teaching differ. The lesson plan, the execution of the lesson process and many educational activities to be done differ. In this context, it can be interpreted that teachers do not have the knowledge and experience about how and in which process of education they can use graphic tablets in face-to-face education. Or, it can be stated that teachers do not need to use technology other than the traditional blackboard in terms of performing and reflecting mathematical operations in the real classroom environment in the context of the learning environment. It has been understood that it is very important to use quality graphics tablets, to practice enough before using them in the lesson, to perform pen calibration, to experience the processes for sharing what is written in the virtual environment, and these factors will limit the problems that may arise due to the use of graphics tablets during the lesson (Candaş, Ersoy, & Değer, 2022). In addition, it can be stated that planning the stage and how to use the graphic tablet during the distance lesson will prevent the negative situations that may be encountered in the classroom management during the lesson.

5. Suggestions

This study was conducted with teachers working in distance education mathematics courses during the emergency distance education process.

When we look at the findings obtained as the purpose of using the graphic tablet in mathematics lessons, it has been seen that it can have a common use with many disciplines such as writing, solving questions and lecturing. It can be stated that the use of graphic tablets in virtual lessons, which contain numerical information, require drawing and where problem-solving activities are carried out, will make a positive contribution to achieving educational outputs.

Although it is understood that the disadvantages regarding the use of graphic tablets are quite limited, teachers who will use graphic tablets should examine this technology before the lesson, give sample lectures, and integrate it with the virtual classroom application they will use, which will prevent potential live broadcast problems.

After the distance education, it was understood that most of the participant group did not think of using the graphic tablet again. This situation can also be interpreted as the need to improve teachers' awareness and competencies regarding the use and integration of technology in the teaching process. For this reason, trainings can be organized for mathematics teachers in the context of the use of graphic tablets and similar technologies for educational purposes.

This study, which was carried out in the context of the mathematics lesson, can be repeated in other lessons that we can express numerically.

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