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Research

Teachers' instructional design for e-learning for deaf and hard of hearing students [1]

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Abstract:

The purpose of this study was to examine teachers ' e-learning instructional design and practices for deaf/hard of hearing students during the COVID-19 period. For this reason, this study is assumed to serve as a reference point for the development of accessible e-learning instruction for teachers of deaf/hard of hearing students. This study is a quantitative research in survey design. During the COVID-19 pandemic, education and communication were maintained thanks to e-learning, which has become an integral part of education. Since it was intended to establish the attitudes, thoughts, and behaviors of the sample over a specific time period, a cross-sectional design was used. The data collection tool was an online survey developed by the researcher. The participants of the study were 138 teachers. However, neither before nor throughout the COVID-19 period, 13 of the participating teachers had no experience with e-learning. Therefore, they did not answer the questions related to e-learning in the third part of the survey. Descriptive statistics were used to analyze the data As a result, it was determined that teachers of deaf/hard of hearing students were unprepared for the e-learning process. They require assistance with the instructional design for e-learning.

Keywords: Deaf, hard of hearing, students with special education needs, e-learning, instructional design.

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INTRODUCTION

The pandemic process has had a devastating impact on people 's physical and psychological well-being, as well as on the need for flexible and accessible learning opportunities for students and educators (Themelis, 2023). Thus, e-learning, a form of synchronous or asynchronous learning conducted through the Internet, computer networks, and technological devices, has taken its place in education systems worldwide (Arshavskiy, 2017; Slade, 2020). Even if the pandemic process ends, it will not be possible to ignore the e-learning experience and continue in traditional classrooms as if nothing has happened because e-learning has been an important catalyst for the spread and development of digitalization At the same time, many students have met and adapted to e-learne (Rapanta et al., 2021). However, regarding education, focusing only on digitalization and technology is not enough. Many aspects of technology pedagogy should be addressed in a way that will serve lifelong learning. The first is the examination of instructor and student experience regarding the emergency e-learning process. In line with these examinations, the development of e-learning designs that will allow educators and students to learn effectively, enjoyable, and long-term in e-learning networks should be considered (Themelis, 2023). This abrupt transition in the field of education has led researchers to rethink accessible e-learning instructional designs for students with different characteristics.

E-Learning and Instructional Design

E-learning is teaching and learning supported by technological devices such as computers, tablets, smartphones, and digital technologies (Brown & Voltz, 2005; Gülbahar, 2018). E-learning is carried out in two forms as synchronous and asynchronous. Synchronous e-learning is conducted through mutual interaction by considering the learning performance of students under the leadership of an instructor, similar to a normal classroom (Arshavskiy, 2017). Asynchronous e-learning, in contrast to synchronous learning, offers students the opportunity to learn on their own at a time and at an individual pace (Slade, 2020). In this context, what is learned by watching a YouTube video, taking an online course, or attending a live webinar can be called e-learning (Arshavskiy, 2017; Gülbahar, 2018; Slade, 2020; Themelis, 2023). Learners can participate in e-learning from anywhere in the world as long as they have a computer, internet connection, and audio or video conferencing (Arshavskiy, 2017). Although traditional face-to-face learning is still very popular and widely used, e-learning is preferred by an increasing number of organizations and individuals as it offers many advantages (Garrison & Anderson, 2003; Gülbahar, 2018; Slade, 2020). The change in the learning context also affects the relationship between teachers, who are the mentors of the learning process, and students (Brown & Voltz, 2005). To meet the individual learning needs of the students, teachers should design the e-learning instruction by considering the

characteristics and learning styles of the students in the group. Effectively designed e-learning courses facilitate the achievement of targeted learning outcomes for students (Arshavskiy, 2017; Brown & Voltz, 2005; Fox, 2003). E-learning's ability to be as good as classroom learning depends on a good design.

Instructional design is a body of knowledge about instructional practices that guides teachers in achieving desired learning outcomes (Reigeluth, 1999). Mager (1984) explained instructional design based on answers to three basic questions. The first question is what the instructional objectives are. Then comes the question of which teaching strategies will be used to achieve these objectives. Finally, how to assess the level of achievement of the objectives should be considered. Today, interest in instructional design has shifted to digital literacy and pedagogy because of evolving technology and changing methods of accessing information (Gülbahar, 2018; Themelis, 2023; Zaharias & Pylygmenakou, 2009). Accordingly, e-learning instructional design has begun to be emphasized (Piskurich, 2009). There are many elements that distinguish e-learning instructional design from traditional instructional design. However, the most important aspect is that it is much more difficult to attract students ' attention and maintain their interest in an e-learning process than in a traditional instructional design. In an e-learning environment, it may not be possible for teachers to notice and eliminate students ' inattention, apathy, or other problems that they may exhibit. Simultaneously, if effective instructional design is not realized, it is much easier for participants to leave the e-learning application than to leave the physical classroom environment (Fox, 2003). Therefore, teachers who design e-learning instruction should anticipate the problems that may arise by considering the student characteristics and take precautions. At this point, teachers' competencies in using both learning and educational theories and related technological equipment and applications have gained importance (Garrison & Anderson, 2003; Steen, 2008).

Students Who Are Deaf and Hard of Hearing and E-Learning

The impact of rapidly developing digital technology in supporting the learning of individuals with different abilities and needs is increasing. E-learning offers accessibility to content by making adaptations according to the individual needs of learners due to its advantages such as its versatility in adapting to every discipline (Brownell et al., 2010; Garrison & Anderson, 2003; Slade, 2020). Teachers, the leaders of the teaching process, can largely eliminate the barriers in the education of students with special educational needs such as hearing, vision, or intellectual disabilities by taking advantage of such advantages of e-learning (Fichten et al., 2009; Sandars & Morrison, 2007). For this, teachers need to design the teaching process well, considering student characteristics (Brownell et al., 2010; Fox, 2003; Johnson & Semmelroth, 2014). Deaf/hard of hearing (D/HH) students ' preference for language and communication approaches and literacy skills differ depending on many factors such as age and degree of hearing loss, use of hearing-assistive

technology, education methods, family education, and socio-cultural and economic characteristics of the family (Marschark et al., 2002). Teachers have a responsibility to make interdisciplinary inquiries into ideas and best practices that will respond to the needs of the target audience while designing instruction. Successful teachers are known to have expertize in terms of subject area knowledge and knowledge about the learning styles of D/HH students (Spencer & Marschark, 2010). In this context, communication preferences, special educational needs, and learning styles are important issues that need to be considered to support the learning of D/HH students (Guardino, 2015; Pappas et al., 2018). According to Long et al. (2011), the quality of interaction between teachers and students in synchronous e-learning for D/HH students significantly affects their success. Effective e-learning instructional design offers the opportunity to eliminate the communication and interaction barriers that D/HH students may encounter in the physical world. E-learning instructional designs, including subtitles, videos, pictures, and sign language, have positive effects on the learning of D/HH students (Bueno et al., 2007; Pappas et al., 2018; Yoon & Kim, 2011).

Literature Review

In a study conducted by Drigas and Kouremenos (2005), the effectiveness of an e-learning design that provides D/HH students with access to information through written texts, sign language, and visualization was examined. The e-learning design in this study was found to support the learning of D/HH students by enabling them to learn with their peers. Similarly, Al-Osaimi et al. (2009) created effective e-learning design guidelines in line with the feedback of D/HH students and teachers on the grounds that existing e-learning designs are not age-appropriate and create difficulties in interaction. It was observed that the accessible and interactive e-learning instructional design positively affected the performance of the students. In the literature, research on effective e-learning applications for D/HH students has increased even more with the sudden and rapid transition to e-learning all over the world during the COVID-19 pandemic In the study conducted by Alsadoon and Turkestani (2020), it was determined that teachers working with D/HH students faced technical and sign language translation deficiencies while conducting synchronous lessons. Similarly, Karasu and Kaya (2021) examined the COVID-19 distance education process of D/HH students in vocational colleges. This research revealed that students with D/HH face various difficulties due to the limitations of their language skills and instructors face various difficulties related to e-learning instructional design. A similar result regarding educators was also encountered in the study by Elivera et al. Accordingly, special education teachers who teach D/HH students were not prepared for synchronous e-learning (Elivera et al., 2022). Atış and Doğaner (2022) conducted semi-structured interviews with teachers about teaching mathematics to D/HH students and obtained similar findings Because of this research, it was concluded that digital materials have positive effects on student motivation, but teachers lack knowledge in preparing digital materials. Considering all these research results, this led to a comprehensive

investigation of e-learning instructional design and the experience of teachers who suddenly started to implement e-learning applications with D/HH students during the COVID-19 process. Thus, it is hoped that the future e-learning experiences of D/HH students and their learning with the help of in-class educational technologies will become more qualified. It is assumed that this research will guide the design of accessible e-learning instruction for learners working with D/HH students. In addition it is thought that it will also make important contributions to classroom educational technologies and instructional designs.

Research Objective

The aim of this study was to examine teachers ' e-learning instructional design and practices for D/HH students during the COVID-19 period. For this purpose, answers the following questions were sought:

Sub-problems

Q1: How is the technical infrastructure used by teachers in e-learning?

Q2: How does the teacher use language and communication modes in e-learning?

Q3: What are teachers ' attitudes toward the reorganization of instructional objectives in e-learning?

Q4: Did teachers use different teaching methods in e-learning than in face-to-face lessons?

Q5: What are the e-materials used by teachers in e-learning and the problems related to e-material design?

Q6: How do teachers use assessment methods and e-assessment tools in e-learning?

Q7: What are the subjects in which teachers want to gain knowledge and experience in e-learning?

METHOD

Research Model

In this study, which was conducted to examine the e-learning instructional design and the practices of teachers for D/HH students during the COVID-19 pandemic period, a quantitative survey design was used. During the COVID-19 pandemic, education and communication were maintained thanks to e-learning, which has become an integral part of education. Since it was intended to establish the attitudes, thoughts, and behaviors of the sample over a specific time period, a cross-sectional design was used (Creswell, 2012).

Participants

The population of this research is teachers in schools working with D/HH students with primary, secondary, and high school levels in Turkey. There are no schools for D/HH students in any of the 81 provinces of Turkey. Accordingly, there are 32 primary and secondary schools and 20 vocational high schools for D/HH students in Turkey (MoNE, 2022). In this context, considering that the pandemic period has not yet ended and the

voluntary nature of the participants, the convenience sampling method was preferred (Patton, 2005). An online survey call was sent to 138 teachers who agreed to participate in this study. However, 13 of the participating teachers had no e-learning experience either prior or throughout the COVID-19 period. Therefore, they did not answer the questions related to e-learning in the third part of the survey. As shown in Table 1, the presentation of participant demographic information was given.

Table 1.

Demographic Information of the Participants (n=125)

	Frequency (f)	Percentage (%)
The type of school (deaf/hard of hearing)		
Primary School	36	26
Middle School	74	54
Special Education Vocational High School	28	20
Gender		
Male	70	51
Female	68	49
Age		
20-30	8	6
31-40	40	29
41–50	51	37
51 and over	39	28
Professional working time (years)		
0-5	6	4
6-10	14	10
11-15	29	21
16-20	23	17
21 and over	66	48
Education Level		
Associate degree	4	3
Undergraduate degree	112	81
Master's degree	22	16
Branch		
Biology	1	1
Chemical	1	1
Geography	3	3
Guidance and Psychological Counseling	3	3
Handicrafts	6	4
History	5	4
Information Technologies	6	4
Mathematics	9	7
Music	4	3
Physical Education	2	2
Religious Culture and Moral Knowledge	6	4
Science	10	7
Social Science	6	4
Special Education	48	34
Technology and Design	4	3

Turkish Language and Literature	18	12
Visual Arts	6	4
Conducting E-Learning prior to or throughout COVID-19		
Yes	125	91
No	13	9
Total	**138**	**100**

As seen in Table 1, teachers working in schools for the D/HH at the secondary school level (f=74, 54%) participated the most. This was followed by teachers working in schools for the D/HH at the primary school (f=36, 26%) and vocational high school (f=28, 20%) levels. Considering the gender of the participants, it is seen that the number of male teachers (f=70, 51%) is slightly higher. Considering the age range, the number of participants was higher among teachers aged 31-40 (f=40, 29%) and 41–50 (f=51, 37%). At the same time, the number of teacher participants aged 51 and over is high (f=39, 28%). The least number of teachers who participated were between the ages of 20 and30 (f=8, 6%). Regarding teachers' working time in the profession, teachers with 21 years or more experience (f=66, 48%) participated the most. The least number of teachers who have 5 or fewer years of experience participated (f=6, 4%). Most of the participating teachers had an undergraduate degree (f=112, 81%). In addition, special education teachers (f=48, 34%) and teachers from different branches participated the most. Thirteen of the participating teachers (9%) did not conduct e-learning prior to or throughout COVID-19. Accordingly, they did not respond to the following questions. The branches of these teachers are special education (f=8), guidance and psychological counseling (f=2), religious culture and ethics (f=2), Turkish language and literature (f=2) and science (f=2).

Data Collection Tools

In this study, the data collection tool was an online survey developed by the researcher. The onlinesurvey was developed following the methods described in the literature to support communication and learning of D/HH students (Bruce & Borders, 2015; Lederberg et al., 2013; Marschark et al., 2011; Yoshinaga-Itano et al., 1998) and models of e-learning instructional design (Gagné et al., 1992; Keller, 2010; Koohang, 2009; Rose & Meyer, 2002). To increase the content validity of these survey items, the opinions of two researchers with doctoral degrees in the field of education of the D/HH students were obtained. As a result, an open-ended question about teachers ' knowledge and practice requirements regarding e-learning was added in the last section. Simultaneously, a pilot study was conducted with 6 teachers working with D/HH students to measure the comprehensibility of the survey. These pilot applications were excluded from the research findings. A participation consent form was added to the link of the online survey. Accordingly, the online survey comprised eight sections. The first section includes the purpose of the research and the consent section. The second section includes demographic information about the participants. In the third section, there are questions about the technical infrastructure related to e-learning. The fourth section includes language and

communication, the fifth section includes instructional objectives and teaching methods, the sixth section includes e-material usage and design, and the seventh section includes various question types in the subject areas of teaching assessment. In the last section, there is an open-ended question about teachers ' knowledge and practice needs related to e-learning.

Data Analysis

Descriptive statistics were used to analyze the data. The data were analyzed using the Microsoft Excel infrastructure of Google Forms, which was used to collect the data. Google Forms presents the responses of the people filling out the form as statistics such as frequency and percentage through Microsoft Excel. At the same time, Microsoft Excel provides the opportunity to perform many calculations such as mean and standard deviation calculations. The data were transferred unchanged and checked by another professional. Accordingly, frequency, percentage, mean, and standard deviation values were calculated for the third question of this study. For the other questions of the study, only frequency and percentage values were calculated.

Ethical considerations

In alignment with the overarching commitment to ethics, this study stringently adhered to all provisions delineated in the "Higher Education Institutions Scientific Research and Publication Ethics Directive." It is imperative to note that there were zero instances of activities that might infringe upon the clauses stated under the "Actions Against Scientific Research and Publication Ethics."

Ethics committee and Turkish Ministry of National Education permissions were obtained, and the online survey link was sent to the schools. The data of this research were collected between January and July 2022. Data were meticulously harvested electronically, ensuring the privacy and anonymity of the respondents.

Ethical Review Board: Bursa Uludag University

Date of Ethics Review Decision: May 28, 2021

Ethics Assessment Document Issue Number: 2021–05

RESULTS

The findings related to the data collected through the online survey are presented under subheadings in accordance with the subproblems of the research.

Findings Related to the Technical Infrastructure Related to E-Learning

The data related to the technical infrastructure regarding e-learning are presented in Table 2 as the physical environment where e-learning is conducted, the tools used to access e-learning, the platforms on which e-learning is conducted, and the subject areas of past knowledge-experience related to e-learning. Participants were given the opportunity to tick more than one option while answering these questions.

Table 2.

Technical Infrastructure Related to E-Learning

	f	%
Physical Environment in which E-learning occurs		
Home	125	60,4
School	57	27,5
Outside	25	12,1
Tools Used to Access E-learning		
Computers smartphones/	106	43,5
Smartphones/tablets	105	43,0
Smartboards	33	13,5
Platforms used in e-learning		
Zoom	121	81,7
Google Meet	9	6,1
Teams	9	6,1
Whatsapp	8	5,4
Teamlink	1	0,7
Background Knowledge and Experience of E-learning		
No	115	92,0
Yes	10	8,0
Adult education		
Project meetings in eTwinning		
Interest in technology		

As seen in Table 2, participant teachers mostly conduct e-learning applications from home (f=125, 60.7%). At the same time, it is seen that they also conduct e-learning applications from school (f=57, 27.5%) and outside (f=25, 12.1%). they mostly use tools such as computers (f=106, 43.5%) and smartphones/tablets (f=105, 43%) to access e-learning. In addition, it was determined that some teachers accessed e-learning via the smart board in the classrooms (f=33, 13.5%). teachers mostly use platforms such as Zoom (f=121, 81.7%), to a lesser extent Google Meet (f=9, 6.1%), Teams (f=9, 6.1%), Whatsapp (f=8, 5.4%), and Teamlik (f=1, 0.7%) in e-learning. Finally, it was determined that most of the teachers (f=115, 92%) had no past knowledge or experience about e-learning. It was understood that some teachers (f=10, 8%) who had previous knowledge and experience had e-Twinning project meetings and an interest in technology and adult education.

Findings Related to Language and Communication in E-Learning

Under this heading, the findings related to the language and communication modes that the participant teachers think are effective in e-learning, as well as the language and communication problems caused by teachers and students, are presented (see Table 3). Participant teachers were given the opportunity to tick more than one option while answering questions about teacher- and student-induced language and communication problems.

Table 3.

Language and Communication in E-Learning

	f	%
Language and Communication Mode Used in E-Learning Courses		
Both spoken and sign language together	93	74,4
Only sign language	15	12,0
only written communication	7	5,6
Others	10	8,0
Sign language-oral language-writing together		
Teacher-related Language and Communication Problems in E-Learning		
Not being able to use sign language correctly and functionally	59	33,3
Lack of knowledge and experience in alternative communication systems	40	22,6
Lack of sign language interpretation	37	20,9
Not being able to use spoken language effectively according to the level of the student	31	17,5
Others	10	5,7
No answer given		
No problems		
Technical issues		
D/HH Students' Language and Communication Problems in E-Learning		
Lack of eye contact and shared interest	61	21,9
Not being able to use sign language correctly and functionally	52	18,7
Limited oral language and communication skills	47	16,9
Failure to match hearing aids with distance learning tools	46	16,6
Lack of knowledge and experience in alternative communication systems	38	13,6
Lack of sign language interpretation	26	9,4
Others	8	2,9
Dropping out of class		
Not attending class		
Tecnical issues		

As seen in Table 3, most of the teachers stated that they used both oral and sign language together in e-learning (f=93, 74.4%). The remaining teachers used only sign language (f=15, 12%), sign language-oral language-writing together (f=10, 8%), and only written communication (f=7, 5.4%)

In addition teachers' inability to use sign language correctly and functionally (f=59, 33.3%) is one of the problems arising from e-learning. There are also problems arising from lack of knowledge and experience in alternative communication systems (f=40, 22.6%). In addition, it was found that a considerable number of teachers experienced problems due to the inability to interpret sign language (f=37, 20.9%) and the inability to use oral language effectively in accordance with the level of the student (f=31, 17.5%). Some teachers (f=10, 5.7%) stated that there were language and communication problems due to technical problems. Eye contact and lack of common interest (f=61, 21.9%) were the main language and communication problems caused by students. This was followed by

problems arising from students ' inability to use sign language correctly and functionally (f=52, 18.7%), limitations of their oral language and communication skills (f=47, 16.9%), and inability to match hearing aids and distance education tools (f=46, 16.6%). In addition students reported problems due to a lack of knowledge and experience with alternative communication systems (f=38, 13.6%) and a lack of sign language interpretation (f=26, 9.4%). Some students (f=8, 2.9%) had language and communication problems such as technical problems, dropping out, and not attending the course.

Findings Related to Attitudes toward the Reorganisation of Instructional Objectives in E-Learning

Teachers' attitudes toward setting instructional objectives in e-learning are presented in Table 4.

Table 4.

Attitudes toward the Reorganisation of Instructional Objectives in E-Learning

Attitudes toward the reorganization of instructional objectives in e-learning (n=125)	**Strongly disagree**		**Disagree**		**Undecided**		**Agree**		**Strongly agree**		**Mean**	**Standard Deviation**
	f	%	*f*	%	*f*	%	*f*	%	*f*	%		
Instructional objectives for e-learning courses should be reorganized by considering the needs of students.	1	0,8	2	1,6	16	12,8	30	24	76	60,8	4,42	0,835
Instructional objectives for e-learning courses should be reorganized according to group or individual education.	1	0,8	3	2,4	21	16,8	33	26,4	67	53,6	4,30	0,889
Instructional objectives for e-learning courses should be reorganized by considering teaching time.	0	0	3	2,4	25	20	33	26,4	64	51,2	4,26	0,862

As can be seen in Table 4, most of the teachers (agree + strongly agree, f=106, 84.8%) stated that the instructional objectives for e-learning courses should be reorganized by considering the needs of the students. It was understood that there were teachers who were undecided (f=16, 12,8%) on this issue, as well as some teachers who thought that there was no need for reorganization (disagree + strongly disagree, f=3, 2,4%). Another finding is the high rate (agree + strongly agree, f=100, 80%) of teachers' attitudes toward the reorganization of instructional objectives for e-learning courses according to whether they are individual or group education. However, some teachers were undecided (f=21, 16.8%), while others (f=4, 3.2%) disagreed and strongly disagreed. Finally, most of the teachers (agree + strongly agree, f=97, 78.6%) expressed their attitudes toward reorganizing

the instructional objectives for e-learning courses by considering the teaching time. While some teachers were undecided (f=25, 20%), very few teachers (f=3, 2,4%) disagreed with this idea. In addition to the attitudes toward the determination of instructional objectives in e-learning, findings were obtained regarding the teaching methods used by teachers in e-learning, which are different from those used in face-to-face education (see Table 5).

Findings Related to Teaching Methods in E-Learning

Findings regarding the teaching methods used in e-learning differently from face-to-face courses are presented in Table 5.

Table 5.

Teaching Methods Used in E-Learning Courses

	f	%
Yes	102	81,6
*EBA contents		
e-book		
Web 2.0 tools		
No	23	18,4
Total	**125**	**100**

*EBA (**E**ğitim **B**ilişim **A**ğı [Education Information Network])

As seen in Table 5, it was determined that most of the teachers (f=102, 81.6%) used teaching methods different from face-to-face education in e-learning courses. These tools are EBA content, e-books, and Web 2.0 tools. It was understood that the other part of the participant teachers (f=23, 18,4%) did not use teaching methods different from face-to-face education in the lessons with e-learning.

Findings on E-Material Usage and Design

The findings regarding the use and design of e-materials by teachers working with D/HH students are presented in Table 6. Participants were given the opportunity to tick more than one option while answering these questions.

Table 6.

E-Material Usage and Design Issues

	f	%
E-materials Used in E-Learning Process		
Videos	107	32,5
Power Point	78	23,7
Word and pdf documents	53	16,1
Digital drawing and writing programs	52	15,8
Oral presentations	33	10,1
Other	6	1,8
Web 2.0 tools		

Problems in the E-material Design		
Internet access and its limitations	75	17,5
Insufficient technological devices	71	16,6
Insufficient motivation	63	14,7
Insufficient support and cooperation of the parents	52	12,1
Insufficient experience in using applications related to e-material design	50	11,7
Not knowing which programs can be used in e-material design	46	10,7
Lack of support and cooperation from other experts in e-material design	34	8,0
Time limitation	34	8,0
No problems	3	0,7

As seen in Table 6, teachers mostly use videos (f=107, 26,4%) and PowerPoint (f=78, 19,2%) in the e-learning process. These were followed by Word and PDF documents (f=53, 13.1%), digital drawing and writing programs (f=52, 12.8%), and oral presentations (f=23, 8.2%). Some teachers (f=6, 1.4%) stated that they used web 2.0 tools. In addition it is also among the findings that most of the teachers (f=76) use traditional tools such as paper, notebook, and pen in the e-learning process.

Teachers face many problems in e-material design. These are, respectively, internet access and limitations (f=75, 17.7%), insufficient technological devices (f=71, 16.6%), insufficient motivation (f=63, 14.7%), insufficient support and cooperation of parents (f=52, 12.1%), insufficient experience in the use of applications related to e-material design (f=50, 11,7%), not knowing what programs can be used in e-material design (f=46, 10,7%), lack of support and cooperation of other experts in e-material design (f=34, 8%) and time limitation (f=34, 8%). Very few teachers (f=3, 0.7%) stated that they had no problems designing e-materials.

Findings Related to Assessment of Teaching in E-Learning

The findings regarding the assessment methods used by the teachers in e-learning and their use of e-assessment tools are presented in Table 7.

Table 7.

Assessment of E-Learning

	f	%
Assessment Methods Used in E-Learning Courses		
Question-answer	55	44,0
Exams consisting of different question types	38	30,4
Observation	17	13,6
Not used	15	12,0
Use of E-Assessment Tools		
Yes	110	88,0
EBA assessment tools		
Web 2.0 tools (Kahoot, Quiziz, learningApps, Mentimeter, wooclap)		
No	15	12,0
Total	**125**	**100**

As seen in Table 7, teachers used assessment methods such as question-answer (f=55, 44%), exams consisting of different question types (f=38, 30.4%), and observation (f=17, 13.6%) in e-learning courses. Some teachers (f=15, 12%) stated that they did not use any assessment and evaluation techniques. In addition, most of the teachers (f=110, 88%) used e-assessment tools. It was determined that these tools were EBA assessment and web 2.0 tools.

Findings Related to Subjects Teachers Want to Gain Knowledge and Experience about E-Learning

In this study, the attitudes and practices of teachers who have e-learned experiences with D/HH students were analyzed. Finally, the findings related to the subjects in which teachers would like to gain knowledge and experience about e-learning are presented in Table 8.

Table 8.

Subjects Teachers Want to Gain Knowledge and Experience about E-Learning

	f	%
Subjects Teachers Want to Gain Knowledge and Experience about E-Learning		
E-learning material design	13	15
E-learning content preparation	12	13,8
Interactive course design	11	12,7
Effective use of e-learning platforms	9	10,4
E-öğrenmede değerlendirme yöntemleri	6	6,9
Video and image processing programs	6	6,9
Technological education knowledge	6	6,9
Using web 2.0 tools	5	5,8
Effective communication in e-learning	3	3,4
E-learning motivation techniques	3	3,4
Efficient use of time in e-learning	3	3,4
Sign language training	3	3,4
Preparing e-learning content using sign language	3	3,4
All type of training on e-learning	2	2,3
Not want (did not find e-learning useful for the D/HH students)	2	2,3
Total	**87**	**100**

As seen in Table 8, there are many subjects in which teachers want to gain knowledge and experience about e-learning. It is understood that e-learning material design (f=13, 15%), e-learning content preparation (f=12, 13,8%), interactive course design (f=11, 12,7%), and effective use of e-learning platforms (f=9, 10,4%) are the main topics.

Other subjects that are desired to gain knowledge and experience are assessment methods in e-learning (f=6, 6,9%), video and image processing programs training (f=6, 6,9%), technological education knowledge (f=6, 6,9%) and using web 2.0 tools (f=6, 5,8%). In addition to these, effective communication in e-learning (f=3, 3.4%), e-learning motivation techniques (f=3, 3.4%), efficient use of time in e-learning (f=3, 3.4%), efficient use of time in e-learning (f=3, 3.4%), 4%), sign language training (f=3, 3.4%), and preparing e-learning contents with sign language (f=3, 3.4%). Some teachers stated that they wanted to receive all type of training (f=2, 2.3%), while others stated that they did not want to receive any training (f=2, 2.3%) on the grounds that they did not find e-learning useful for the D/HH students.

DISCUSSION

Because of the analysis of the data collected through the questionnaire to examine the teachers ' e-learning instructional design and practices for D/HH students during the COVID-19 period, important results that will contribute to the literature were obtained.

In this study, it was determined that the participant teachers mostly conducted synchronous e-learning applications from home. At the same time, they sometimes conducted them from school and outside. One of the strengths of e-learning is that it offers flexibility in accessing education (Arshavskiy, 2017; Garrison & Anderson, 2003; Gülbahar, 2018; Slade, 2020; Themelis, 2023). Another result was that teachers mostly access e-learning applications using tools such as computers, smartphones and tablets. Some teachers accessed e-learning applications via a smart board. Besides, almost all of the teachers used the Zoom platform. Some teachers used Teams, Google Meet, and Teamlink. In addition teachers continued to use e-learning applications via WhatsApp. It was concluded that the majority of the teachers had no previous experience with the platforms they used. On the other hand, very few teachers had previous experiences related to the platforms they used in this process through adult education, e-twinning project meetings, and interest in technology. In line with the results obtained, the fact that most of the teachers used the Zoom platform and some teachers used different platforms can be explained by the fact that EBA, the educational information network prepared by the Turkish Ministry of National Education, used the Zoom platform as an infrastructure in this process. Another result is that teachers do not have experience with e-learning, which suddenly entered their lives, they may have been caught unprepared. Similarly, Toquero (2020) stated that teachers had difficulties in planning, implementing instruction, and assessing student performance due to the sudden transition to e-learning. However, it is thought that teachers who have developed technological literacy and the ability to design instruction in accordance with student needs can adapt to this process in a shorter time.

Most of the teachers related to the subject area of language and communication in e-learning stated that they use both oral and sign language together in e-learning. In addition, it was understood that some teachers prefer only sign language and others prefer

only written communication. Some teachers used sign-written-oral language with all three communication systems in e-learning. On the other hand, it was concluded that no teacher preferred to use only oral language. There are similar findings in the literature that effective e-learning applications for D/HH students are sign language and text-supported (Beal-Alvarez & Cannon, 2014; Debevc et al., 2014; Keser & Özdemir, 2018; Pappas et al., 2018). It was concluded that the problems related to language and communication during synchronous e-learning stemmed mostly from teachers' inability to use sign language correctly and functionally. Other language and communication problems arising from the teachers were determined to be the inability to interpret sign language, inadequate knowledge and experience of other alternative communication systems, and inability to use spoken language effectively according to the level of the student. The findings of this study regarding communication problems in e-learning applications due to educators ' inability to use sign language functionally and the lack of sign language interpretation support are supported by other research results in the literature (Aljedaani et al., 2021; Atış & Doğaner, 2022; Karasu & Kaya, 2021; Lynn et al., 2020; Schafer et al, 2020). Considering the teacher-related results in language and communication in this study and the literature together; developing the competencies of teachers working with D/HH students regarding sign language and alternative communication systems is an urgent necessity not only for e-learning but also for traditional classroom education. The main language and communication problems arising from the students are eye contact and lack of common interest. This was followed by problems arising from the students ' inability to use sign language correctly and functionally, limitations of oral language and communication skills, and inability to match hearing aids and distance education tools. In addition it was concluded that there were problems arising from students ' lack of knowledge and experience with alternative communication systems and their inability to interpret sign language. Some student-related language and communication problems, such as technical problems, dropping out of the course, and not attending the course were identified. In this study, it is thought that other problems underlie the problems arising from students' inability to establish eye contact and common interest in e-learning applications. Not receiving clear auditory input due to the mismatch between hearing aids and distance learning tools and not receiving visual language input due to the lack of sign language interpretation directly limit communication. On the other hand, the limited oral language skills of the students and the inability of the teachers to use oral language effectively according to the level of the student may have made it difficult for D/HH students to establish a common interest. In addition, as Kear et al. (2012) stated, deaf/hard of hearing students may not establish eye contact and joint interest despite the screen, thinking that the teacher is not directed toward them. At the same time, it is known that D/HH students' fatigue increases, their performance decreases, and they cannot participate effectively in e-learning courses (Rodrigues et al, 2022).

Most of the teachers revealed their attitudes toward the redetermination of instructional objectives in e-learning, considering student needs, whether it is an individual or group lesson, and instructional time. Similar to the findings of this research, there are similar research results that most of the teachers in Turkey benefit from EBA content in e-learning (Demir & Özdaş, 2020; Çiftçi & Aydın, 2020; Tartuk & Turan, 2023). In addition, it was determined that most of the teachers used different teaching methods than face-to-face education in e-learning courses. They stated these as EBA content, e-books, and Web 2.0 tools. It is pleasing that the teachers' attitude toward the reorganization of instructional objectives for e-learning courses is positive. As stated by Filiz and Güneş (2020), conducting e-learning in line with the objectives determined in face-to-face education may have many negative consequences. On the other hand, the result that teachers used different teaching methods from face-to-face education by using EBA contents, e-books, and web 2.0 tools can be interpreted as an attitude toward conducting effective e-learning courses.

Regarding the e-materials used in the e-learning process, videos and PowerPoint are mostly used. In addition, Word and PDF files, digital drawing and writing programs, oral presentations, and Web 2.0 tools were used by the teachers. In addition, it was also determined that most of the teachers used traditional tools such as paper, notebook and pen in the e-learning process. Materials containing visual and auditory information in both e-learning and traditional classroom teaching support the learning, motivation, and development of language skills of D/HH students (Beal-Alvarez & Cannon, 2014). E-learning provides access to teaching material to suit their various needs, including high-level visualization, bilingual information, and. (Pappas et al., 2018). In this study, it was concluded that teachers had problems with e-material design due to the lack of internet access and technological devices, motivation, time, parents ' support, and cooperation. In addition, problems arising from a lack of experience in e-material design and expert support were reported. Although it is easy to access e-materials prepared today, teachers' ability to design or adapt their own e-materials is an important requirement in a rapidly changing and digitalized world. In this context, arrangements from the individual to the institutional level should be made to solve problems such as internet and technological device access, motivation, and expert support for teachers to design e-materials.

Regarding the evaluation of e-learning, it was determined that teachers used measurement and evaluation techniques such as question-answer, exams consisting of different question types, and observation in synchronous lessons. At the same time, it was found that most of the teachers made e-assessments through EBA assessment and web 2.0 tools. According to these results, the assessment and evaluation techniques and tools used by teachers in the e-learning process do not vary. There are similar results in the literature that limited assessment and evaluation techniques and tools were used in e-learning during the COVID-19 period (Alshawabkeh et al., 2021; Sani-Bozkurt et al., 2022). The importance of assessment and evaluation in determining the effectiveness of e-learning

courses and the level of achievement of learning outcomes cannot be discussed. In this context, teachers' knowledge and skill development regarding different types of assessment and evaluation methods and tools suitable for student characteristics should be supported.

Finally, it was understood that there are many subjects in which teachers want to gain knowledge and experience about e-learning. The most important are e-learning material design, e-learning content preparation, interactive course design, and effective use of e-learning platforms. In addition there are topics such as evaluation methods in e-learning, video, image processing programs training, technological education knowledge, and the use of web 2.0 tools. At the same time, it was concluded that they would like to receive training on effective communication in e-learning, e-learning motivation techniques, efficient use of time in e-learning, sign language training, and preparing e-learning contents with sign language. Today, digitalization has brought about a very rapid change and transformation. Its effects on all areas of our lives are inevitable. Digital transformation has become much more evident in education with COVID-19. The issue of digitalization in education has become increasingly important. With digitalization in education, more comfortable, accessible and flexible time-based learning opportunities have emerged (Kocaman-Karoğlu et al., 2020). Accordingly, it is inevitable that this change will not affect teacher qualifications. To meet changing student needs, teachers need to be prepared to include digital student-centred practices in the teaching process (Arshavskiy, 2017; Fox, 2003; Garrison & Anderson, 2003; Robertson, 2020).

LIMITATIONS AND RECOMMENDATIONS

The main limitation of this study is related to the structure of the survey and the areas of instructional design that were not addressed. Given that this is a cross-sectional survey on the pandemic, the survey instrument was reviewed by professionals before dissemination to ensure its reliability and validity. Secondly, for the pilot study, six teachers working with the D/HH students completed the online survey. As a result of these procedures, the survey was finalised and used. Overall, this study conducted with teachers working with only one group of students with special education needs. It is important to conduct studies using different research methods and designs with teachers working with students with different special education needs.

CONCLUSION

When the results obtained in this study regarding the instructional design of teachers who conducted e-learning with D/HH students were evaluated, it was understood that the teachers were unprepared for e-learning. It was understood that teachers faced various problems in e-learning instructional design related to language and communication. The most important of these problems is the inability of teachers and students to use sign language correctly and functionally, as well as the inability of

students to establish eye contact and common interest. Considering that the primary need of D/HH students is language and communication, both teachers and students should be trained to use sign language correctly and functionally to benefit from both e-learning and traditional classroom environments. Although teachers' attitudes toward the reorganization of instructional objectives for e-learning courses are positive, whether they have attempted to implement this is an issue that needs to be further investigated.

In addition to these, although the teachers stated that they used different materials, teaching, and evaluation methods than traditional classroom education in the e-learning process, the examples given are not as extensive as it is thought. It was understood that they mostly used ready-made materials and had limited knowledge and skills in designing e-materials. In addition, they mostly benefited from EBA content in the teaching method and the e-assessment process.

Finally, it was found that teachers need support in designing e-learning instructions and materials, e-learning content preparation, interactive course design, and effective use of e-learning platforms. In this context, more in-service training is needed to enable the development of teachers on e-learning to keep up with the rapid digitalization

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