| Research Article / Araştırma Makalesi|

Examination of Distance Education Processes from the Perspective of Science Teachers

Uzaktan Öğretim Süreçlerinin Fen Bilimleri Öğretmenlerinin Bakış Açısına Göre Irdelenmesi[1]

Ersin Karademir[2]**, Kübra Altunsoy**[3]

Abstract

Purpose: The purpose of this study is to examine the opinions of science teachers who teach online about synchronous distance education applications that allow teachers and learners to come together regardless of place and time, and to examine them based on teacher experiences.

Design/Methodology/Approach: This study, which was prepared to determine the views of teachers on distance education, was carried out with the case study model. The study group of the research was carried out with 19 science teachers from different schools and institutions with different years of seniority. A structured interview form was used as a data collection tool. The data has been collected remotely; The research data obtained were analyzed through content analysis.

Findings: Science teachers stated that the transition to distance education completely affects the quality of education negatively. However, it has been stated that distance education and face-to-face education can create beneficial results when used together effectively. In addition, the positive side of distance education is to carry out distance education and to access digital content easily in cases where education stakeholders cannot be together physically.

Öz

Çalışmanın amacı: Bu çalışmanın amacı, çevrimiçi ders veren Fen Bilimleri öğretmenlerinin, yer ve zamandan bağımsız olarak öğretmen ve öğrenenin bir araya gelmesine olanak sağlayan eş zamanlı uzaktan eğitim uygulamalarına ilişkin görüşlerinin incelenmesi ve ve öğretmen deneyimlerine dayalı olarak irdelenmesidir.

Materyal ve Yöntem: Öğretmenlerin uzaktan öğretime Yönelik görüşlerinin tespit edilmek üzere hazırlanan bu çalışma durum çalışması modeliyle yürütülmüştür. Araştırmanın çalışma grubunu farklı okul ve kurumlarda, değişik kıdem yıllarına sahip 19 Fen Bilimleri Öğretmeni ile gerçekleştirilmiştir. Veri toplama aracı olarak yapılandırılmış görüşme formu kullanılmıştır. Verilerin uzaktan yollarla toplanmış olup; elde edilen araştırma verileri içerik analizi yoluyla çözümlenmiştir.

Bulgular: Fen Bilimleri öğretmenleri, tümüyle uzaktan öğretime geçilmesinin eğitim niteliğini olumsuz etkilediğini belirtmişlerdir. Ancak uzaktan eğitim ve yüz yüze eğitim beraber etkili kullanıldığında yararlı sonuçlar oluşturabileceği belirtilmiştir. Ayrıca eğtim paydaşlarının fiziki olarak bir arada bulunamadığı durumlarda uzaktan eğitimi gerçekleştirmek ve dijital içeriklere kolaylıkla ulaşabilmek, uzaktan eğitimin olumlu tarafı olarak belirtilmiştir.

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[2] **Corresponded Author,** Eskişehir Osmangazi University, Faculty of Education, Department of Mathematics and Science, Eskişehir, Türkiye; https://orcid.org/ 0000-0002-8519-622X, eekarademir@gmail.com
[3] Ministry of Education, Ankara, Türkiye; https://orcid.org/ 0000-0003-3749-772X , kubraleb@hotmail.com

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INTRODUCTION

The use of digital content in learning-teaching processes is inevitable with the change in technology. As technology and the digital world have changed rapidly in recent years, the structure of in-class and out-of-class practices, teachers and students have had to change. Educational stakeholders (student-teacher), who only exist together in the classroom or school environment, have turned into an interactive system that can come together in different environments or times with the development of technology. With this change, distance learning environments, one of the rapidly developing digital learning technologies in recent years, have begun to be used by many people and have begun to replace face-to-face education environments (Gençer, 2015). Blended learning is also mentioned at the point where face-to-face education environments replaced by digital learning technologies meet with non-formal learning styles (Graham, 2013). However, most of the research on online teaching has focused on studies that combine online and face-to-face environments, rather than blended learning environments that make face-to-face education possible (Usta and Mahiroğlu, 2008).

The pandemic period seen all over the world as of 2020 accelerated this and subsequently made it a popular concept. Distance learning, which has many different types, appears as blended learning, which has an important place in academic research. Blended learning is learning practices in which face-to-face teaching environment is combined with internet and computer-based digital tools. Blended learning is defined as a distance education method used by combining technology with known face-to-face education and training (Allan, 2007; Bonk and Graham, 2013). Electronic materials as well as non-electronic materials can be used in distance education. Therefore, it is a more comprehensive term than e-learning (Altunsoy and Karademir, 2022). According to Matthews (1999), although distance education first emerged to meet the needs of individuals who cannot attend face-to-face or continuous education, it has been preferred over other education methods because it meets different content needs. While distance education provides a flexible learning environment for students, it also provides positive benefits to parents, society and all users (Harasim, 1996; Kuboni, 2013). Simultaneous or split-time tools offered by distance education have features that will increase interaction by eliminating people's time and space limitations (Sun et al., 2008). These opportunities offered by distance education offer more intensive, flexible and accessible programs to students without the need for educational institutions to physically build new places (Dixon, 1996). In this context, it makes it easier for teachers to give instant feedback to students, reach a wide and diverse audience, provide sustainable content, and enable different research (Deal, 2002; Revere and Kowach, 2011; Ruiz, Mintzer and Leipzig, 2006; Özcan, 2019). .

It is of great importance to focus on the experiences of teachers, one of the most important practitioners of distance education practices, in this process. Nowadays, when distance education has taken a different and effective path, it is a matter of curiosity how the understanding of distance education in science teaching will be adopted, teachers' willingness to this education, their acceptance of the change in their duties and roles, their adaptation to developing conditions, and their views on new technologies and distance education. Because the nature of the Science course includes practical experiments as well as theoretical knowledge. For this reason, the opinions of science teachers who conduct theoretical and applied courses regarding distance education are important. The purpose of this research is to reveal the problems experienced in the process based on the opinions of science teachers who teach online in distance education applications in terms of the learning-teaching process, content, technology usage status, measurement and evaluation dimensions. In accordance with this purpose; It is aimed that the positive and negative opinions of science teachers on this subject will give ideas to those who direct science education and teaching activities.

Within the framework of this problem, answers to the following research questions will be sought:

1. What are the teachers' opinions on distance education?

2. What are the practices of teachers regarding the learning-teaching process in distance education?

3. What are the conveniences and difficulties experienced in the distance education process for teachers?

4. What are their opinions on improving distance education practices for teachers?

METHOD

Research Model

This study was conducted with a case study model based on a qualitative approach. The important features of qualitative research are that qualitative research techniques are carried out sensitively to the natural environment, the researcher assumes the role of participant, has a holistic approach, ensures that participant perceptions are revealed, has flexibility in the research method and allows for an inductive analysis (Yıldırım & Şimşek, 2008). Case study is defined as a method in which one or more events, environments, programs, social groups or other interconnected systems are investigated in depth (McMillan, 2000, p. 10). What distinguishes case study from other types of research is that it is based on "How" and "Why" questions and allows for in-depth investigation of phenomena that the researcher cannot control (Çepni, 2010). In this study, it was conducted with this method, since it was aimed to examine in detail the opinions of science teachers who teach online on the use of distance education applications.

Study Group

Case studies examine an existing situation, event or process in depth with a limited number of samples. According to Patton (2014), purposeful sampling allows the situations/events to be examined in depth in order to provide rich data. For this reason, since in-depth analysis was aimed when selecting the study group, maximum diversity sampling, one of the purposeful sampling methods, was preferred. The main purpose of this sample selection is not to make generalizations, but rather to identify commonalities between various situations and to reveal differences within the scope of this diversity (Yıldırım and Simsek, 2013). Within the scope of this sampling method the study group of the research consists of 19 science teachers working in schools in different regions and socio-economic levels of Türkiye. 15 of the participants were female and four were male; 14 of them teach at public secondary schools, four of them at private secondary schools, and one of them teaches at the Science and Art Center. It is seen that the teachers participating in the research have different years of professional experience. However, it is seen that the majority of the teachers participating in the research have 6-10 years of experience. The codes of the participants participating in the research and their demographic characteristics such as gender and years of professional experience are given in Table 1.

Table 1. Demographic characteristics of the study group

Code of Teacher	Gender	Seniority year	Type of School	Weekly Lesson Hours Conducted by Distance Education
T1	Female	6-10	Public School	18
T2	Male	11-15	Public School	20
T3	Female	6-10	Private School	28
T4	Female	11-15	Public School	20
T5	Female	6-10	Public School	24
T6	Female	16-20	Public School	28
T7	Female	26-30	Public School	20
T8	Male	6-10	Public School	24
T9	Female	1-5	Private School	16
T10	Female	26-30	Public School	16
T11	Female	6-10	Private School	20
T12	Female	15-20	Public School	12
T13	Male	11-15	Public School (SAC*)	30
T14	Female	6-10	Private School	32
T15	Female	6-10	Public School	24
T16	Female	6-10	Public School	26
T17	Male	21-25	Public School	16
T18	Female	6-10	Public School	20
T19	Female	6-10	Public School	28

*Science and Art Center

Data Collection Tool

In this study, it was aimed to reveal the opinions of the science teachers who teach with online methods on distance education based on their own experiences and a structured interview form was used. The draft form on "Science Teachers' Opinions on Distance Education Practices" was created by taking the literature review and expert opinions (2 faculty members working in the field of science education, 1 measurement and evaluation expert, 2 science teachers, 1 language expert). Necessary arrangements were made in line with the evaluation and suggestions of the experts. After obtaining permission from the relevant authorities, the scale prepared for the research was pre-applied to three randomly selected science teachers. and they were asked to make an assessment of the scale. In this way, the validity of the interview form was tested. As a result of the participant evaluations, a consensus was reached, necessary corrections and additions were made in some items, and the form was finalized. The final version of the form was applied to the participants on a voluntary basis.

Data Analysis

The data obtained from the research were analyzed according to the content analysis technique, which is an analysis technique used in qualitative research methods. Content analysis technique is expressed as a systematic, innovative analysis technique in which some words are described with small content categories by using coding based on certain rules of the texts obtained from the participants (Büyüköztürk et al., 2008).

• While organizing the data, notes were kept primarily.

• It is aimed to reach the details by reading several times.

• In the readings, attention was paid to repetition and associations.

• It was tried to reach codes from the importance levels of the same and different opinions and temporary themes reflecting teachers' opinions. This tentative table of themes has been created.

• The tentative themes table was transformed into final themes through various readings, and the determined themes were combined to create categories.

• Categories are supported with examples.

FINDINGS

The themes obtained as a result of the content analysis carried out in this section and the sub-themes formed in line with these themes are given in Table 2. The findings are stated accordingly. Since some of the answers given by the participants during the analysis process are related to more than one category, the frequency numbers in the tables given in the findings section and the number of participants may vary. In addition, one-to-one quotations from teachers are included in this section..

Table 2. General themes of the research

Number of Theme	Theme	Sub-theme
Theme-1	Opinions on General Characteristics of Distance Education	-
Theme-2	The Conveniences Provided by the Distance Education Process	-
Theme-3	Difficulties Experienced in the Distance Education Process	-
Theme-4	Opinions on the Distance Learning-Teaching Process	Lesson Preparation Method Online Education Platform Educational Applications Measurement and Evaluation Tool
Theme- 5	Opinions on Improving the Distance Education Process	-

Findings of Theme-1: Opinions on General Characteristics of Distance Education

Science teachers were asked about their knowledge of distance education and what kind of education model distance education is. In the light of the answers received from the teachers who participated in the research, the theme of "Opinions on the general characteristics of distance education" was formed. The created theme is divided into four different categories. The categories and frequencies related to the theme of "opinions on the general characteristics of distance education" are given in Table 3.

Table 3. Categories and frequencies of Opinions on General Characteristics of Distance Education's

Number of Category	Categories	f
1	Ability to Use Various Communication Tools	15
2	Teaching Anywhere (Independent of Space)	10
3	Being Independent of Time	3
4	A System with Low Interaction	3

According to Table 3, the majority of science teachers (15) answered the question of their knowledge about distance education and what kind of an education model distance education is. About distance education; teachers (10) frequently expressed the answer of being able to teach anywhere (being independent of the space). Apart from these, the statements of being independent of time (3) and a system with low interaction (3) are other opinions expressed by the teachers.

Some of the prominent answers under this theme are directly quoted:

As T1 stated; "Teacher-student relationship in computer and internet environment." (Category-1)

As T2 stated; "It is the educational activities that teachers and learners do without the limitation of time and place." (Category-3)

T2 emphasizes that the distance education process is independent of both space and time(Category-2/3).

As T6 stated; "Distance education is the continuation or completion of the trainings that cannot be done in the same place for any reason, by bringing together teachers and students in online environments." (Category-2)

As T13 stated; "Educational activities are carried out in online environments. It should not be taken to mean that the same face-to-face education in schools is conducted in online environments. There is no contact, no emotional attachment in online environments. This results in low engagement." (Category-4)

T13 stated that there is no contact between the teacher and the student in distance education, so there is no emotional bond between them. This situation reveals that the distance education process is a system with low interaction.

As T16 stated; "Training conducted through various channels without the need for all participants to be in the same venue. While this training sometimes takes place simultaneously, sometimes it is not needed." (Category-2)

As T18 stated; "It is a form of education made by using various communication tools without the student and teacher face to face."

, T18 expresses distance education as an education system using various communication tools. (Category-1)

Findings of Theme-2: The Conveniences Provided by the Distance Education Process

Science teachers were asked about the ease of use of distance education applications. According to the answers given by the participants, the theme of "The Conveniences Provided by the Distance Education Process" was divided into eight different categories. The categories and frequencies formed in this direction are given in Table 4.

Table 4. Categories and frequencies of The Conveniences Provided by the Distance Education Process

Number of Category	Categories	f
1	Being independent of location	13
2	Flexibility in Time	10
3	Easy Access to Technologically Equipped Virtual Environments	7
4	Economy	6
5	Effective Use of Educational Technologies	6
6	More Problem Solving Opportunities	3
7	Practicality	2
8	Individual Working Opportunity	2

According to Table 4, most of the science teachers stated that it is independent of space (13) and provides flexibility in terms of time (10). In the answers given by the teachers, easy access to virtual environments equipped with technological opportunities (7), affordability (6), effective use of educational technologies (6), more problem solving opportunities (3) are stated as the conveniences provided by distance education. In addition, practicality (2) and the opportunity to work individually (2) are among the conveniences stated by the teachers.

Some of the prominent answers under this theme are directly quoted:

As T1 stated the following about this issue:; "Flexibility in terms of time is one of the greatest conveniences provided by distance education… Moreover, time spent on the way to school is saved. Smart board, internet etc. Lessons can be taught in a virtual environment where technological opportunities are more than in a classroom environment that does not exist." (Category-2)

With these statements, T1 stated that the convenience provided by the distance education process is about time, access to virtual environments equipped with technological opportunities and practicality.

As T2 stated the following about this issue:; "The convenience of distance education applications is that we benefit more from technological resources and enable us to develop technology skills for the future." (Category-5)

As T3 stated the following about this issue:; "Conveniences, time and place independence, using many technological tools and materials and providing the opportunity to work individually." (Category-8)

With this statement, T3 stated that the distance education process provides individuals with the opportunity to work individually, as well as the convenience of teaching anywhere and providing flexibility in time. This shows that individuality is at the forefront rather than group work in distance education.

As T9 stated the following about this issue:; "It is one of the conveniences of distance education that teachers can use the time efficiently in any place with internet access." (Category-2)

As T10 stated the following about this issue:; "It is independent of time and space. It provides equal opportunity in education. It reduces the cost of education." (Category-4)

With these statements, T10 stated the following about this issue; they experienced in time and space, and stated that the cost of education decreased. Although the establishment of the infrastructure required for distance education is very costly, it is a very suitable education model compared to other education systems. In this direction, T10 emphasized that one of the conveniences provided by the distance education process is economy.

As T11 stated; "One of the greatest conveniences is that I can solve questions in a shorter time..." (Category-2)

With this statement, T11 stated that he solved more questions in a shorter time during the distance education process. This is a situation that is beneficial in reinforcing the gain.

As T13 stated; "The convenience that distance education provides for me is that I can carry out my activities in a more planned manner. My pre-class preparations are of higher quality than face-to-face education. When I am unprepared in face-to-

face education, while I am conducting improvisation activities; My distance education activities are progressing more regularly and in a planned manner. Designing new activities for distance education is what motivates me in terms of my personal and professional development… I feel more researching and more creative. I can use educational technologies more. Because I give them much easier access." (Category-2/4/5/7)

With these expressions, T13 especially in distance education where the use of communication technologies is inevitable; He stated that he used educational technologies a lot. Therefore, it is an advantage of the distance education process that teachers use educational technologies effectively and provide easier access to them.

As T15 stated; "Teaching lessons in the comfort of home has been very good in terms of protection from disease during the epidemic process. Apart from that, I think that distance education is more economical (no transportation, food, etc. expenses for going to school) and practical." (Category-2/6)

As T17 stated; "The easy aspect is the opportunity to reach the source you want without wasting time and conduct the lesson through different question sources and different visuals..." (Category-3/4)

With these expressions, T15 and T17 stated that distance education is more efficient in terms of time and resource usage.

Findings of Theme-3: Difficulties Experienced in the Distance Education Process

Science teachers were asked about the difficulties they experienced in distance education applications. According to the answers given by the participants, the theme of "Challenges Experienced in the Distance Education Process" was divided into nine different categories. The categories and frequencies formed in this direction are given in Table 5.

Table 5. Categories and frequencies of Challenges Experienced in the Distance Education Process

Number of Category	Categories	f
1	Technical Problems (Infrastructure, Hardware and Software Problems)	15
2	Failure to Detect Learning Deficiencies	10
3	Weakening of the Teacher-Student Bond	9
4	Students' Interest in Extracurricular Elements During Class	8
5	Student Absenteeism	8
6	Staying Passive on Screen	7
7	Unavailability of the Laboratory	6
8	Collaboration Between Teachers	5
9	Lack of Certain Working Hours	3

According to Table 5, the majority of science teachers expressed the technical problems arising from infrastructure, hardware, software and the like (15) in the question of what are the difficulties experienced in the distance education process for teachers. Teachers stated that they could not detect the learning deficiencies of students in the distance education process (10) and that the teacher-student bond weakened (9). In the answers given by the teachers, they frequently stated that they could not control the students' involvement in extracurricular elements (8) and student absenteeism (8) during the lesson. The difficulties experienced in the distance education process were stated as the teachers being inactive for hours on the screen (7), the inability to use the laboratory (6), the change in the way the lesson was taught, and the decrease in the cooperation between the teachers (5). In addition, the absence of a certain working time during the day (3) is one of the difficulties experienced by the teachers.

Some of the prominent answers under this theme are directly quoted:

As T3 stated; "Technical problems, internet shortage, weakening of student-teacher bonds… In addition, not being able to learn by doing and living in a laboratory environment, only supporting it with videos, visuals and simulations is one of the difficulties I have experienced in the distance education process. (Category-1)

With these statements, T3 mentioned the technical problems, the weakening of the teacher-student bond and the inability to use the laboratory as the difficulties he experienced in the process.

As T6 stated; "I can say this because of its difficulty: It is very difficult to understand whether the student is really interested in the lesson in front of the screen… Apart from that, technical infrastructure problems, course absences cannot be followed effectively as in face-to-face education…"(Category-2)

With this statement, T6 emphasized that together with technical problems and student absenteeism, students are interested in extracurricular elements during the lesson. In the distance education process, students' camera and microphone, etc. It is possible to say that the distance education process is an environment open to extracurricular elements since it is not compulsory to use it.

As T9 stated; "It is very difficult to understand and eliminate the learning deficiencies of students. Moreover, since science course is a course for applying scientific process skills such as observing, measuring, classifying, changing and controlling variables, not being able to use them in online courses reduces the efficiency of the course." (Category-2/3)

With this statement, T9 stated the following about this issue that is against the nature of science. It was stated that there was no use of laboratories in distance education, with the statements that steps could not be taken to apply scientific process skills such as observation, measurement, classification, changing and controlling variables in lessons. Therefore, this situation prevents the course from being taught in a qualified way.

As T10 stated; "The absence of visual and audio participation during the lesson can make communication inadequate. During the live lesson, technical problems (internet interruption, hardware or software problems, not using an updated browser, etc.) may occur. In addition, the reliability of the exams made in distance education applications is also discussed." (Category-1/6)

As T13 stated; "I have difficulties with internet connection problem, lack of technological tools, body language, eye contact and emotional communication." (Category-1/9)

As T14 stated; "As a negative point, the lesson hours of the teachers spread throughout the day in this process, and students, parents and administrators were able to reach us at every hour. Apart from working hours, we have no time of our own and no such thing as private life. In addition, being inactive in front of the screen for a long time brought sedentary lifestyle problems..." (Category-6/8)

As T15 stated; "Distance education does not make it possible to learn by doing for the science course. Some methods that should be applied especially in our branch, such as experimentation, etc. Distance education is very difficult. Students get the impression that they are watching a video as a demonstration experiment, not by doing it themselves. This reduces the efficiency of the lesson." (Category-2/3)

As T16 stated; "Failure to follow up on absenteeism, lack of communication between teachers, not being able to measure and evaluate, not being able to understand whether the student has learned the subject or not..." (Category-3/4/5/6)

T16 especially stated that they could not identify the learning deficiencies of the students.

As T17 stated; "Distance education challenges for me; Our eyes are negatively affected by standing in front of the screen, we cannot make eye contact with the students, so the teacher-student relationship weakens and the technical infrastructure problems we experience from time to time." (Category-3/4/5/6)

As T19 stated; "The most important challenge of distance education is not being able to communicate with the student and enabling the students to focus on the lesson. Even if the cameras are on, we cannot prevent the child from doing other things on the computer. I have already understood how inefficient online lessons are in the face-to-face trainings that are made from time to time. I have to retell some subjects because the children are surprised as if they are hearing about it for the first time." (Category-3/4/5/6)

Findings of Theme-4: Teacher practices in the Distance Education-Teaching Process

Science teachers were asked in detail what they did during the online learning-teaching process (before the lesson, during the lesson and after the lesson). In line with the answers given by the teachers, the theme of "Opinions on the online learning-teaching process" was formed. The theme of " Teacher practices in the Distance Education-Teaching Process " was analyzed under five sub-themes. These are listed under the following headings:

- Lesson Preparation,
- Method,
- Online Education Platform,
- Educational Applications
- Measurement and Evaluation Tools.

The categories and frequencies formed in line with these sub-themes are given in Table 5.

Table 6. Categories and frequencies of Teacher practices in the Distance Education-Teaching Process

Sub-themes	Categories	f
Lesson Preparation	Video	15
	Enriched Book	10
	Web 2 Tools	19
	Slide (.ppt)	7
	Contents with pdf extension	3
	Working Sheet	3
Method	Expression	12
	Q&A	12
	Problem solving	6

Sub-themes	Categories	f
	Discussion	4
Online Education Platform	Education and information network*	15
	Zoom	7
	Meet	1
	Teams	1
Education Applicants	Education softwares	9
	Youtube	8
	Padlet	4
	Wordwll	4
	Kahoot	3
	Canva	2
	Khan Academy	1
	Phet	1
Measurement and Evaluation Tools	Whatsapp	11
	e-mail	7
	Online exam	5
	Gogole forms	3

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According to Table 6, Online Learning-Teaching Process was examined under five sub-themes. In the sub-theme of Preparation for Lessons, it was seen that science teachers benefited from many different sources according to their learning outcomes. When the sources used by the teachers in the preparation process for the lesson are examined, the frequency of uttering is much to the lesser than the frequency of being said, in a total of six categories: video (15), Z-book (10), web 2.0 tools (10), slide (7), pdf (3) and worksheet (3). has occurred.

Some of the prominent answers in this sub-theme are directly quoted:

As T1 stated; "Finding videos suitable for the learning outcomes of the lesson before the lesson."

As T3 stated; "Points, videos, images, etc. related to the subject. material preparation."

As T6 stated; "Z-books, videos, worksheets, etc. required for the course. I have it ready."

As T8 stated; "Arranging pdf, worksheet and Z-books about achievements according to the course of the lesson and preparing related questions."

As T9 stated; "Finding visual documents, PowerPoint and documentaries according to the content of the subject to be covered."

As T10 stated; "The materials that will be needed (web2 tools, etc.) are determined and prepared according to the aims and objectives of the course."

With these statements, the teachers stated that they mostly benefited from the videos in the preparation stage for the lesson. E-book and Web 2.0 tools were used after the videos, which offer a very rich content visually. Apart from these, the teachers stated that they benefited from slides, pdfs and worksheets in the course preparation process.

In the method sub-theme, it was seen that science teachers benefited from the limited method according to the nature of the subject, the number of students and the possibilities. When the methods used by the teachers were examined, four categories were formed, namely lectures (12), question-answer (12), problem solving (6) and discussion (4).

Method sub-theme

Some of the prominent answers in this sub-theme are directly quoted:

As T2 stated; "I mostly use the lecture method in the lesson, but I also use the brainstorming technique."

As T7 stated: "I often use the problem solving method in my lessons. At times, I also prefer the discussion method where I am more in the role of guide and observer. I use this method mostly in situations where I do not have time concerns, the number of students is low, and the course outcome is appropriate."

As T11 stated; "I tried to carry out the course process in the form of questions and answers. During the question-solving hours, I gave each student an equal opportunity to speak and enabled them to analyze."

As T12 stated; "I make a short repetition of the previous lesson and move on to the new topic. First, I explain, I make short notes on the places that I consider important, and I watch short videos to reinforce the subject. Finally, I do exercises and finish the lesson by giving homework."

As T13 stated; "I try to have a one-on-one conversation with each of my students at the beginning of the lesson. Since I make my lesson activity-based, I make a brief introduction about the activity. Question and answer, like brainstorming. I share the

instructions about the activity both verbally and visually. During the activity, I give feedback by following my students. I promise different people to ensure that everyone speaks and actively participates."

As T14 stated; "I make programs and preliminary assessments that support the visual aspects of students in the online process. However, in my lectures, I mostly explain through presentation."

As T15 stated; "I watch videos during the lesson. I teach my lessons through the presentation that allows me to convey what I will tell to the student as soon as possible. I try to activate the students in the lesson as much as possible with question solutions."

As T18 stated; "I usually use the question-answer method after giving the topic during the lesson. However, in distance education, students are more reluctant to answer in crowded classrooms. Since the time in distance education is more limited than in formal education, I especially use the presentation method in 8th grades."

With these expressions, the teachers stated that they often preferred the straight lecture method in the teaching of the lesson. Teachers used the straight lecture method, which is one of the oldest methods, because they transferred many subjects to large groups in a short time. The question and answer method in which the student is active, as well as the lecture method, which is traditional in the distance education process and in which the student is inactive, has taken its place in the lessons. Question and answer method; It motivates the student, makes him think, gives him the opportunity to comment, and at the same time socializes him. In this direction, the question and answer method has been a method frequently used in distance education. The problem solving technique, which is a method in which students are very active and develops their independent thinking skills, is another method used in the lessons. In addition, the teachers stated that they benefited from the discussion method in the teaching of the lesson. Since the discussion method is more suitable for face-to-face education in terms of application, it is more preferred in cases where the number of students is low.

In the Online Education Platform sub-theme, it was observed that science teachers generally benefit from free education platforms in line with the institution they work for and their own means. When the online education platforms used by the teachers were examined, four categories were formed: EBA (Education Information Network) (15), Zoom (7), Meet (1) and Microsoft Teams (1).

Some of the prominent answers in this sub-theme are directly quoted:

As T3 stated; "I do my lessons through EBA and Zoom."

As T4 stated; "I use the Zoom platform in distance education applications."

As T6 stated; "Because it is free, I provided training by connecting via Zoom."

As T11 stated; "I use the EBA platform in my online courses."

As T13 stated; "I primarily use Zoom and Teams applications as online education platforms."

As T16 stated; "I use the EBA platform in distance education."

In these statements, the system they preferred most was EBA, Turkey's first and only information network. It has become the most widely used online education platform in our country, as it is a free platform and as a result of the information provided by the Ministry of National Education to conduct the trainings through EBA. It was stated that the Zoom platform, which can be used free of charge for a certain period of time after EBA and provides a lot of practicality, is used. Apart from these, Meet and Teams platforms were used, albeit a little.

In the Education Applications sub-theme, it has been seen that science teachers benefit from many different applications in distance education applications, since it is quite easy to access virtual environments equipped with technological opportunities. When the educational applications used by the teachers are examined, it is seen that the frequency of being told is less than Morpa Kampüs (9), Youtube (8), Padlet (4), Wordwall (4), Kahoot (3), Derslig (3), Classroom (2), Canva (2), There were 15 categories: Digital Study (1), Leaningaps.org (1), Khan Academy (1), Phet (1), Bookwidgets (1), Miro (1), Quizizz (1).

Some of the prominent answers in this sub-theme are directly quoted:

As T2 stated; "I benefit from applications such as morpakampüs, digital etudes, padlet, Word Wall, as I can make students more active in the course with interactive activities and lecture animations in distance education applications."

As T3 stated; "I use web 2 tools (kahoot, learningapps.org, canva, padlet…) a lot in distance education applications."

As T4 stated; "I use Word Wall, khan Academy and classroom apps in my classes. I rarely use the youtube app."

As T6 stated; "I use digital etudes, youtube and morpa campus applications in my online courses."

As T8 stated; "I use the Phet app and the Derslig app."

As T10 stated; "I use morpa campus, bookwidgets applications in distance education."

As T13 stated; "To make online lessons interesting and interesting, applications such as Word Wall, bookwidgets, kahoot and games etc. I design content. I also prefer applications such as padlet for exchanging ideas with my student group and miro for concept maps. In this way, even though we cannot meet face to face with my students, we work together. Finally, at the stage of measuring the lesson, I create exams with various question types with the quizizz application."

Teachers stated that they frequently use Morpa Campus and Youtube as educational applications. It is known that they are familiar with these practices from the face-to-face training process. Our teachers, who want to color the lessons in the distance education process to make them more attention and interesting, have increased the scale of the education applications they use.

In this direction, educational applications such as Padlet, Wordwall, Kahoot, Derslig, Classroom, Canva, and Digital Etude have taken their place in distance education courses, where many digital applications can be easily used.

In the Assessment and Evaluation Tool sub-theme, it was observed that science teachers used several sources to evaluate students in terms of their learning status after the lesson. When the tools used by the teachers during the assessment and evaluation phase were examined, four categories were formed: WhatApp (11), mail (e-mail) (7), online trial (5) and Google survey (3).

Some of the prominent answers in this sub-theme are directly quoted:

As T2 stated; "After the lesson, I want the students to answer the questions in the MEB science book. According to the feedback they give, I evaluate whether the achievements are obtained or not with the WhatsApp application."

As T3 stated; "With the subject screening tests, I identify the learning deficiencies of the students and help them to overcome these deficiencies. I provide tests related to the subject with applications where I can prepare online question content."

As T8 stated; "I will send tests and exercises on WhatsApp after class."

As T9 stated; "After the lesson, I do the things I deem necessary as homework on WhatsApp, where our class group is. I also use the Google survey application to get feedback about the achievements once in 3 weeks."

As T10 stated; "Actually, the opportunities that online courses provide us are not at a level that can be underestimated. By conducting online trials, we have provided the opportunity to evaluate the level of education given. Of course, besides these, it is necessary to think about the validity and reliability of online exams…"

As T12 stated; "During the assessment and evaluation phase, I send resources such as activities, tests and mock exams to the class group via WhatsApp. Students send their feedback about these individually via e-mail."

As T13 stated; "At the end of the lesson, I evaluate the results of the activity together with the students. I evaluate with various web 2.0 tools and share the results with my students. If a product comes out as a result of the activity, I request its photo or video from the students and give feedback on missing or incorrect places."

As T19 stated; "I want them to prepare short summaries about the subject and write them in the notebook, and I want them to send me the photos of the notebook via e-mail. When the subject is over, my students send a test and tell me how many correct and how many mistakes they have. Afterwards, I answer questions they do not understand over WhatsApp."

In these statements, the teachers stated that they frequently use the WhatsApp application as a measurement and evaluation tool. WhatsApp application, which we use quite widely in our daily life, has been a practical way for teachers in this process. Apart from this, e-mail, online trial and Google survey are used as measurement and evaluation tools.

Findings of Theme-5: Opinions on Improving the Distance Education Process

Science teachers were asked what their suggestions were for the improvement of distance education practices. According to the answers given by the teachers, the theme of "opinions on the improvement of the distance education process" was divided into eight different categories. The categories and frequencies formed in this direction are given in Table 7.

Table 7. Categories and frequencies of Opinions on Improving the Distance Education Process

Categories	f
Each Student Has Their Own Computer and Internet Access	9
Strengthening the Technical Infrastructure	7
Taking Effective Measures for Class Participation	7
Teaching Teachers About Online Learning Processes	6
Configuring the Assessment and Evaluation Process for Distance Education	5
Diversification of Digital Content	4
Making Textbooks Suitable for Distance Education	3
Making the Curriculum Suitable for Distance Education	3

According to Table 7, the question of what are the suggestions for the improvement of distance education applications, nine of the science teachers said that each student should have their own computer and internet access, seven of them said that the technical infrastructure should be strengthened and effective measures should be taken for participation in the lesson, and six of them said that teachers should be trained about online learning processes. stated. In addition, five of the teachers stated that the measurement-evaluation process should be structured in accordance with distance education. In addition to these,

diversification of digital content (4), making textbooks suitable for distance education (3), making the curriculum suitable for distance education (3) are among the answers given.

Some of the prominent answers under this theme are directly quoted:

As T1 stated; "Strengthening Internet and EBA infrastructure."

As T2 stated; "More effective measures should be taken for students to participate in the lesson. Digital content should be diversified and content should be prepared in which students will be more active."

As T4 stated; "The technical infrastructure (internet access and hardware) should be fixed."

T4 stated that the technical infrastructure should be strengthened in order for the distance education process to be more effective. This situation reveals the necessity of improving technological infrastructure conditions such as online course presentation tools, visual and video pool, online library service, student information systems, portal pages, database etc.

As T7 stated; "In addition to digital content, textbooks should be made suitable for distance education and printed resources should be increased."

T7 stated that textbooks should be made suitable for distance education. This situation reveals that the textbooks provided to the students free of charge by the Ministry of National Education should have the form of e book.

As T10 stated; "More video and game content needed."

T10 emphasized video and game contents and stated that digital contents should be diversified.

As T12 stated; "I advocate that distance education should be able to enter every house, that the inadequacy of infrastructure should be eliminated, and that technological tools should be equal in every house."

As T15 stated; "Introducing attendance requirement in online courses."

 T15 expresses the obligation to take attendance and states that more effective measures should be taken for students' participation in the lesson.

As T17 stated; "Digital programs and documents that can be used in distance education have many features. But we know and practice very little of them. Teachers can be trained on these."

With these statements, T17 stated that teachers should be given training on online learning processes.

As T19 stated; "Every student should have access to the internet, especially in districts and villages, this situation is dire.

With this statement, T19 stated that every student should have computer and internet access based on the problems experienced by students living in districts and villages in this process.

DISCUSSION

In this research, most of the teachers generally have a positive perspective on distance education because it eliminates the boundaries of time and space. According to Altıparmak et al. (2011), distance education is considered a positive process that benefits more from students whose financial situation does not allow it and therefore cannot study. In addition, Bozkurt (2020) emphasized that technologies should be used extensively in distance education during the epidemic and that digital skills should be developed in this way. In the study conducted by Kaya (2002), the advantage of distance education is; It was stated that it reduces education costs and is an independent learning system. According to Parsa-Yekta (2004), individuals have the opportunity to continue their education in any environment through distance education. These can also be considered as positive reflections of technology on education. In this context, the views of most of the teachers participating in the research overlap with the literature.

In this study, teachers emphasized that the distance education process is significantly related to the ability to use digital materials. They reported that not all teachers working in Ireland have skills for distance education and that they experience various problems with hardware, software and technological skills (Burke and Dempsey, 2020). In this research, it was seen that the majority of teachers directly used EBA as an online education platform. Fidan, Sariaslan and Yılmaz (2022) found that Turkish teachers mostly use Turkish textbooks, EBA platforms and auxiliary resources in the distance education process; Research results

are consistent with this. Şengül (2021) states that the use of technological materials in ISE distance education processes has increased and that these materials are an important content transfer tool. According to Chao, Saj and Tessier (2006), the quality and richness of learning-teaching resources and materials affect the quality of online education; Many teachers have the opportunity to access materials during distance education processes.

In this research, teachers stated that, as a negative aspect especially in distance education, they could not detect students' learning deficiencies. They stated that during the distance learning process, students were exposed to external influences during the course, they could not control student absences, therefore their participation in online courses was low and students' motivation was low. According to Yıldırım (2022); A general problem that teachers encounter during the distance education process is student apathy and low participation in classes. In the study of Sari and Nayır (2020), they emphasize that the participants' problems such as not being able to communicate with the student in distance education and not being able to follow the student remotely make classroom management difficult in distance education. In the study of Şener, Ertem and Meç (2020), classroom management was considered as a problem in distance education, and reasons such as children not wanting to turn on their cameras and reluctance towards the lesson were considered as difficulties in classroom management. According to Akgül and Oran (2020), the majority of teachers stated that students' motivation for the distance education course was low. Baran and Sadık (2021) and Fidan (2020) stated in their studies that teachers' classroom management is difficult in distance education, and while it is difficult to teach the rules to students even in face-to-face classes, this is much more difficult in virtual classes. Similarly, Sintema (2020); reported that students' communication skills with teachers were weak, and there was a decrease in performance due to the lack of e-learning opportunities during the COVID-19 pandemic.

CONCLUSION AND RECOMMENDATIONS

For teachers' distance education; teaching lessons using various communication technologies and emphasizing the expressions of being able to teach anywhere showed that they were satisfied with the process. In this context, it can be said that most of the teachers have positive opinions on distance education. The fact that some of the teachers included statements about a system with low interaction about distance education shows that they do not have positive opinions about distance education. The convenience that teachers experienced in the distance education process, most of the teachers answered that they are independent of the place and flexibility in time. One of the conveniences experienced by teachers in the distance education process has been easy access to virtual environments equipped with technological opportunities. It has been seen that the other conveniences provided by the distance education process in the eyes of the teachers are the economy and the opportunity to work individually. Considering the opinions of the teachers, it is one of the conveniences brought by this process that teachers use educational technologies more effectively. The fact that teachers use educational technologies more actively in online trainings and design new activities and content affects teachers positively in terms of their personal and professional development. The difficulties that teachers experienced in the distance education process, the majority of the teachers expressed technical problems arising from internet connection, hardware, software and the like. It is thought that factors such as the lack of direct feedback from teachers to students in online learning environments, the inability to make eye contact with the student, the student not using the camera and microphone for various reasons affect the motivation of the teachers negatively.

Most of the teachers participating in the research think that they cannot complete their laboratory or workshop studies with distance education. It was seen that teachers who stated that they could do practical work such as laboratory and workshop studies generally wanted students to do the practice at home by sending sample videos. It has been seen that the materials used by the teachers during the preparation for the online lesson are much more diverse and equipped with technological opportunities compared to face-to-face education. It has been observed that most teachers use videos that combine education and interactive learning in preparation for the lesson. Again, it was seen that the majority of them benefited from e-books and web 2.0 tools during the course preparation phase. Another part of the teachers benefited from slides, pdfs and worksheets that are frequently used in face-to-face education. Considering the sub-theme of educational applications used in the course, when considering the classroom environments where there is no smart board in face-to-face education, there is smart board but no internet; In the online education process carried out in virtual environments equipped with technological and digital opportunities, teachers' access to these has led to a wealth of materials. Some of the teachers benefited from educational videos on Morpa Campus, Youtube, and some of them benefited from web 2.0 tools such as Padlet, Kahoot, Wordwall, and Phet. When the issue of improving distance education practices was examined, most of the teachers stated that each student should have their own computer and internet access. Apart from this, it is among the opinions of most teachers that the technical infrastructure should be strengthened and effective measures should be taken for students' participation in the lesson. It is the opinion of many teachers that the distance education process will become more qualified by structuring the curriculum, textbooks and assessment and evaluation process in accordance with distance education.

Considering the results of this research, the following suggestions can be made within the scope of this study;

- This study was conducted with the opinions of science teachers. It is recommended to study with teachers working in different branches.

- This study was conducted with teachers who experienced the distance education process during the pandemic. It is recommended to conduct different studies with teachers who have received training on distance education processes.

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Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

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Ethics Committee Approval Information

It has been approved with the decision of Eskişehir Osmangazi University Social and Human Sciences Scientific Research and Publication Ethics Committee, numbered 2021-01 and dated 07.01.2021. "Ethics Committee Approval Document" is attached.

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