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## **Investigation of the Views of Biology Teachers on Distance Education during the COVID-19 Pandemic**

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## Investigation of the Views of Biology Teachers on Distance Education during the COVID-19 Pandemic

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### Abstract

Coronavirus disease has caused the death of many people since its first identification in Wuhan, China, in December 2019. Countries have implemented emergency action plans in many areas to prevent the disease from spreading further. In order to reduce the spread of the disease throughout the country, there has been a transition to distance education in the Turkish education system. In this research, it is aimed to determine the views of biology teachers about distance education in COVID-19 Pandemic process. The research using phenomenological study was carried out with 62 biology teachers. Semi-structured interview form prepared by the researchers was used to collect the data. The data were evaluated by using content analysis method. As a result of the research, it has been determined that distance education increases technology use, cooperation, empathy and positive thinking about lessons. However, it has been determined that there are problems arising from the lack of technological infrastructure and knowledge. It has been understood that in order for the distance education systems to be applied in situations such as the COVID-19 pandemic, the technological infrastructure and the knowledge of the stakeholders should be improved.

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### Introduction

Today, the whole world has been struggling with a disease that first emerged in Wuhan, China in December 2019. The disease was identified as the new coronavirus (2019-nCoV) in its beginning stage (Wang, Wang, Chen, & Qin, 2020). In the later period, the new coronavirus pneumonia was named "COVID-19" (coronavirus disease 2019) by the World Health Organization (WHO, 2020). Coronaviruses causing the disease are enveloped, positive and single stranded RNA viruses (Velavan, & Meyer, 2020). Coronaviruses which has an envelope (outer layer) enter into the cell by binding their glycoproteins to the specific sensing molecules on the surface of the host cell (Madigan, Bender, Buckley, Sattley & Stahl, 2019: p.313; Reece, Urry, Cain, Wasserman, Minorsky, & Jackson, 2017: p.404-405). Coronaviruses cause respiratory infections in humans and other animals, including about 15% common colds and SARS. Respiratory diseases that are caused by coronavirus rapidly spread in humans and cause deaths (Rasmussen, Smulian, Ladnicky, Wen, & Jamieson, 2020).

In order to minimize the speed of spread and fatal effects of epidemics, global measures should be taken. In fact, measures such as closing restaurants, using masks, working part-time or working from home have been brought into action across the world in order to reduce the spread rate of the COVID-19 pandemic. Face to face education was interrupted in many countries to prevent the spread of pandemic among students. In the COVID-19 pandemic process, distance education has become the preferred education concept worldwide. Distance education is a form of education implemented through corporate and communication technologies, differently from the environments in which formal education is implemented. (Moore & Kearsley, 2012). In other words, distance education is the concept of education in which interaction between students, teachers and educational materials is realized by using communication technologies (Özgöl, Sarıkaya & Öztürk, 2017). The first Covid-19 case was detected as of March 10, 2020, in Turkey. With the detection of the disease, both individual and institutional measures have been activated across the country. Ministry of National Education (MoNE) announced that on March 16, 2020, face to face education was interrupted in primary, secondary and high education institutions. On 23 March 2020, it decided to switch to distance education in order for the education process not to be interrupted and students not to be victimized. In this context, Education Information Network (EBA) created by the Ministry of Education and serving as Turkey's official digital learning platform strengthened its infrastructure and began the process of distance education (Özer, 2020). Additionally, it has cooperated with Turkey Radio and Television Corporation (TRT) so that distance education can be made across

the country and all the students can benefit from it distance learning (Özer, 2020). As a result of the collaboration, three national channels were started to broadcast to provide distance education at primary, secondary and high school levels. In higher education, the education process was interrupted for three weeks at the beginning of the epidemic. It was later announced that the 2020 spring semester will be completed by distance education (The Council of Higher Education (CoHE), 2020).

When the relevant literature is examined, it is seen that there are many studies analyzing the effects of COVID-19 pandemic on health and economy. However, it has been determined that studies in the field of education are limited. For example, in the study of Bao (2020), six basic principles were explained in order for online education to be successful in higher education during the COVID-19 pandemic process. Basilaia and Kvavadze (2020) analyzed the capacities of transition to distance education and usage of platforms during the COVID-19 pandemic process. As a result of the research, it was determined that the transition to distance education was successfully completed in Georgia. In addition, it has been determined that the experiences gained from this process can shed light on the future with laws and regulations (Basilaia & Kvavadze, 2020). Özer (2020), in his research, described the work that Turkey has done in the field of education during the process of the pandemic. Toquero (2020) shared his recommendations for higher education in his study, in order to reduce the impact of the pandemic process on education systems and achieve success. Yamamoto and Altun (2020) examined the countries' transitions to online education during the COVID-19 pandemic process. As a result of their research, it was stated that distance education will go beyond being a support platform in the future (Yamamoto & Altun, 2020). Zhou, Wu, Zhou and Li (2020) analyzed the "schools are closed" but "classes are open" campaign and practices for online education in China during the pandemic process. In the research, it has been concluded that information investments in education have been successful that China has carried out in the last thirty years.

The effects of disasters that have reached the pandemic dimension on education systems shape both the present and the future of societies because; education systems have a structure that concerns all segments of the society, considering their stakeholders (students, teachers, parents). Therefore, countries have provided continuity in education by rapidly switching to distance education in the COVID-19 pandemic process. Distance education provides an advantage in education because of the opportunity to repeat the classes (Gregory & Lodge, 2015), ease of access (Gök, 2015) and flexibility in learning speed (Özgöl et al., 2017). However, it has disadvantages that caused by lack of social interaction, high establishment cost (Bolliger & Wasilik, 2009) and lack of technological infrastructure.

The most important criteria for successful distance education are being able to understand the expectations of students (Cabi, 2018) and giving them feedback (Richardson et al., 2015). In this context, teachers have a great responsibility. When the distance education carried out during COVID-19 pandemic process is examined, it is seen that teachers have taken active roles in Turkey. One of the groups of teachers that take an active role is biology teachers. Biology science has complex and interconnected systems in its structure. Focusing on didactic learning methods in biology education causes the depth of knowledge to weaken (Tanner and Allen 2005). The teacher is one of the most significant factors of the education (Dikmenli, Kılıç & Çardak, 2018). In order to be successful in biology education, teachers should have strong connections with students and their sources (Erten, 2008). During the process of the COVID-19 pandemic, application-based educations, one of the indispensable elements of biology education, were not carried out. For this reason, determining the views of biology teachers towards distance education is important for eliminating the problems that are experienced in the distance education process. In addition, determining the views of biology teachers will help measures to be taken for similar disasters and the success of the integration process of technology into education. Therefore in this research, it was aimed to determine the views of biology teachers about distance education in the process of COVID-19 pandemic.

## **Method**

### **Study Design**

Of the qualitative research designs, phenomenological study was used in this research. A phenomenological study is the unification of the lived experiences of several people regarding a phenomenon or concept around a common meaning (Creswell, 2013). Phenomenography explores the qualitatively different ways in which people potentially understand certain phenomena or an aspect of the world around them (Montenegro, 2020). In this research, a phenomenological study was used to analyze the views of biology teachers about the distance education applied in the COVID-19 pandemic process.

## Study Group

The study group of the research consists of 62 biology teachers who are working in different provinces and institutions in Turkey. 69.4% ( $f = 43$ ) of biology teachers are females and 30.6% ( $f = 19$ ) are males. Biology teachers participating in the research have been using the applications of EBA ( $f = 20$ ), Zoom ( $f = 40$ ), TeamLink ( $f = 4$ ), Skype ( $f = 4$ ) and Whatsapp ( $f = 9$ ) in the distance education process.

## Data collection tool

Semi-structured interview form prepared by the researchers was used to collect the data. For the validity of the semi-structured interview form, views were received from two (2) biology educators and one (1) information and technology expert. It was stated by the experts that some questions did not serve research purposes. They also stated that the two problems were similar and suggested that one of them should be included in the form. The semi-structured interview form consisting of ten (10) questions was prepared as five (5) questions in accordance with the views of the experts. The final form of the form was created by making the necessary language corrections.

Semi-structured interview forms consist of two parts. In the first part, there are questions to determine demographic information. In the second part, there are questions prepared for the purpose of the research. <https://docs.google.com/forms> system was used in the data collection process. The prepared link was shared to teachers via e-mail and Whatsapp. In the introduction part of the form, teachers were informed about the purpose of the study. In addition, as required by ethical rules, voluntary consent statements were taken from teachers.

## Data Analysis

The answer forms of the teachers who participated in the research were coded and named as (T-1, T-2, T-3...). The data were evaluated by performing content analysis. Content analysis is defined as the systematic coding of quantitative or qualitative data within the framework of certain themes and classifications (Cohen, Manion & Morrison, 2007; Fraenkel, Wallen & Hyun, 2012). Content analysis provides the data to be classified under certain themes to reveal the relationship with each other (Yıldırım & Şimşek, 2011, p.227). In addition, content analysis gives meaningful conclusions by analyzing verbal or written data for a specific purpose (Kaya, Fırın & Nas, 2013). Therefore, the analysis of the data was carried out by inductive content analysis.

Each data was firstly read by two different researchers and a holistic understanding was tried to attempt. The third researcher checked the consistency of the themes obtained and the compatibility of the literature. In order to determine whether there is consistency among the researchers, the formula introduced by Miles and Huberman (2015) was applied, which is  $\text{Reliability} = \text{Consensus} / \text{All views}$ . Reliability of two encoders was calculated as  $= .89$ . The reliability of the research was obtained by presenting the data obtained from teachers exactly.

## Findings

In this part of the study, the views of biology teachers on distance education applied in the COVID-19 pandemic process were analyzed. In the research, the views of the participants regarding the distance education applied during the COVID-19 pandemic were examined firstly. Findings obtained from the research are presented in Table 1.

When Table 1 is examined, it was determined that the participants had positive and negative views about distance education during the COVID-19 pandemic process. Participants expressed positive views in terms of distance education process such as; Independence from time and place ( $f=21$ ), providing live courses ( $f=13$ ), providing time management ( $f=11$ ) and providing rich content and visual material opportunities ( $f=11$ ). However, their negative views also draw attention in terms of causing inequality of opportunity ( $f=27$ ), involving technical and technological problems ( $f=27$ ), providing classroom organization ( $f=10$ ) and revealing negative affective characteristics ( $f=10$ ).

Table 1. Views of participants on the distance education process

Category	Theme	Sub-theme	f	
Positive		Time management	11	
		Positive affective properties	10	
		Classroom Management	Classroom control and discipline	7
			Classroom environment and group interaction	5
			Classroom organization	5
			Learning process	10
		Competencies and the learning / teaching process	Evaluation and Evaluation	6
			Technology use	4
			Independence from time and place (desire)	21
			Live course schedule	13
		Distance education process	Enriched content and material	11
			Repeatability	7
			Continuity (durability)	6
Economical	3			
Not positive		Not positive	14	
Total			133	
Negative		Classroom organization	10	
		Negative affective characteristics	10	
		Classroom Management	Lack of communication	5
			Classroom control and discipline	4
			Time management	3
			Learning environment and group interaction	3
		Competencies and the learning / teaching process	Learning/Teaching process	6
			Evaluation and Evaluation	8
			Technology use	2
			Unreadiness	6
		Distance education process	Inequality of opportunity	27
			Technical and technological problems	27
			Live course schedule	9
Not negative		Not negative	3	
Total			123	

Examples of the positive views of the participants regarding the distance education in the COVID-19 pandemic process are given below:

T-4: There is no transportation. Material and food are from the student. Its positive aspect is that not only the students keep up with the classes, but they also do not fall behind.

T-5: Since there are no working hours, training activities can be carried out at any hour. Both students and teachers learn to follow technology more closely by scanning more resources.

T-9: We do not waste time writing the course notes in a notebook, I take the screen record and send it to the students, and I have them write it as an assignment. With this way, they repeat the course subject.

T-24: Since the courses are live, I ask questions to the students as if we were in the classroom, it is just like the classroom environment. I can even say that they are more careful than the classroom environment.

T-34: You can appeal to more audiences in distance education.

T-44: It enables students to access classes whenever they want and to repeat topics frequently.

Examples of the negative views of the participants regarding the distance education in the COVID-19 pandemic process are given below:

T-9: We find it difficult to reach students who cannot access the internet. In addition, students who have technical problems and lack of information technologies have difficulty connecting to the classes.

T-20: Internet speed is insufficient. Also, there are deficiencies in the documents.

T-21: There are some problems with the issues of internet connection, feeling discomfort due to other family members' being at home, and adjusting the appropriate time for all students.

T-61: There are some problems due to technological impossibilities.

T-38: Problems with internet speed and time are experienced.

In the study, the views of biology teachers about the methods and techniques used by them in distance education in the COVID-19 pandemic process were examined. Findings obtained from the research are presented in Table 2.

Table 2. Views on methods and techniques used in biology course in distance education process

Category	Theme	Sub-theme	f		
Learning Through Presentation	Education Through Presentation	Education Through Presentation	2		
		Direct Instruction	(Direct) instruction (presentation) Using course notes (Pdf, Ppt, Word etc.) Summarizing Subject repetition	29 21 2 1	
Learning Through Invention	Demonstration	Demonstration	Video usage Visual (photograph, figure, graphic, animation etc.) Performance	15 14 1	
		Concept maps	Concept maps	1	
		Question answer	Question-answer Question, test or problem solving	23 15	
		Education Through Invention	Education Through Invention	2	
	Enriched content and visual materials	Case study	Case study	2	
			Daily life (exemplification)	2	
			Exemplification	1	
			Discussion	Discussion	7
			EBA	7	
			Social Media	4	
Learning through Research and Analysis	Self-study	Live course schedule (Zoom etc.)	3		
		Z-book	1		
		3D visuals	1		
		e-material (Instagram, Twitter, Whatsapp etc.)	1		
		Voice record	1		
		Homework	5		
		Self-study	1		
		Brain storming	Brain storming	5	
		Demonstration	Demonstration Guidance	1 1	
		Constructivism	Educational Games	Educational Games	1
Activity based learning	Activity work			1	
Constructivist Learning	Constructivism			1	
	5E			1	
	Research and Questioning-Based Education			1	
	Problem-Based Thinking			1	
	Project-Based Education			1	
	Project-Based Learning			1	
	Snowball Technique			1	
	Other			Other	Arousing curiosity
Reasoning		1			
Student control		1			
All but group activity and laboratory activity		1			

When Table 2 is examined, it is noticed that the participants preferred learning through presentation strategies in the distance education process more than other strategies, methods and techniques. The participants also

preferred methods and techniques such as direct instruction method ( $f= 29$ ), question-answer technique ( $f= 23$ ), use of course notes (Power Point, Pdf, Word etc.) ( $f= 21$ ), question, test or problem solving ( $f= 15$ ) use of videos ( $f= 15$ ) and images ( $f= 14$ ) more. The sample view of the participants about the methods and techniques used in biology courses in distance education in the COVID-19 pandemic process are given below:

T-2: I use brainstorming, question-answer, discussion, direct instruction, concept maps, z-books and visualization techniques.

T-3: I use plenty of visual factors (photos, figures, graphics, animation, videos ...). In addition, I use case study method, question-answer, educational game (on the digital environment), brainstorming.

T-10: I can make lectures with live videos, I use conference meeting program (Zoom). I give assignments via EBA, and share lecture notes via Whatsapp.

T-20: I use video, animation, pdf note, live course, and on Whatsapp, I do problem-solving.

T-42: I prepare ppt-word documents for the students and upload them to the EBA system. In addition, I prepare target-specific tests in EBA academic for the willing students.

T-44: I use lecture instruction, question-answer, discussion, brainstorming, case study, demonstration, problem solving, video, animation, snowball technique etc.

T-52: I use PowerPoint presentations, 3d visuals, video presentations, and I convert my specific notes that I have prepared to pdf and upload them.

In the study, the views of biology teachers on distance education in the COVID-19 pandemic process regarding the measurement and evaluation used in their courses were analyzed. Findings obtained from the research are presented in Table 3.

Table 3. Views on measurement and evaluation methods and techniques used in biology course in distance education process

Category	Theme	Sub-theme	<i>f</i>
Summative Evaluation for Success / Level Determination	Objective	Multiple-choice tests, tests, retests	29
		True-False tests	3
		Matching	1
		Gap-filling	1
		Structured Grid	2
		Diagnostic tree	1
		Open-ended questions	1
		Oral examination	1
		Short answer exams	1
		Mini quizzes	2
Formative Evaluation	Performance / Process Evaluation	Performance evaluation	3
		Process evaluation	1
		Research -review	1
		Activity applications	1
		Worksheets	1
		Online Exam	11
Online Evaluation	Online Live Broadcasting Programs	Google form and drive	4
		EBA (Academic)	19
		Social media tools (Whatsapp, Instagram etc.)	1
	Web 2.0 tools	Live broadcasting programs (Zoom, Microsoft teams etc.)	2
		Kahoot (Quiz)	2
		Socrative	1
		Question-answer, question, test, problem solving etc.	12
Other	Other	Giving assignments	9
		Multiple intelligence techniques	1
		Constructivism	1
		Inquiry-learning	1
I did not use it	I did not use it	I have not used it yet	8

When the findings in Table 3 are examined, it is noticed that the participants preferred the methods and techniques of summative evaluation for success/level determination and online evaluation methods, techniques and tools for distance education in comparison to others. The most used measurement and evaluation methods and techniques are; multiple-choice tests ( $f=29$ ) from the category of “summative evaluation”; EBA (Academic) ( $f=19$ ) from the online evaluation category- digital education platform created by the Ministry of National Education; and question-answer, question, test, problem-solving, etc. ( $f=12$ ) from the 'other' category. Sample views of the participants on the measurement and evaluation methods and techniques used in biology courses in distance education in the COVID-19 pandemic process are given below:

T-4: I use verbal question and answer, online exams, and tests.

T-8: I utilize from multiple-choice tests, true-false, gap-filling, structured grid.

T-11: I use multiple-choice, true-false, short answer questions on Socrative. Research-review performances via Drive.

T-15: I use Google forms, online exam, EBA exam, Kahoot, Quiziz.

T-18: I use question-and-answer and I check the topic repetition tests on EBA.

T-30: I use the success rates obtained from activities such as homework, study, and test, which I sent through EBA.

T-32: I use question-answer, matching, structured grid, multiple-choice questions, open-ended questions.

T-37: I share assignments from the academic support system and my own sample questions.

T-44: Student-centered learning and teaching techniques, constructivism, multiple intelligence techniques, inquiry-based learning.

T-52: I control of given assignments in teams. I ensure that the presentations given are uploaded to the system and repeated.

In the study, the views of the participants regarding the applicability of distance education for biology courses in the COVID-19 pandemic process were examined. Findings obtained from the research are presented in Table 4.

Table 4. Views of the participants on the applicability of distance education for biology courses

Category	Theme	Sub-theme	<i>f</i>
Applicable	Classroom management	Class control and discipline	1
		Nature of the course	Verbally weighted
	Distance education process	Theoretical competence	1
		Insufficiency in practice	1
		Necessity	2
		Enriched content and visual material	2
		Supportive (complementarity)	1
Partly applicable (not enough by itself, not experimentally applicable)	No explanation	No explanation	3
	Nature of the course	Verbally weighted	1
		Theoretical competence	3
		Insufficiency in practice	3
	Distance education process	Supportive (complementarity)	1
		Repeatability	1
	Non-applicable	No explanation	No explanation
Classroom management		Classroom environment and group interaction	7
		Negative affective features	1
Nature of the course		Insufficiency in practice	6
		Insufficiency in learning by experiencing	2
Distance education process		Inequality of opportunity	1
No explanation		No explanation	3



When Table 4 is examined, it was determined that the participants had view about the applicability of distance education for biology courses as it is applicable ( $f= 13$ ), partially applicable ( $f = 8$ ) and non-applicable ( $f=17$ ). Some participants ( $f= 24$ ) did not express their view about the applicability of distance education for biology course.

Sample views of the participants about the applicability of distance education for biology courses in the COVID-19 pandemic process are given below:

T-3: Distance education is applicable for biology courses but I think it will not be good in the long term, because student control is more difficult and takes more time in this system.

T-4: I think it is theoretically applicable but since biology needs practice, it will be difficult. Laboratory applications will not be possible.

T-8: I think that distance education is applicable to the theoretical topics of biology courses but it is not applicable for the experimental part of the course.

T-9: Biology is a course containing animation, visual and video due to its content. For this reason, I think distance education is applicable to it.

T-19: Since it is verbally weighted, it is more applicable than many courses.

T-27: It is never applicable.

T-37: No. It is not applicable for biology course acquirements.

T-41: I think it is not applicable.

T-47: Partially yes. It can be used as a complementary education.

T-50: It is not very convenient because biology is learned by experience.

In the study, the views of biology teachers about that distance education in biology courses' continues in the future were examined. Findings obtained from the research are given in Table 5.

Table 5. Views on the application of the distance education process in biology courses in the future

Category	Theme	Sub-theme	f	
I want	Classroom management	Learning environment and group interaction	1	
		Distant education process	Necessity	3
	Enriched content and visual material		1	
	Economics		1	
	Supportive (complementarity)		7	
	No explanation		1	
	I partially want	Nature of the course	Verbally weighted	1
Insufficiency in practice			2	
Distant education process		Necessity	1	
		Supportive (complementarity)	6	
I do not want	Classroom management	Unreadiness	2	
		Learning environment and group interaction	9	
		Classroom control and discipline	1	
	Competencies and the learning / teaching process	Time management	1	
		Learning / teaching process	1	
		Nature of the course	Insufficiency in practice	4
		Distant education process	Inequality of opportunity	1
		Other	Another system request	1
			Similarity with the technology used	1
No explanation	No explanation	2		

When Table 5 is examined, the participants stated that I want ( $f = 13$ ), I partially want ( $f = 10$ ) and I do not want ( $f = 17$ ) regarding the application of distance education applied in the COVID-19 pandemic process in future biology courses. On the other hand, some participants ( $f = 22$ ) did not comment on the application of distance education in biology courses in the future.

The sample views of the participants regarding the application of distance education applied in the COVID-19 pandemic process in the biology courses in the future are given below:

T-1: I don't want it, because the classroom atmosphere and face-to-face education are more efficient and friendly.

T-2: No. No matter how much it is described, there are shortcomings. Courses would be more beneficial if they are taught in the same environment with the student.

T-6: Distance education should continue as an aid to formal education.

T-10: It can happen at certain intervals.

T-12: Yes. Participation of students in education from the comfort of their homes, away from the day's tiredness and transportation etc. would be nice and they would not waste time with these.

T-13: In the future, distance education should continue, but it should be arranged to complement the shortcomings of face-to-face education.

T-51: It is applicable. Distance education will continue and should be.

T-61: I want distance education to continue with formal education because I think it will be useful in the form of supportive education.

## Results and Discussion

The aim of the study is to determine the views of biology teachers about distance education in the COVID-19 pandemic process. The teachers evaluated the distance education process in COVID-19 pandemic in terms of process, methods and techniques used in biology courses, the applicability of distance education for biology course and the possibility of future application. As a result of the research, it has been determined that biology teachers have positive views about distance education conducted in the COVID-19 pandemic process in terms of classroom management, competencies, and application processes. The teachers stated that distance education, which is carried out in the pandemic process, provides advantages due to time management, organization of the learning process, use of technology and being independent of place. When the literature on the subject is examined, it is seen that there are studies supporting the findings of the research. For example, as a result of the research conducted by Özgöl et al. (2017), it has been determined that distance education is beneficial in terms of providing extra time to students, being independent of the place and enabling repetition of courses. Cabi (2018), in his study, determined that distance education is beneficial for students (access to course materials, opportunities for repetition, being independent of place and time) and teachers (classroom management, enriched course contents and reduced workload). According to Gregory and Lodge (2015), one of the most important advantages of distance education is the possibility to watch the courses again. In addition, it was found in the research that distance education was found positive for teachers due to its providing enriched content and visual course materials. It can be said that the existence of a lot of visual education materials prepared in the field of biology is effective in this result. One of the factors that increase the quality of education is the availability of materials (Chao, Saj & Tessier, 2006). According to the results of the research, it was determined that the teachers also had negative views about distance education in the pandemic process. The teachers stated that they had negative views on distance education due to the disruption of classroom organization, lack of technological infrastructure and inequality of opportunity. Face-to-face education strengthens students' sense of belonging to the learning environment and process (Luo, Zhang & Qi, 2017). The transactional distance perception weakens the communication between the student and the teacher in different environments and causes psychological gap (Moore & Kearsley, 2012). These results support the findings of the research.

In the research, it has been determined that biology teachers conduct the education process by using teaching methods and techniques such as direct instruction, sharing of course notes, demonstration, enriched content and visual materials through online platforms. According to these results, it can be said that biology teachers use different teaching methods and techniques in distance education applied during the COVID-19 pandemic process. In the distance education process, the use of different activities, methods and techniques by the educators will enable them to build bridges with their students (Moore & Kearsley, 2012). Can (2020) determined that higher education faculty members use different methods and techniques in distance education depending on the COVID-19 pandemic. According to Bao (2020), the use of sound is important for successful distance education in the COVID-19 pandemic process. For this reason, teachers can increase success by using audio-content techniques such as direct instruction, use of visual materials or animations. In addition, the use of technology-assisted teaching techniques will enable students to improve their knowledge and skills. In the research, it has been determined that biology teachers use the methods and techniques of summative evaluation for success/level determination such as multiple-choice tests, true-false tests, matching, in the distance education process; and they use formative evaluation methods and techniques such as project, activity, research; and online evaluation methods and techniques such as online exams and EBA applications in parallel with technological developments. Based on these results, it can be said that biology teachers evaluate students' knowledge-skills and competencies by using different measurement and evaluation methods and techniques. Similar to the categories created for this research, in the literature, it is stated that there are two different measurement-evaluation methods and techniques: the summative evaluation which is measurement-evaluation for determining success and level and the formative evaluation (Gikandi, Morrow, & Davis, 2011). While measurement-evaluation for success and level determination refers to the comparison of students with each other and their meeting certain standards (Shute, & Kim, 2014); formative measurement-evaluation is called evaluation for learning. Formative measurement-evaluation is used to increase students' learning and to improve their organizing learning practices by themselves (Nicol, & Macfarlane-Dick, 2006). Although formative measurement-evaluation has been stated as the most effective methods for learning (Shute, & Kim, 2014), this method and technique are less preferred due to reasons such as crowded classes etc. (Broadbent, Panadero, & Boud, 2018). In this context, the main reason for less usage of formative measurement-and-evaluation methods and techniques in distance education compared to others may be crowded classes. With the face-to-face education was not possible in the COVID-19 process, face-to-face evaluation tools were replaced by online measurement-evaluation tools which use technology (Burgess, & Sievertsen, 2020). This situation has emerged in the research results. Zhou, Huang, Cheng, and Xiao (2020), in their studies, investigated the use of the micro-video Massive Open Online Course (MOOC) distance learning method in the COVID-19 pandemic for the training of emergency service interns and determined that the effect of this evaluation approach was similar with the traditional method. Online evaluation methods and techniques are of vital importance in the process of COVID-19. However, according to Teclehaimanot and Marshall (2016), measurement-evaluation should be compatible with the objectives of the courses. The teaching materials used in online courses should be based on the most convenient practices, be up-to-date and appropriate. These courses should include audio-visual equivalents, and various online educations should be provided to ensure teachers' adaptation to this process.

In the research, some teachers think that distance education is not applicable for biology courses due to the lack of laboratory courses, the lack of some practical applications, the lack of field trips and observations, and the absence of face-to-face interaction in the classroom environment. In addition, these teachers stated that they do not want to apply distance education in biology classes in the future. Practices (experiments) in scientific process-based courses such as biology are necessary for instructional development (Mattheis, Ingram, Jensen, & Jackson, 2015). However, some teachers stated that due to its features of nature of the course and the necessities of the process, distance education is applicable for biology courses and can be applied in the future. Additionally, biology teachers stated that due to its complementarity feature, distance education can be applied in the biology courses in the future. Li, Zhou and Fan (2014) stated that equal opportunities have been provided to students through distance education. Distance education is especially useful for providing simultaneous and same quality education to more than one classroom branch (Cabı, 2018). As a result of the research conducted by Özgöl et al. (2017), it was determined that distance education provides advantages to students because it provides course repetition and easy access.

## Suggestions

According to the results of this research, the following suggestions can be proposed:

- It was determined that some teachers did not express positive or negative views about the various aspects of distance education. This situation suggests that some of the teachers do not have information about

distance education and they are in contradictions about its implementation. For this reason, it would be very convenient to provide teachers with education about what distance education is and in what cases and how it should be applied.

- In this process, some of the teachers discovered that distance education is not enough presenting the course content to the student in the classical sense at the specified time by only uploading them onto the system. From this point of view; It will be convenient to equip the course contents with the most up-to-date information suitable for the age level that will attract the attention of the student sitting in front of the screen.
- Course contents should be organized to appeal to the students' affective perceptions (enjoyable animations, videos, knowledge contests that they can actively participate in). Although students are provided with standard education programs by their schools, the content should be updated by the course teachers by taking students' levels and interest levels into account.
- Teachers should be told that situations similar to this global problem experienced in the context of the COVID-19 pandemic can be experienced at other times and therefore, they should be prepared in all circumstances. It should be noted that preventive medicine is very closely related to raising awareness of teachers as much as developments in medicine and pharmacy in the prevention of epidemics. For this reason, platforms can be created where teachers can transfer their experiences about situations that they find themselves successful or unsuccessful during their daily work.

### Scientific Ethics Declaration

The author(s) declare that the scientific ethical and legal responsibility of this article published in JESEH journal belongs to the author(s).

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