

Examination of Mathematics Teachers' Opinions on the Future of Distance Education*

Dr. Elif ÇELİK

Ministry of Education, Erzurum, Turkey.

ORCID ID: 0000-0001-5007-6415

elif-aktepe2010@hotmail.com

Asst. Prof. Gülsah ÖZDEMİR BAKİ

Department of Finance, Oltu Faculty of Humanities and Social Sciences, Atatürk University, Erzurum, Turkey.

gulsah.baki@atauni.edu.tr.

ORCID ID: 0000-0002-1497-6528

ABSTRACT

In this study, it is aimed to reveal the opinions of mathematics teachers about the future use of distance education. This study, which was designed in accordance with the case study, which is one of the qualitative research designs, was carried out with 42 mathematics teachers in the spring term of the 2020-2021 academic year. The data of the study were obtained from the answers given to the semi-structured interview form made with mathematics teachers. The data obtained from the research were analyzed using content analysis. As a result of the research, it is seen that teachers want to continue distance education for different purposes. Mathematics teachers who want to continue distance education; They want distance education mostly in order to be able to solve questions, to eliminate the deficiencies of the students and to repeat the subject. Teachers also stated that distance education can be used in online meetings, in communicating with parents who cannot come to school, in eliminating deficiencies that may occur due to disruptions in face-to-face education. In the study, it was seen that teachers who think that distance education should not continue, generally think that online lessons are not efficient for mathematics education and that a classroom atmosphere cannot be created in these lessons. As a result, the majority of teachers who have experienced distance education want to continue the new normal and later distance education in order to support face-to-face education.

Keywords: Distance education, mathematics teaching, mathematics teachers, lesson model

INTRODUCTION

Distance education has created remarkable effects in the field of education by using various communication technologies since the 19th century and has become an important topic of interest in the field. In this context, various definitions have been made in the literature about what distance education is and what it includes. For example, Holmberg (1989, p.168) defined distance education as a concept that covers all learning-teaching activities where learners and instructors are separate in space and time. According to Moore (1994), distance education is teaching methods in which teaching behaviors are carried out separately from learning behaviors, so that communication between teacher and student is facilitated by printed, electronic, mechanical or other devices. Simonson (2003) defines it as an institutional-based, formal education in which interactive telecommunication tools are used to connect learners, instructors and course contents, in which the learning group is separated. This definition of Simonson highlighted four main components of distance education as seen in Figure 1.

* A part of this article was presented as a summary paper at UFBMEK2021.



Figure 1. Basic Components of Distance Education (Simonson, 2003)

The first of these components is the conduct of distance education by institutions. Second, it provides flexibility to students and instructors in terms of time and space. This distinctive feature of distance education makes distance education attractive by overcoming the problems such as space and time management brought by traditional face-to-face education (Of, Kahraman, & Kudu, 2018). Third, distance education allows individuals in the learning group to communicate with various telecommunication tools. The last component is distance education, which provides students with the opportunity to gain different learning experiences through various educational resources.

In distance education, the classroom environment where teachers and students communicate face-to-face is replaced by a technological environment. This allows technological developments to shape the distance education process and to continue this process in accordance with today's conditions. This process, which is defined as the new generation distance education, is explained by Zhou et al. (2020) as a method of rapid learning and dissemination of content through the use of information and internet technologies. In other words, it is a teaching process in which enriched learning environments are developed in which learning processes are carried out through instructional technologies. Saykili (2018) states that in this process, when the effect of technology on learning reached its peak, previous learning models began to lag behind, and thus new models that allow multi-faceted communication and interaction came to the fore. Therefore, new generation distance education; aims to use synchronous, asynchronous and mixed education models effectively.

Distance education has gained a special importance, especially with the onset of the Covid-19 global epidemic, and has been seen as the only way to continue education activities in many countries around the world (Moreno & Gortazar, 2020). Due to the Covid-19 epidemic, face-to-face education was suspended in most countries and various restrictions were introduced, and distance education activities, which provide flexibility to students and teachers in terms of time and space, have begun to be carried out rapidly. Thus, as in most countries, in order not to disrupt education and training activities, Turkey has adopted and started to implement the new generation distance education method. With the distance education activities developed day by day, teachers tried to keep up with these studies, which they encountered for the first time, and to make distance education as efficient as possible by combining technology and education (Ozdemir Baki & Celik, 2021). In this context, teachers gained various experiences in the distance education process and continued their educational activities by combining these experiences with their professional experiences.

When the relevant literature is examined, there are studies that show that distance education has many advantages and that it is as effective as traditional education when appropriate methods and technologies are used (Kiryakova, 2009; Ward et al., 2010). Some of these advantages are; distance education is economical in terms of cost (Bijeesh, 2017; Brown, 2017; İsmail, 2011), being easy in terms of accessibility (Moore & Kearsley, 1996; Traxler, 2018), being independent of space and time management (Erfidan, 2019; Fidan, 2020) ; Horspol & Lange, 2012; Kirik, 2014; Nagrale, 2013; Of et al., 2018) the use of various educational resources (Arat & Minister, 2014), the replayability of the content (Duman, 2020; Yolcu, 2020), the use of technology in education. (De Paepe et al., 2018), aiming at lifelong learning, and most importantly, meeting the need for education during the pandemic period (Almaghaslah & Alsayari, 2020; Kaden, 2020). In addition, Simonson et al. (2011) emphasized the

importance of the design and quality of distance education and revealed a significant relationship between well-designed online courses and student satisfaction and learning outcomes. Whereas, some studies suggest that rapid growth due to technological developments, along with the increase in online learning opportunities in distance education, brings along various problems (Ferguson, 2020). For example, Murphy (2020) stated that distance education practices limit face-to-face classroom interactions during the Covid-19 epidemic. Stillman (2019), on the other hand, stated that the interaction between the student and the instructor is insufficient in distance education and argued that online courses limit the opportunity of following the students' work. Basaran et al. (2020), on the other hand, revealed that students and teachers do not find online lessons productive. On the other hand, most research findings show that digital technology opportunities in distance education vary according to individuals with different economic conditions, and therefore, schools in rural areas and individuals living in places without internet infrastructure are negatively affected by this situation (Alpago & Oduncu Alpago, 2020; Ozdemir Baki & Celik, 2021; Zhou et al., 2020). As a matter of fact, conducting online courses, which are compulsory due to the pandemic, requires internet infrastructure. This also applies to mathematics education.

When the studies on distance mathematics teaching are examined, it is seen that there are two different opinions regarding the online realization of mathematics lessons. While the first view argues that conducting mathematics courses completely online is as effectual as face-to-face teaching, the second view argues that it is not possible to conduct mathematics courses completely online in an effectual teaching process (Trenholm et al., 2019). Xu and Jaggars (2014) concluded in their study that students are more successful in face-to-face mathematics lessons rather than online mathematics lessons. Similarly, Smith and Ferguson (2005) concluded in their qualitative research that teaching mathematics in online courses is difficult and not effective enough. Moliner and Alegre (2022) found a statistically significant difference between the academic achievements of high school students in their study in which they compared mathematics achievements before and after Covid-19. In the study, decreases were detected in the mathematics achievement of students with Covid-19 restrictions. In particular, it was determined that the main factor explaining this decrease was the changes in peer support. Although the results of the research comparing face-to-face and online mathematics teaching revealed that there was no significant difference between the two applications in terms of learning, Trenholm et al. (2019) argued that this claim is incomplete, the success achieved as a result of the tests is not obviously expressed, and the data collection tools used are not reliable and valid enough. For this reason, the researchers stated that this is not enough to compare the effectiveness of face-to-face and online teaching, and online courses should only be used to support face-to-face teaching.

Studies examining the distance education experiences of mathematics teachers, their views and attitudes towards distance education also draw attention during the pandemic process. For example, Ozdemir Baki and Celik (2021), in their study investigating teachers' experiences of teaching mathematics remotely during the pandemic process, revealed that teachers experienced difficulties due to instructors (student, teacher and mathematics-specific), technology and external factors, and that they took various measures depending on environmental factors. In the study conducted by Kilit and Guner (2021) with mathematics teachers, it was concluded that teachers did not find web-based distance education effective and efficient for teaching mathematics. It is possible to encounter similar findings in the studies of Tican and Toksoy Gokoglu (2021). In the study conducted by the researchers with the teachers, most of the participating teachers stated that they did not find mathematics lessons useful in distance education. Unlike other studies, Cassibba et al. (2021) stated in their study that most of the professors consider writing tablets, mathematical software and e-learning platforms they use in distance education to be limited. On the other hand, Ozcakar Sumen (2021), who stated that teachers adopted positive views on distance education, revealed that in this process, teachers planned the operation of mathematics lessons before the lesson and used technological materials more. In addition to these studies, when the results of the study examining the attitudes of students and teachers towards distance mathematics education were evaluated, Demir, Kaleli Yilmaz and Sert Celik (2021) examined about distance mathematics education the attitudes of teachers working at primary, secondary, high school. Research findings showed that teachers' attitudes towards distance mathematics lessons were undecided but negative. In this direction, Wijaya (2021) examined students' attitudes towards mathematics during the pandemic. In the study, it was concluded that the use of video through dynamic mathematics software affects students' attitudes towards mathematics teaching positively.

In general, researches clearly reveal that distance education, which was started because of the epidemic, is an effective method for teaching and learning. On the other hand, studies on mathematics teaching more specifically show that this situation is not the same. As a matter of fact, considering the general course of the Covid-19 epidemic, it would be correct to say that its effects in the field of education will not be short-lived, and therefore distance education may turn into a permanent teaching method rather than an alternative solution used during the epidemic period. For this reason, distance mathematics teaching activities should be structured as well as possible in the new normal and subsequent period when the epidemic continues. This makes the experiences and observations of mathematics teachers who carry out distance education activities important under the emergency

conditions of the global epidemic. Although studies have been carried out to determine the views of mathematics teachers on distance education during the pandemic period, no study has been found that reflects the perspectives of teachers on using distance education in the new normal and the following period. It is very important to reveal the opinions of the teachers who train the individuals of the future about the role of distance education in the new normal and the following process, in order to raise students with the necessary competencies and needs of the age. In this study, it is aimed to reveal the views of mathematics teachers on the future of distance education. In this context, the research problem of the study is as follows:

- What are the opinions of mathematics teachers about using distance education in the future?

METHOD

Research Model

This study was designed in accordance with the phenomenology approach, one of the qualitative research designs. Phenomenological research focuses on making sense of the lived experiences of individuals related to a phenomenon (van Manen, 2007). Therefore, the main purpose of phenomenological research is to reflect individuals' understandings, feelings and perspectives towards the phenomenon, based on how they experience a phenomenon. In this study, it was found appropriate to use the phenomenological research method as it will reveal the perspectives of mathematics teachers towards using new normal and later distance education in line with their experiences in distance education.

Ethics committee approval was obtained for this study from Atatürk University Social and Human Sciences Ethics Committee with the number E-56785782-050.02.04-2200007986.

Study Group

This study was carried out with 42 mathematics teachers working in different provinces of Turkey. In phenomenological studies, the study group is chosen for the purpose, since it is aimed to collect information from individuals who have experiences with the phenomenon that the study focuses on and who will reflect this phenomenon. For this reason, multi-stage sampling method was preferred in determining the participants. In the first stage, criterion sampling, one of the purposeful sampling methods, was used. In this method, it was taken as a criterion for teachers to have mathematics teaching experience in the distance education process. In the next step, snowball sampling, one of the purposeful sampling methods, was used. Snowball sampling consists of subjects added as research continues. This sample begins with one or more known and available subjects. Just as a snowball expands and grows when it rolls, snowball sampling can lead the researcher to more events or subjects with one or more types of events or subjects that are initially desired to be studied. In this way, more events or subjects than expected can be reached (Ozen & Gul, 2007). From this point of view, a mathematics teacher, who is well known by the researchers, was determined as the key person. Then, four resource people were reached from the mathematics teacher who was the key person, who volunteered to be interviewed, who were suitable for the purpose of the research and the criteria determined in the research. With the help and suggestions of these teachers, a total of 42 mathematics teachers, 33 of whom work in secondary schools and 9 of which work in high schools, were reached. The descriptive characteristics of the participant teachers are given in Table 1.

Table 1. Information on the descriptive characteristics of participant teachers

School Levels	Gender	Teaching Experience (years)			
		0-5	6-10	11-15	16 and over
Secondary	Woman	5	7	4	5
	Man	2	4	5	1
High	Woman	1	1	1	1
	Man	1	1	1	2

Data Collection

One of the most frequently used data collection techniques by qualitative researchers in education and social sciences is semi-structured interview. The data of the study were obtained through semi-structured interviews with mathematics teachers. The first question in the semi-structured interview form prepared by the researchers was prepared to determine the opinions of the teachers participating in the interview about whether distance education should continue or not. According to the answers given by the teachers, the sub-questions were directed in two different ways. Teachers who did not want distance education to continue during and after the new normal were asked to explain why they did not want it to continue. Teachers who wanted to continue distance education were asked for what purposes they wanted to use distance education activities. It was tried to determine whether there

was any change in their perceptions of using distance education by interviewing the interviewers twice at different times. The interviews were conducted online. The first interview was held in the spring term of the 2020-2021 academic year, and the second interview was held in the fall term of the 2021-2022 academic year. Thus, by reconsidering the feelings, thoughts and experiences of mathematics teachers towards distance education at different times, it has been tried to reflect the different perspectives of teachers towards using distance education.

Data Analysis

Qualitative data analysis was used in this study. Qualitative data analysis is a collection of activities in which the data obtained by data collection methods and techniques such as observation and interview are organized, categorized, themes are discovered, and ultimately the whole process is transferred to the report (Özdemir, 2010). The data obtained from the research were analyzed using content analysis. In this process, firstly, the questions in the interview form were determined and the answers of the teachers who participated in the interview were evaluated in detail. While the answers given by the teachers were analyzed, the data were coded by dividing them into small meaningful parts with the help of an excel table. The codes were revised after each interview. While the codes were being created, it was determined how often a code was used in the interviews and where to pay attention in the next interview. Then the frequencies of each code were determined. Thus, while determining how many teachers the determined codes were effective on, it was also tried to reach the exceptional situations experienced by the teachers. A table was created by giving names to the codes according to the explanations. Afterwards, a literature review was made and the codes were revised. By examining the generated codes, the relevant codes were brought together and categories were created. In order to increase the reliability of the coding, the collected data were examined by both researchers. The agreement between researchers was calculated by using Miles and Huberman's (1994) percent agreement formula. In this study, the agreement between the two encoders was found to be 94%. Accordingly, the coding process provided a desired level of reliability. In addition, the relationships and explanations between the codes were explained descriptively in the research. In order to increase the validity and reliability of the research, the accuracy of the interview transcriptions of the participants was confirmed by the participants. In addition, direct quotations from the interviews with the teachers were included and the study was presented in detail through dense and rich descriptions.

RESULTS

In the interviews, the first question was asked to the teachers, “Do you want distance education activities to continue when the new normal and then face-to-face education is started? question was posed. In this context, teachers who wanted to continue distance education were asked for what purposes they wanted to carry out distance education activities. The codes created in line with the answers given by the teachers are given in Table 1.

Table 1.

Theme	Category	Codes	f
Distance education should continue	Teacher-oriented purposes	Flexible lecture hours	2
		Being able to communicate easily outside of school	4
		Reaching more students at the same time	1
		Carrying out professional development activities	3
	Student-oriented purposes	Using interest in technology	2
		Considering individual differences	1
		Giving guidance	2
		Conducting special education lessons	1
		Providing weekend courses	3
		Conducting online parent meetings	3
	Teaching-oriented purposes	Solving the question	11
		Repetition of the topic	2
		Conducting the discussions	1
Making/completing activities		4	
		Elimination/support of subject deficiencies	7

Teachers' Opinions on Continuation of Distance Education

As seen in Table 1, teachers who think that distance education should continue in the future; It has been determined that they want distance education to continue with the aim of contributing to the development of students, reaching the purpose of teaching and contributing to the personal development of the teacher. The category that teachers who want to continue distance education think to develop the least is the goals for the teacher. According to Table 1, it is noteworthy that the frequencies of the four codes of the category created for these purposes are not very high. When the categories are examined, it is seen that the teachers mostly want the distance education to continue

by highlighting the aims of the teaching. In this context, teachers; They stated that they want to continue distance education for purposes such as repeating the subject, conducting discussions, completing the activities in the lesson or doing new activities, eliminating the deficiencies of the subjects covered in the lesson and solving questions.

Mathematics teachers who want distance education to continue when the new normal and then face-to-face education is introduced stated that live lessons should be conducted in distance education in order to be able to solve the most questions. In this context, T2 “Live lessons can be continued to solve problems.” expressed his opinion. T15 said, “Teachers can solve questions that students cannot do with distance education. Additional questions can be resolved.” expressed his thoughts on this subject with his statements. One of the teachers who thinks that distance education should continue in order to make up for the deficiencies of the students, T1 said, “*The subjects of the mathematics course are interconnected and do not accept any deficiency. For this reason, I would like distance education to continue in order to complete the deficiencies.*” expressed as. T17 said, “*A more effective course can be created by supporting the subjects that students are stuck on with distance education, especially apart from face-to-face education.*” He stated that distance education can be used to support the subjects. Similarly, T7 said, “*In order to use the time efficiently, support lessons can be taught by conducting distance education with students who do not understand the same subject. In fact, by developing distance education, the lectures can be recorded and students who do not understand can be given the opportunity to watch it over and over again*”, he stated that distance education can be used to support the subjects. T14, on the other hand, stated that distance education can be used both to support the subjects and to eliminate the deficiencies that may occur due to disruptions in face-to-face education:

“Distance education can be used to support the topics we cover in face-to-face education, especially in order to discuss the subject or problem that is not understood after the lesson... When we get sick and get a report, it can be used to make up for the lesson.”

In this direction, T9 stated that distance education should continue in order to repeat the topics covered. In addition, T9 mentioned that since some students are interested in technology, it is possible to support mathematics teaching by using technology. T9 “Some students can better understand this method because they are interested in technology. In this way, we also take into account student differences.” used expressions. Stating that distance education has become a part of the education system, T10 emphasized that distance education can be used in online meetings with the following statements: “*We can communicate with the parents who could not attend the school, organize a parent meeting in the evening with the participation of the parents, and exchange views about the students. We can also hold online meetings, such as group meetings, with branch teachers at school.*” Similarly, T7 stated that teachers had improved themselves in online education in this process and emphasized that this situation should be used beneficially in the field of education in the following periods. T7 also said, “*We can hold meetings with parents who can't come to school using online meetings and who have limited time. Thus, we can make school, family and student communication more active, and we can cooperate with parents so that students can use the time they spend at home efficiently. Also, as math teachers, we can exchange ideas with each other using these remote online meetings.*” made statements. T4, who is in favor of using face-to-face education on weekdays, said that distance education should continue for weekend courses. “*I think question solving can be done in distance education in the courses that exist on the weekend. We can continue by solving questions and explaining the subject by using the smart board application in the courses. We will save time and children can attend courses at home.*” expressed in his words. In parallel, T18, who works in a regional boarding school, said, “*Weekend courses can continue as live lessons, not as lessons. It may not be possible for every student to attend the courses at the school. These students can attend courses with distance education.*” used expressions. T18 also stated that he wants his students, who live in different villages, who have problems in transportation, but stay at the school as boarders and attend classes on weekdays, to attend the courses held at the weekends as distance education. Ö15, a village teacher, also stated that weekend courses can be continued with distance education. Four teachers stated that distance education can be used to carry out and complete the activities. Stating that it is not predictable how long the pandemic will last, and therefore we need to improve ourselves in the distance education process, T10 said, “*We can use these programs to improve ourselves in the profession. We can attend online meetings related to mathematics teaching organized by some university professors. We can meet with our online math teacher friends and exchange information, so we can perform a better mathematics teaching.*” made statements. Stating that they do not know what life will bring even in the end of the pandemic process, and therefore teachers should be prepared for many difficult conditions, T26 said, “*It is impossible to break away from this completely experienced, tried and gained distance education.*” made statements. However, T7 mentioned that it is necessary to continue distance education in order to carry out professional development activities as follows:

“... Also, as math teachers, we can exchange ideas with each other using these remote meetings. We can discuss how we can teach mathematics better and share different mathematics problems with our branch colleagues through this platform. We can inform each other about current teaching methods and

techniques in mathematics and share what we have done in our productive lessons. We can exchange ideas to diversify the materials we use.” Drawing attention to a different point, T13 stated that distance education can be effective for students who need to be educated at home.

In the interviews, he said to the teachers who do not want distance education to continue, “Why do not you want to continue distance education activities in the new normal and afterwards?” question was posed. The codes created in line with the answers given by the teachers are given in Table 2.

Table 2 Teachers' Opinions on the Discontinuation of Distance Education

Theme	Category	Codes	f
Distance education shouldn't continue	In terms of the structure of distance education	Not suitable for village schools	1
		Virtual learning environment	4
		Insufficient interaction	7
		Inequality of opportunity	6
		Lack of face-to-face lecture	3
		Not suitable for math class	8
	In terms of students	Boredom of students	2
		Students have problems taking responsibility	2
	In terms of teaching	Difficult to measure and evaluate	3
		Not efficient	7
		Insufficient class participation	3
		Lesson time is limited	2

As seen in Table 2, teachers who think that distance education should not continue in the future; It has been determined that they do not want distance education in the future due to the negative effects on the development of students, the inability of the education to achieve its purpose, and the unsuitability of the structure of distance education. The situations that the teachers who do not want to continue the distance education think that they have the least problems are the problems related to the "In terms of students" category. It is noteworthy that the frequencies of both codes of this category created according to Table 2 are not very high. From this point of view, it can be thought that teachers do not have enough knowledge about the problems experienced by students in distance education. When the categories were examined, it was determined that the teachers had various concerns about the structure of distance education. Teachers, who think that distance education should not continue, have generally argued that the interaction in live lessons is insufficient and live lessons are not efficient for teaching mathematics. For this reason, they argued that distance education should not continue when face-to-face education is introduced. On this subject, T23 said, “*Distance education is insufficient in the narration and interaction of the subject. Since the interaction with the student has decreased, the necessary intervention cannot be made on time, and therefore the deficiency continues exponentially. After a while, the student loses all interest. Since the interaction of students with each other is minimized, it is not an enjoyable process for the student.*” used expressions. T6 stated that distance education is not suitable for village schools without internet infrastructure and argued that face-to-face interaction is necessary for mathematics teaching. Sections of teachers' statements in this regard are presented below:

“...If possible, I would like a complete transition to face-to-face training. Because I believe that face-to-face training will be more beneficial due to our branch. Mathematics is a lesson that students can only understand with face-to-face education.” (T28)

“We have seen that distance education is not as beneficial as face-to-face education. Not all students can attend remote courses. Since the subjects of mathematics lesson are related to each other, it is necessary to know the previous subjects in order to learn each subject. Students who cannot attend one lesson do not understand the other lesson. In addition, I think that it affects the learning of the course badly because there is a lack of communication.” (T30)

“...Because I think that even facial expressions are helpful in class. It is difficult for students to understand mathematics in distance education. We mathematicians use our bodies a lot, especially in figure or graphic questions.” (T36)

T3 and T22, on the other hand, stated that the lecture should be face-to-face and stated that distance education should not continue. T3 explained this situation as “*Because I love education and teaching as a whole, I want to make eye contact with my students and be together with them in my lessons.*” explained as. In addition, T5 argued that live lessons should not continue due to the virtual nature of distance education. Stating that he had difficulties

in doing live lessons in distance education, T8 stated that not all students could benefit from distance education because of the inequality of opportunity and stated that distance education should not continue. In addition, T27, T31, T30 and T41, on the other hand, stated that adequate opportunities could not be provided to everyone and stated that distance education should not continue. Similarly, T13, who works in a rural school and tries to offer live lessons with students living in villages, emphasized the inequality of opportunity in distance education and stated that distance education should not continue. Ö22, on the other hand, stated that he did not want distance education to continue on the grounds that a classroom environment could not be created in distance education.

In the first interviews, it was seen that the teachers had concerns about teaching such as the difficulty of measuring and evaluation in distance education, the limited duration of the lesson, the insufficient participation in the lesson and the ineffectiveness of the live lessons. In this context, T5 said, *“Since the time is very limited in live lessons, we can only teach here, but we are disrupting the education part of education and training. Therefore, face-to-face training would be better.”* He talked about the limited time with his statements. On the other hand, it has been determined that some teachers do not want distance education to continue due to student-related reasons such as students getting tired of live lessons and having problems in taking responsibility in lessons.

During the meetings held with the teachers in the spring term of 2021, their opinions on using the new normal and then distance education were taken. When the opinions of the teachers were examined, it was determined that there were three lesson models they wanted to use in mathematics lessons. The lesson models preferred by the teachers are shown in Figure 2.

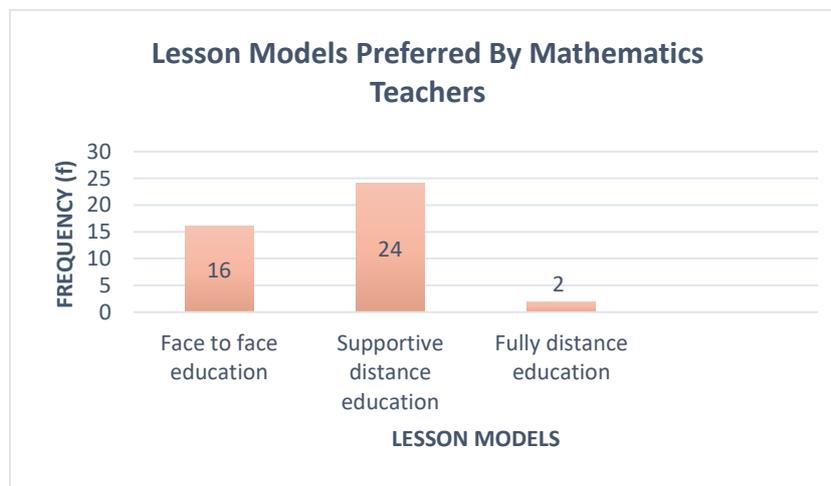


Figure 2. Preference Ethics of Mathematics Teachers Lesson Models

Teachers who want to use the distance education model completely stated that some deficiencies should be eliminated in order to carry out mathematics lessons efficiently in distance education, but they emphasized that the flexibility of the lessons is quite advantageous. Teachers who think that mathematics lessons should only be continued face-to-face, stated that they could not provide enough classroom order in virtual environments and that they encountered negative effects during the operation of distance education. In addition, it has been determined that teachers working in rural areas argue that distance education should not continue due to inequality of opportunity and they only want to continue face-to-face education. The teachers who agreed that distance education is a new achievement for teachers and that the deficiencies experienced in live lessons can be largely corrected in the new normal and afterwards, and that success in distance education can be achieved, stated that distance education can be used to support face-to-face education.

When face-to-face education was introduced in the fall semester of 2021, interviews were conducted again to determine whether there was a change in teachers' thoughts on using the new normal and then distance education. In repeated interviews, it was determined that there were changes in the use of distance education by some teachers. In this direction, the lesson models that teachers want to use in mathematics lessons in the spring and fall semesters of 2021 are compared in Figure 3.

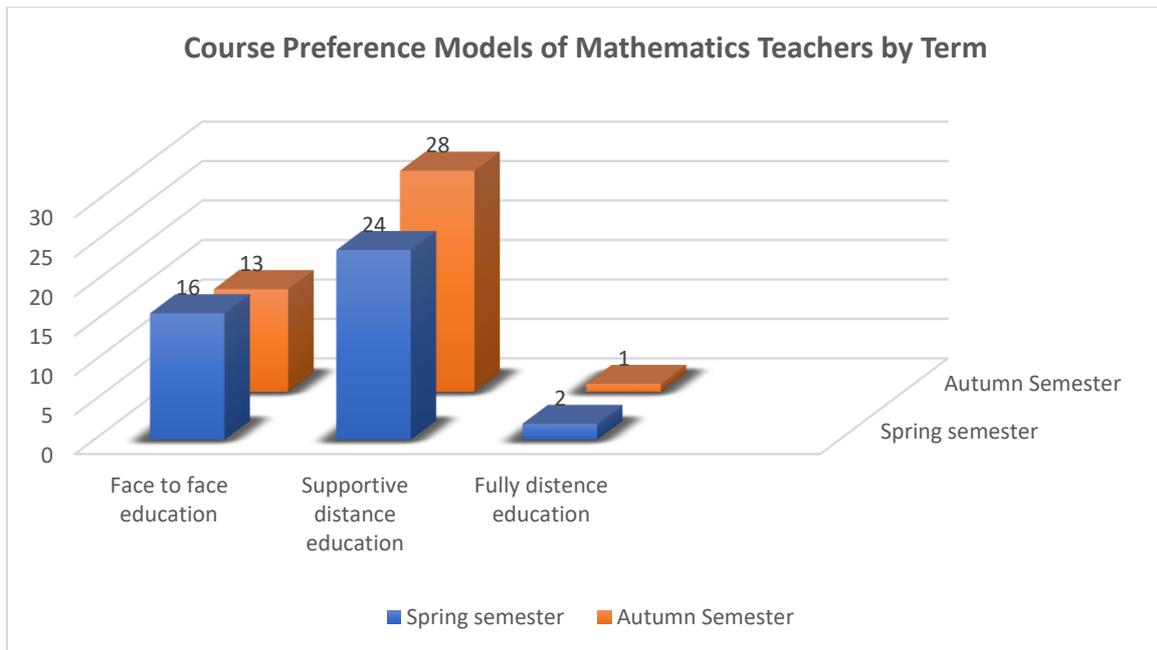


Figure 3. Preferred Ethics of Mathematics Teachers, Lesson Models by Term

As seen in Figure 3, in the spring term of 2021, 16 teachers preferred face-to-face education only, while 13 teachers preferred face-to-face education in the fall semester of 2021, when face-to-face education was introduced. During this time, three teachers decided that "distance education should support face-to-face education" instead of "only face-to-face education". For example, "...I don't want to continue with distance education only in the future, face-to-face education is more effective. But they can be together. I would like to do live lessons remotely from home at certain times a week. I would like to use distance education for the purposes of repeating the subject, solving questions and informing the students about the instant developments in the lesson, not to teach new subjects in mathematics." T11, who preferred only face-to-face education in the first interview, stated that distance education and face-to-face education should be combined in the second interview. Despite this, a teacher who preferred only distance education stated that there was no change in his ideas. Contrary to this situation, T3 who stated that distance education is not beneficial in the spring semester and he wanted to meet and be together with the students as a reason and preferred only face-to-face education; in the interviews held in the fall semester, he stated that he preferred face-to-face learning more decisively. T3 justified this situation by saying, "...Only my views on distance education have definitely not changed, they have even been consolidated and strengthened. When it comes to supporting face-to-face education with distance education, school already takes children's time. Also, I don't want to make children sit in front of the computer at home. I am one of those who think that the computer makes children more passive than necessary. ..." used the expressions. In parallel with this situation, T30, who preferred only face-to-face learning in the spring semester, stated that the students could not attend the live lessons sufficiently, and that the students who could not attend a lesson because the mathematics subjects were related to each other could not fully understand other mathematics subjects. T30 also stated that there was no change in his ideas during the interviews held in the fall semester. T30 explains this situation as follows;

"... Last year, I thought that students who could not attend my live lessons in distance education for various reasons did not understand the lessons. In fact, I saw this semester that even some students, who only interrupted some lessons and tried to attend live classes as much as possible, did not fully understand the subjects due to the disconnections in the lessons. Since distance education is not efficient enough, when I switched to face-to-face education this year, I found that children could not acquire the gains they should have in distance education. Due to the nature of the mathematics course, students cannot understand new topics this semester, as there are deficiencies in the topics of the previous semester. I think we should just continue with face-to-face training."

However, it was observed that there was no change in the opinions of 24 teachers who preferred the supportive distance education model in the spring term when distance education was started. These teachers think that face-to-face education supported by distance education will be more beneficial for students in both conditions. Parallel to this situation, the statements of T11, who is considering using distance education to support a subject that the student does not understand, are given below:

“I would like to use distance education together with face-to-face education in the future. It can be used to supplement topics that students do not understand. In fact, the lessons can be recorded and students who do not understand can be given the opportunity to watch it again and again. I am seriously considering using distance education as a support. I will even start distance education myself in this process. I don't have enough time for face-to-face training. Some math subjects that were supposed to be finished according to the plan did not catch up. Considering that my students have completed their deficiencies such as internet and computer in distance education and that they have learned how distance education should be by experience, we can think that we will not have a problem in this regard. I talked to the children and we will do online lessons together. We both complete the missing topics and solve a lot of questions.”

Similarly, many teachers think that distance education can be used to support face-to-face education with live lessons that can be held at flexible hours. For example, T10 said, *“I think we can provide education outside of school because of the flexible course hours in distance education. We can communicate with our students even during the summer holidays. Even as teachers, we can participate in professional development courses to improve ourselves by reducing costs without paying for travel and hotel expenses.”* In both interviews, she stated that she preferred supportive distance education.

When the interviews held in the spring and fall terms are compared, a significant increase has been observed in the number of teachers who prefer supportive distance education. It was determined that three teachers who preferred only face-to-face education in the first interviews and one teacher who preferred only distance education preferred supportive distance education in the second interviews. Ö25, who prefers distance education completely in both interviews, emphasized the importance of distance education by stating that more audiences can be reached at the same time with live lessons at a lower cost. T25 also stated that due to the flexibility of distance education hours, students can be given more education during the day and stated that distance education should be used completely in the future. It is understood from the interviews that most of the teachers care about the gains they have gained in distance education, and they want to provide positive developments in education for the future by transferring these gains and experiences to face-to-face education.

Conclusion

The present study reveals the opinions of mathematics teachers who have distance education experience on the new normal and later on using distance education. It was observed that the teachers gave three disjointed opinions on the use of distance education and explained these opinions by presenting various reasons. In this context, some of the teachers stated that only face-to-face education is suitable for mathematics teaching, while others claimed that distance education can be used to support face-to-face education. On the other hand, some teachers stated that distance education is as effective as face-to-face education and stated that mathematics lessons can be conducted with distance education. As a result, it has been concluded that there are three lesson models that teachers want to use based on their views on the future of distance education.

In the spring semester of 2021, some of the teachers who wanted only face-to-face education changed their minds by stating that face-to-face education was not sufficient in the fall semester of 2021, when face-to-face education was started. It was observed that teachers who changed their minds in this direction claimed that a distance education model that supports face-to-face education would be more beneficial for students. However, all of the teachers who want to use the new normal and later distance education together with face-to-face education in the spring term in which distance education is held, showed that they agreed by choosing the supportive distance education model in the fall period when face-to-face education was given. In both conditions, teachers who prefer supportive distance education in interviews; They emphasized that face-to-face education should be supported by stating that it has various deficiencies. At this point, they stated that face-to-face education can be supported by reaching more students at the same time with less cost and by providing more education to the students during the day thanks to the flexible education hours, with the distance education activities developed at this point, the deficiencies of which are identified and eliminated.

When the interviews made in the spring and fall terms are compared, it is observed that the number of teachers who prefer supportive distance education has increased. Although there are differences of opinion on the subject, it can be said that most of the teachers tend to use the supportive distance education model. Teachers who want to use the distance education model completely claimed that mathematics lessons can be carried out effectively in a well-planned distance education process where the deficiencies are eliminated. Similarly, the study results of Simonson et al. (2011) show that well-designed distance education is an effective method for teaching and learning. However, Ward et al. (2010) revealed that distance education is as effective as face-to-face education when appropriate methods and technologies are used. In addition, the teachers who support the conduct of mathematics courses entirely with distance education emphasized that distance education provides flexibility in terms of time

and space. They stated that it is possible to reach more students at the same time thanks to distance education. In line with this result, Duman (2020) in her research evaluating distance education, showed that distance education is independent from the environment, being able to take distance lessons by phone, and the absence of absenteeism problems as the advantages of distance education.

In the study, it was seen that teachers who think that distance education should not continue in the new normal and afterwards, generally think that live lessons are not efficient, that distance education is virtual and that a classroom environment cannot be created. There are studies showing similar results in the related literature (Aksu, 2021; Smith and Ferguson, 2005; Kilit and Güner, 2021; Ozdemir Baki and Celik, 2021). In this direction, Basaran et al. (2020) stated that the most important shortcoming of distance education is its inability to provide the education-teaching spirit created by the school environment, and stated that it is very difficult to provide education in a virtual environment. Therefore, these results support the findings of the present study. In addition, it has been determined that teachers who work in suburban schools or try to conduct live lessons with students living in villages argue that distance education should not continue due to the inequality of opportunity in distance education. In parallel with this research result, Can (2020) emphasized that everyone's access to distance education opportunities at all education levels should be strengthened. Similarly Aksu (2021); Stating that students who do not have opportunities such as internet and computer at home in distance education cannot attend the classes, he stated that the lessons given in distance education should be recorded and delivered to every student in order to provide equal opportunities in education. In the study, some of the teachers who thought that distance education should not continue, brought up the issue of insufficient interaction. In parallel with this study, Ferri, Grifoni and Guzzo (2020) stated that students lack motivation and interaction in distance education and stated that there are various social difficulties in distance education, among students themselves and between teachers and students. On the other hand, in the interviews conducted within the scope of the research, it was determined that secondary school mathematics teachers generally wanted distance education and face-to-face education to be used together, whereas high school mathematics teachers wanted to use only face-to-face education model. The teachers, who said that distance education is not suitable for the mathematics course, stated that they found that the students could not apply the knowledge they learned after listening to the lesson to the problem solving stages in order to support their views. Similarly, Akyurek (2020) argued that distance education can work in theoretical courses, but it cannot work effectively in practical courses. The situations that the teachers who do not want to continue the distance education think that they have the least problems are the problems related to the "In terms of students" category. From this point of view, it can be thought that teachers do not have enough knowledge about the problems experienced by students in distance education.

Teachers, who agree that distance education can be provided to a large extent in the new normal and afterwards, find it appropriate to use the distance education model in order to support face-to-face education. In this context, it has been determined that teachers want to use distance education to solve more questions, eliminate the deficiencies of students, repeat the subject, conduct weekend courses and conduct special education lessons. In line with these findings, Trenholm et al. (2019) stated that distance education should only be used to support face-to-face education. Watson (2008), on the other hand, stated that both models have strengths and drew attention to the blended education model in which face-to-face education and distance education are used together. As a matter of fact, most of the teachers emphasized that they have gained experience of distance education during the pandemic process and that they have improved themselves considerably and emphasized that they want to benefit from this experience in the future.

As a result, although the current study reveals that mathematics teachers mostly prefer the distance education model that supports face-to-face education, the future of distance education will continue to be a topic that teachers all over the world discuss and make evaluations about.

References

- Aksu, H. H. (2021). Mathematics teachers' opinions on distance education using the educational informatics network (EBA). *The Turkish Online Journal of Educational Technology*, 20(2), 88-97.
- Akyurek, M. İ. (2020). Distance education: A literature review. *Medeniyet Eğitim Araştırmaları Dergisi*, 4(1), 1-9. <https://dergipark.org.tr/en/pub/mead/issue/56310/711904>
- Almaghaslah, D., & Alsayari, A. (2020). The effects of the 2019 novel coronavirus disease (COVID-19) outbreak on academic staff members: A case study of a Pharmacy School in Saudi Arabia. *Risk Management and Healthcare Policy*, 13, 795-802. <https://doi.org/10.2147/RMHP.S260918>
- Alpago, H., & Oduncu Alpago, D. (2020). Socio-economic consequences of coronavirus. *IBAD Journal of Social Sciences*, (8), 99-114. <https://doi.org/10.21733/ibad.716444>
- Arat, T., & Bakan, O. (2014). Distance education and applications. *Selçuk Üniversitesi Sosyal Bilimler Meslek Yüksekokulu Dergisi*, 14(1-2), 363-374.

- Başaran, M., Doğan, E., Karaoğlu, E., & Şahin, E. (2020). A study on effectiveness of distance education, as a return of coronavirus (covid-19) pandemic process. *Academia Journal of Educational Research*, 5(2), 368-397. <https://dergipark.org.tr/en/pub/egitim/issue/54643/753149>
- Bijeesh, N. A. (2017). *Advantages and disadvantages of distance learning*. <http://www.indiaeducation.net/online-education/articles/advantages-and-disadvantages-of-distancelearning.html>
- Brown, C. (2017). Advantages and disadvantages of distance learning. <https://www.eztalks.com/elearning/advantages-and-disadvantages-of-distance-learning.html>
- Can, E. (2020). Coronavirüs (covid-19) pandemisi ve pedagojik yansımaları: Türkiye’de açık ve uzaktan eğitim uygulamaları. *Açıköğretim Uygulamaları ve Araştırmaları Dergisi*, 6(2), 11-153. <https://dergipark.org.tr/en/pub/auad/issue/55662/761354>
- Creswell, J.W. (2007). *Qualitative inquiry & research design: Choosing among five approaches*. CA: Sage.
- Duman, S. (2020). Evaluation of the distance education process carried out during the epidemic period. *Milli Eğitim Dergisi*, 49(1), 95-112. <https://doi.org/10.37669/milliegitim.768887>
- Erfidan, A. (2019). *Derslerin uzaktan eğitim yoluyla verilmesiyle ilgili öğretim elemanı ve öğrenci görüşleri: Balıkesir Üniversitesi örneği* [Yayınlanmamış yüksek lisans tezi]. Balıkesir Üniversitesi.
- Smith, G. G., & Ferguson, D. (2005). Student attrition in mathematics e-learning. *Australasian Journal of Educational Technology*, 21(3). <https://doi.org/10.14742/ajet.1323>
- Ferguson, S. (2020) Attrition in online and face-to-face calculus and precalculus courses: A comparative analysis. *Journal of Educators Online*, 17(1). <https://eric.ed.gov/?id=EJ1241557>
- Ferri, F., Grifoni, P., & Guzzo, T. (2020). Online learning and emergency remote teaching: Opportunities and challenges in emergency situations. *Societies*, 10(4), 86.
- Fidan, M. (2020). Covid-19 belirsizliğinde eğitim: İlkokulda zorunlu uzaktan eğitime ilişkin öğretmen görüşleri. *Uşak Üniversitesi Eğitim Araştırmaları Dergisi*, 6(2), 24-43. <https://doi.org/10.29065/usakead.736643>
- Holmberg, B. (1989). *Theory and practice of distance education*. Routledge.
- Horspool, A., & Lange, C. (2012). Applying the scholarship of teaching and learning: Student perceptions, behaviours and success online and face-to-face. *Assessment & Evaluation in Higher Education*, 37(1), 73-88. <https://doi.org/10.1080/02602938.2010.496532>
- İşman, A. (2011). *Uzaktan Eğitim* (4. Baskı). Pegem Akademi.
- Kaden, U. (2020). COVID-19 school closure-related changes to the professional life of a k-12 teacher. *Education Sciences*, 10(6), 165. <https://doi.org/10.3390/educsci10060165>
- Kırık, A. M. (2014). Uzaktan eğitimin tarihsel gelişimi ve Türkiye’deki durumu. *Marmara İletişim Dergisi*, 21, 73-94. <https://doi.org/10.17829/midr.20142110299>
- Kilit, B., & Güner, P. (2021). Matematik derslerinde web tabanlı uzaktan eğitime ilişkin matematik öğretmenlerinin görüşleri. *Anemon Muş Alparslan Üniversitesi Sosyal Bilimler Dergisi*, 9(1) 85-102. <https://doi.org/10.18506/anemon.803167>
- Kiryakova, G. (2009). Review of distance Education. *Trakia Journal of Sciences*, 7(3), 29-34. http://tru.uni-sz.bg/tsj/Vol7No3_2009/GKyriakova.pdf
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded Sourcebook*. (2nd ed.). CA: Sage.
- Moliner, L., & Alegre, F. (2022). COVID-19 restrictions and its influence on students’ mathematics achievement in Spain. *Education Science*, 12, 105. <https://doi.org/10.3390/educsci12020105>
- Moore, M., & Kearsley, G. (1996). *Distance education: A systems view*. Wadsworth Publishing Company.
- Moreno, J. M., & Gortazar, L. (2020, 8 April). *Schools’ readiness for digital learning in the eyes of principals. An analysis from PISA 2018 and its implications for the COVID19 (Coronavirus) crisis response*. World Bank Blogs. <https://blogs.worldbank.org/education/schools-readiness-digital-learning-eyes-principals-analysis-pisa-2018-and-its>
- Murphy, M. P. (2020). COVID-19 and emergency eLearning: Consequences of the securitization of higher education for post-pandemic pedagogy. *Contemporary Security Policy*, 114. <https://doi.org/10.1080/13523260.2020.1761749>
- Nagrale, P. (2013). *Advantages and disadvantages of distance education*. <https://surejob.in/advantages-and-disadvantages-of-distance-education.html>
- Of, M., Kahraman, K., & Kudu, M. (2018). Computer programming students’ attitudes in distance. *The Online Journal of Distance Education and E-Learning*, 6(2), 41-45. <https://tojdel.net/journals/tojdel/articles/v06i02/v06i02-07.pdf>
- Özdemir Baki, G., & Çelik, E. (2021). Ortaokul matematik öğretmenlerinin uzaktan eğitimde matematik öğretim deneyimleri. *Batı Anadolu Eğitim Bilimleri Dergisi*, 12 (1), 293-320. <https://doi.org/10.51460/baebd.858655>

- Özdemir, M. (2010). Nitel veri analizi: Sosyal bilimlerde yöntem bilim sorunsalı üzerine bir çalışma. *Eskişehir Osmangazi Üniversitesi Sosyal Bilimler Dergisi*, 11(1), 323-343.
<https://dergipark.org.tr/en/pub/ogusbd/issue/10997/131612>
- Özen, Y., & Gül, A. (2010). Sosyal ve eğitim bilimleri araştırmalarında evren-örneklem sorunu. *Atatürk Üniversitesi Kazım Karabekir Eğitim Fakültesi Dergisi*, 0 (15), 394-422.
<https://dergipark.org.tr/tr/pub/ataunikkefd/issue/2776/37227>
- Saykılı, A. (2018). Distance education: Definitions, generations, key concepts and future directions. *International Journal of Contemporary Educational Research*, 5(1), 2-17.
<http://ijcer.net/en/download/article-file/498240>
- Simonson, M. (2003). Definition of the field. *Quarterly Review of Distance Education*, 4(1), vii-viii.
- Simonson, M., Schlosser, C., & Orellana, A. (2011). Distance education research: A review of the literature. *Journal of Computing in Higher Education*, 23(2-3), 124-142. <https://doi.org/10.1007/s12528-011-9045-8>
- Traxler, J. (2018). Distance learning: Predictions and possibilities. *Education Science*, 8(1),
<https://doi.org/10.3390/educsci8010035>
- Trenholm, S., Peschke, J., & Chinnappan, M. (2019). A Review of fully online undergraduate mathematics instruction through the lens of large-scale research (2000-2015). *Problems, Resources, and Issues in Mathematics Undergraduate Studies*, 29(10). <https://doi.org/10.1080/10511970.2018.1472685>
- Ward, M., Peters, G. & Shelley, K. (2010). Student and faculty perceptions of the quality of online learning experiences. *The International Review of Research in Open and Distributed Learning*, 11(3), 57-77. Athabasca University Press. <https://www.learntechlib.org/p/49143/>.
- Watson, J. (2008). *Blended learning: The convergence of online and face-to-face education. promising practices in online learning*. North American Council for Online Learning.
- Xu, D., & Jaggars, S. (2014). Performance gaps between online and face-to-face courses: Differences across types of students and academic subject areas. *The Journal of Higher Education*, 85(5), 633-659.
<https://doi.org/10.1080/00221546.2014.11777343>
- Yin, R. K. (2003). *Case study research design and methods* (3rd ed.). Sage Publications.
- Yolcu, H. (2020). Koronavirüs (covid-19) pandemi sürecinde sınıf öğretmeni adaylarının uzaktan eğitim deneyimleri. *Açıköğretim Uygulamaları ve Araştırmaları Dergisi*, 6(4), 237-250.
<https://dergipark.org.tr/en/download/article-file/1268229>
- Zhou, L., Wu, S., Zhou, M. & Li, F. (2020). 'School's out, but class' on', the largest online education in the world today: Taking China's practical exploration during the covid-19 epidemic prevention and control as an example. *Best Evid Chin Edu*, 4(2), 501-519. <https://dx.doi.org/10.2139/ssrn.3555520>