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TEACHERS' VIEWS ABOUT MATHEMATICS INSTRUCTION DURING THE COVID-19 PANDEMIC

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Abstract: The aim of this study is to examine the experiences of secondary school mathematics teachers facing with the distance education process for the first time due to COVID-19 regarding the mathematics lessons. Therefore, this study employs a case study, which is one of the qualitative research types. The study is conducted with 52 secondary school mathematics teachers working at public and private schools in different regions of Turkey during the 2020-2021 academic year. Convenience sampling method is used to determine the participants. In addition, semi-structured interview technique is used. Finally, content analysis is used during data analysis. The results reveal that (i) the curriculum should be arranged in a way that will increase visualization and integrate it into interactive programs that will make the student more active, (ii) the teachers hold the instruction mostly by using textbooks and smart board applications, (iii) using direct instruction and question-answer methods, the teachers indicate that they mostly encounter problems about internet access, and (iv) the teachers draw attention to the problem that students and teachers are not provided the necessary infrastructure and that they do not have devices with internet access. Thus, the teachers conclude that these problems should be solved first in order to manage the distance education process efficiently.

Key words: distance education, mathematics instruction, mathematics teachers, COVID-19.

1. Introduction

Distance education is institution-based formal education where (i) the learning group is distinguished and (ii) interactive communication systems are utilized to connect instructors, learners, and resources (Schlosser & Simonson 2009). Moore and Kearsley (2011) defined distance education as a planned, open-access way of teaching and learning that requires specific instructional designs and technologies in which learners and instructors are in different environments. Distance education is carried out through using synchronous, asynchronous, or mixed methods. Synchronous learning is conducted as live lessons that teachers and students can connect online. The asynchronous distance education model, on the other hand, is a model in which students can follow the previously recorded course videos independently and individually. The mixed distance education model includes both synchronous and asynchronous distance education models (Özen Savran & Bilgin, 2020).

The coronavirus pandemic (Ministry of Health, 2020), which was first announced by the World Health Organization (WHO) on December 31, 2019 and which was named as the novel coronavirus disease (COVID-19), spread rapidly and adversely affected many countries' health system, education system and economy. Various measures such as postponing travels, curfews and quarantine practices were taken to prevent the pandemic in almost all over the world. Thus, educational practices and activities were interrupted and restricted. At least 91% of the students worldwide were affected by the school shutdowns (United Nations, 2020) due to the coronavirus causing the largest educational disruption in history and affecting approximately 1.6 billion students in more than 190 countries and on all continents (Yıldız & Akar-Vural, 2020). Distance education practices have been the compulsory choice of countries during pandemic process in order to ensure the perpetuation of educational activities (Özer & Suna, 2020). In line with the measures taken in Turkey, as of March 23, 2020, distance education has been initiated at all levels of schools within the Ministry of National Education. Television channels started broadcasting for primary, secondary, and high schools. Synchronous lessons were held by creating live classes via the Education Informatics Network (EBA) platform. Besides, students were ensured to watch asynchronous lesson videos by following EBA

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(http://www.eba.gov.tr) on the website. Students and teachers were given free data rights, albeit limited. Tablets were provided to students (Kavuk & Demirtaş, 2021; MoNE, 2020). Defined as the methods of ensuring the interaction of teachers and students in different places with the technological opportunities, distance education has become the most outstanding method of formal and non-formal education (İşman, 2011). Regardless of the teachers' perspective and practices towards technology, they had to necessarily rely on technology during the COVID-19 process (Attard & Holmes, 2020).

1. 1. Mathematics and distance education

Considering the significance of using different representations (real life experiences, concrete models, diagrams, verbal and written representations, etc.) in students' conceptual and operational understanding for the construction of mathematical knowledge (Sarı, 2020); it becomes an inevitable expectation that teaching mathematics through distance education applications and technology support will guarantee an effective mathematics instruction by providing students with different experiences. Upon analyzing the relevant literature for the mathematics lesson, various studies were conducted on revealing that web-based education was more effective than traditional face-to-face education (Hwang, Vu, & Chen, 2012; Özyurt, 2012; Tsuei, 2012; Yorgancı, 2015), while some studies found vice versa (Li, Uvah, Amin & Hemasinha, 2009). Lin (2009) stated that the use of visual models and animated representations through interactive internet resources had a significant impact on structuring mathematical concepts. In their study, Nguyen and Kulm (2005) concluded that individuals experiencing a web-based learning process performed better in fractional and decimal operations. Yorgancı (2015) noted that web-based distance education, carried out synchronously and asynchronously, was an effective method in increasing students' achievement. Engelbrecht and Harding (2004) stated that mathematics has a conceptual structure and educators can only convey these concepts to students in a face-to-face classroom environment. They also outlined that teaching mathematics over the web would not be effective since internet technology was limited in the representation of mathematical symbols.

1. 2. Mathematics education during the COVID-19 period

The use of digital technologies in maths classrooms was considered to be inconsistent in effectiveness, quality, and quantity before the COVID-19 pandemic (OECD, 2016). Even though some papers in the previous literature considered the utilization of digital technologies as an educational imperative (see e.g., Bower 2017), there existed many questions about when and how it should be used, and whether or not its use advanced students' experiences for maths education. Numerous studies have been carried out in order to understand how web-based distance education is implemented in mathematics instruction applied all over the world during the pandemic process and what its educational results are (Addimando, Leder & Zudini, 2021; Attard & Holmes, 2020; Batdal Karaduman, Akşak Ertaş & Duran Baytar, 2021; Kalogeropoulos, Roche, Russo ,Vats & Russo, 2021; Kilit & Güner, 2021; Korkmaz, 2021; Özdemir Baki & Çelik, 2021; Russo, Bobis, Downton, Livy & Sullivan, 2021).

The determination of teachers' experiences in this process will guide the further practices, and it will also provide data to increase the effectiveness and efficiency of education. It is of great significance at this point to examine teachers' experiences regarding the lessons conducted through distance education in order to understand and evaluate what has happened in the process a. In addition, a limited number of studies were conducted on examining how mathematics instruction and the process are managed, which is another reason for carrying out this study.

Current studies in Turkey analyzed general educational processes and practices during the COVID-19 period (Özer & Suna, 2020; Yıldız & Akar-Vural, 2020), possible learning losses in the pandemic process (Baz, 2021), the views of education stakeholders such as teachers, pre-service teachers, student, school principals and parents (Batdal Karaduman, et al., 2021; Çakın & Külekçi Akyavuz, 2020; Günbaş & Gözüçuk, 2020; Karataş Öztürk, 2021; Özüdoğru, 2021; Taşar, 2021). Upon analyzing the studies on the views regarding different fields, in particular mathematics lesson, they were found to mostly unveil the problems experienced by teachers. Along with the problems experienced, the present study aims to identify the teachers' evaluations of the mathematics curriculum, which methods and techniques they use, what kind of teaching materials they use for an

effective lesson, and the solution proposals they offer to conduct an efficient distance education process.

The purpose of this research is to examine the experiences of mathematics teachers regarding the mathematics lessons provided through distance education during the COVID-19 pandemic. Within the framework of this general purpose, answers to the following questions were sought in the study:

1. What are the teachers' evaluations about the curriculum?

2. What are the teachers' evaluations about the teaching process?

3. What are the teachers' suggestions for increasing the efficiency in the education process?

2. Method

2. 1. Research model

This study employs a case study, one of the qualitative research designs. The study data investigates the distance education during the pandemic process. The most distinctive feature that distinguishes case studies from other types of research is that it aims to examine a situation, event or individual in depth rather than reach a general conclusion (Seggie & Bayyurt, 2017). Qualitative research method is used in this study with a view to obtain in-depth information on the subject.

2. 2. Study group

Convenience sampling method, one of the non-random sampling types, is used in the present study. When using this sampling, prospective participants are asked whether they are able to participate in the study or a group of participants who can easily participate in the study is chosen (Christensen, Johnson & Turner, 2015). The sample size used in qualitative research is not handy for generalization in most cases. Therefore, easy and inexpensive situations are preferred (Yıldırım & Şimşek, 2018). Convenience sampling method is promoted in order to carry out the study under appropriate conditions during the COVID-19 pandemic. Convenience sampling is the selection of the participants from a conveniently available pool in the studies that have various limitations (time, financial opportunity, accessibility, etc.) (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz & Demirel, 2012). The participants of this study consist of 52 secondary school mathematics teachers working at private and public schools in different regions of Turkey. Data are gathered during the spring term of 2020-2021 academic year. Table 1 depicts demographic information regarding the participants.

Table 1. *Demographic information regarding the participants*

		f	%
Gender	Female	28	53.9
	Male	24	46.1
School Type	Public	48	92.3
	Private	4	7.7
Occupational Experience	Between 1-5 years	0	0
	Between 5-10 years	18	34.6
	Between 10-15 years	17	32.7
	Between 15-20 years	17	32.7

2. 3. Data collection tool

The data are collected through interview forms consisting of open-ended questions prepared by the researcher. The tool includes questions about the demographic information regarding the teachers and those aiming to receive teachers' views about the process. Literature review is initially conducted on the subject and a form consisting of thirteen open-ended questions is prepared. The form is evaluated by two academicians specializing in mathematics education and computer and instructional technologies education and a mathematics teacher in order to meet the criteria of relevance, intelligibility and applicability. Some items are excluded with regard to the experts' feedback;

moreover, some question statements are abbreviated and revised. Besides, a pilot study is conducted with 2 mathematics teachers who are not in the working group. The form gets its final version after determining its clarity, unambiguity, and applicability. Finally, the following 6 questions are asked to the teachers:

1. Do you think the mathematics lesson curriculum is appropriate for distance education?
2. Are there any points in the mathematics curriculum that you wish to change/transform to align it with distance education? If so, what are they?
3. Do you use any teaching materials during the lesson? If yes, what do you use?
4. Which teaching methods and techniques do you use in teaching process?
5. Do you encounter any problems during the distance education process? If so, what are they?
6. What are your suggestions for increasing efficiency in teaching with distance education?

2. 4. Data collection and analysis

The data are collected via Google Forms through use of a questionnaire prepared by the researcher. Content analysis method is used during data analysis. The main purpose of content analysis is to conceptualize and correlate the elicited data (Yıldırım & Şimşek, 2018). In this regard, the views are grouped by encoding the qualitative data. Appropriate themes and sub-themes along with frequency and percentage values are identified. The teachers are coded as M1, M2, M3….M52 and some of the teachers' views are demonstrated as excerpts.

2. 5. Validity and reliability

The validity and reliability studies are carried out in accordance with the nature of qualitative research. Participant confirmation is provided to ensure internal validity. Two of the participants check the comments on the findings. The research process for external validity is explained in detail. For internal reliability, codes and themes are created by another expert in the field and compared with the researcher's findings. Therefore, a common coding table is established with the discussion of the different codes. Miles and Huberman's (1994) formula that indicates a consensus of 80% is acceptable between the coders is utilized. The consensus between the coders is found as 89% in the study. To ensure external reliability, the raw data and the results were confirmed by an expert working in the field of distance education.

3. Findings

This section presents the analysis results about the responses of the mathematics teachers regarding their experiences in the mathematics lessons they conduct through distance education. The research findings consisted of 3 main themes and sub-themes related to the evaluations of the curriculum, evaluations of the teaching process, and suggestions to increase the efficiency of the teaching in this process. The frequency and percentage values of the codes related to the identified sub-themes are also depicted in tables.

3. 1. Curriculum

3.1.1. Appropriateness of the mathematics curriculum

Teachers were posed the question of "Do you think the mathematics curriculum is appropriate for distance education?" for their evaluations regarding the curriculum. Table 2 displays their responses to the question.

Table 2. *Appropriateness of the mathematics curriculum for distance education*

Theme	Sub-theme	f	%
Curriculum	Yes, appropriate	0	0

	No, inappropriate	19	36.5
	Partially appropriate	33	63.5
	Total	52	100

None of the mathematics teachers responded the question of whether the mathematics curriculum is appropriate for distance education as “yes, it is appropriate”. While 36.5% said no, it is inappropriate, 63.5% replied that the curriculum is partially suitable for distance education.

3.1.2. Aligning the mathematics curriculum

The teachers were asked, “Are there any points in the mathematics curriculum that you wish to change/transform to align it with distance education? If so, what are they?". The distribution of themes and sub-themes in response to this question is presented in Table 3.

Table 3. *Aligning the mathematics curriculum with distance education*

Theme	Sub-theme	Codes	f	%
Curriculum	Curriculum revision recommendations	Topics should be arranged in such a way as to increase the use of interactive programs and materials in order to motivate the student.	32	57.1
		Topic density should be reduced, and topics should be simplified	13	23.2
		The curriculum should be arranged in accordance with visualization.	7	12.5
		The order of the topics in the "Geometry and Measurement" learning area should be brought forward.	4	7.1
		Total	56	100

Mathematics teachers produced a total of 56 ideas for the regulation of the curriculum. The view with the highest frequency 57.1% was as follows, "Topics should be arranged in such a way as to increase the use of interactive programs and materials in order to motivate the student". While 23.2% of the participants were of the opinion that "Topic density should be reduced and topics should be simplified”, 12.5% stated that "the curriculum should be arranged in accordance with visualization". 7.1 of them highlighted that the order of the topics in the "Geometry and Measurement" learning area should be taken more forward.

Some excerpts of teacher responses to this question are as follows:

M13: “The content of the curriculum is not challenging, so it cannot be presented through distance education. Teachers can be offered more virtual manipulative applications in order to make distance education more active. Teachers mostly use z-books from various publishing houses during this process, and instead, ministry textbooks should be presented as z-book application format rather than pdf format.”

M17: “It is necessary to reduce the subject density. We face difficulties at this point even in face-to-face education, thus it is very difficult to continue distance education with this subject density.”

Table 2 depicts that the majority of mathematics teachers found the curriculum partially appropriate for distance education. However, they noted that the curriculum should be arranged in a way to increase teacher-student interaction while integrating the curriculum into distance education. They signified that geometry subjects should be given first as the subjects suitable for visualization are more transferable to the student, and that they positively affect the student's motivation. They also emphasized that it is fundamental to reduce the subject density.

3.2. Teaching Process

3.2.1. Instructional materials

Teachers had many responses about the instructional materials they used. The frequency distribution of the 58 responses is as follows.

Table 4. *Instructional materials*

Theme	Sub-theme	Codes	f	%
Teaching Process	Used teaching materials	MoNE course books	22	25
		Smart board applications (Z book, Smart notebook)	17	19.3
		EBA contents	13	14.7
		Question banks of the publishing houses	11	12.5
		Videos	9	10.2
		Websites for interactive education	7	7.9
		Web 2.0. tools (GeoGebra, matific, kahoot etc.)	7	7.9
		Motion pictures	2	2.2
		Total	88	100

The instructional materials that mathematics teachers used during the distance education process were determined as MoNE textbooks (22), smart board applications (17), EBA contents (13), question banks of publishing houses (11), videos (9), websites related to interactive education (7), web 2.0. tools (7), motion pictures (2).

The following statements indicate teachers' responses to this question:

M13: "*Web2.0 tools (kahoot, learningapps, cram, padlet...), various websites offering virtual manipulatives (phetcolorado, wordwall), dynamic geometry application geogebra, EBA contents…"*

M36*: "We had to use materials for the senses of sight and hearing, videos and moving pictures etc…during the distance education process."*

M52: "*I mostly used textbooks."*

Mathematics teachers mostly used textbooks. Table 4 suggests that they also used materials suitable for distance education. The most preferred instructional materials were found to be the EBA contents and smart board applications offered by the Ministry of National Education for the use of teachers in this process.

3.2.2. Teaching methods and techniques

The distribution of teaching methods and techniques used by the teachers during the lesson is presented in Table 5. The frequency distribution of the 77 responses is displayed according to the codes.

Table 5. *Teaching methods and techniques used by teachers in the lesson*

Theme	Sub-theme	Codes	f	%
Teaching Process	Teaching methods and techniques	Direct instruction method	28	36.3
		Question answer	25	32.4
		Problem solving	14	18.1
		Demonstration	5	6.4

		Simulation techniques	3	3.8
		Brainstorming	1	1.2
		Use of animation and video	1	1.2
		Total	77	100

Considering the responses of the teachers regarding the methods and techniques they used in the lesson, 36.3% (f = 28) of them were determined to use the direct instruction method, 32.4% (f = 25) the question-answer method, 18.1% (f = 14) problem solving, 6.4% (f = 5) demonstration, 3.8% (f = 3) simulation techniques; 1.2% (f = 1) brainstorming and 1.2% (f = 1) animation and video.

Some examples of the teachers' views are as follows:

M19: "*I teach the topic and solve a lot of questions. I solve the questions with the students".*

M38: "*…often direct instruction and demonstration methods as much as possible, brainstorming, simulation techniques..."*

It is noteworthy that teaching methods and techniques used during face-to-face education process are also mostly used in the distance education process. Approximately 86% of the teachers conducted the lesson with direct instruction, question-answer, and problem-solving methods. These methods and techniques may be insufficient by taking into account the need for interaction, which can be described as the most significant part of the process in distance education.

3.2.3. Problems during the distance education

Teachers were asked "Did you encounter any problems during the distance education process? If so, what were they?". In this regard, all of the teachers answered yes to this question and expressed the problems they encountered with multiple answers. Table 6 illustrates the frequency distribution of teachers' evaluations regarding the problems they encountered.

Table 6. *Problems encountered by teachers during the distance education*

Theme	Sub-theme	Codes	f	%
Teaching Process	Student-based problems	Low participation	22	14.4
		Lack of readiness for online courses	13	8.5
		Decrease in student motivation	11	7.2
	Teacher-based problems	Lack of necessary knowledge to integrate the lesson into distance education	4	2.6
		Difficulty in using the EBA program	7	4.6
		Difficulty in transferring operations specific to mathematics lesson	5	3.3
	Curriculum-based problems	The inappropriateness of mathematics lesson curriculum for distance education.	4	2.6
		The interconnectedness of the topics	2	1.3
	Teaching environment-based problems	Unable to monitor the student as the student' camera is off	10	6.5
		Limited interaction	9	5.9
		Failure in providing sufficient documents suitable for distance education	3	1.9
	Infrastructure and Mass media- based problems	Internet access problem	36	23.5
		Unable to provide each student with devices such as computers and smart phones	27	17.7
		Total	153	100

153 teacher views were determined about the problems they encountered. These were gathered within the framework of five sub-themes: "student-based, teacher-based, curriculum-based, learning

environment-based, infrastructure and mass media-based". The student-based problems were identified as "low participation (f = 22), lack of readiness for online courses (f = 13) and decrease in student motivation (f = 11)". Teacher-based problems were found to be "the lack of necessary knowledge to integrate the lesson into distance education (f = 4), difficulty in using the EBA program (f = 7), and difficulty in transferring the operations specific to the mathematics lesson (f = 5)". The curriculum-based problems were related to "the inappropriateness of mathematics lesson curriculum for distance education (f = 4) and the interconnectedness of the topics (f = 2)". The learning environment-based problems were determined as "the inability to monitor the student as the student' camera is off (f = 10) and limited interaction (f = 9)". Problems arising from infrastructure and mass media were noted as "Internet access problem (f = 36), unable to provide each student with devices such as computers and smart phones (f = 27) and failure in providing sufficient documents suitable for distance education (f = 3)".

Some of the teachers' views are as such:

M3: *"I could not understand EBA, I still do not fully understand it. There were many problems such as constantly asking other teachers what is being done in the system and lack of resources".*

M27: *"Since attendance cannot be ensured in class, it is unlikely to provide integrity in the lesson. If one of the subjects is missed in the mathematics lesson, the other lesson cannot be understood. Therefore, it was as if I was repeating the same things over and over."*

The most common problems faced by the mathematics teachers were found to access the internet and the lack of devices for internet access. Low student participation was considered another expected and emerging finding due to these problems. The initiation of the process without the necessary readiness of the students and the teachers as well as the insufficient understanding of the prepared curricula were other problems influencing the process. In line with these basic problems, the difficulty in integrating the curriculum into the mathematics lesson and transferring mathematical operations to distance education were observed as some of the difficulties experienced in this process.

3. 3. Suggestions

The mathematics teachers were posed the question of "What are the teachers' suggestions for increasing the efficiency in the education process?". Table 7 shows 65 teacher responses to the question.

Table 7. *Suggestions to increasing efficiency in teaching*

Theme	Sub-theme	Codes	f	%
Suggestions for Increasing Efficiency in Teaching	Regarding the infrastructure	Providing students and teachers with adequate technical infrastructure and equipment	32	49.2
	Regarding the learning environment	Following-up absenteeism	10	15.4
		Students should also turn on the camera	10	15.4
	Regarding parental support	Homework monitoring by parents	7	10.8
	Regarding the used programs	Improvements in the EBA system	5	7.7
		Conducting online practice exams during the evaluation process	1	1.5
		Total	65	100

Mathematics teachers provided various solutions to increase efficiency in distance education. These solution proposals were gathered around 4 sub-themes: solution suggestions related to infrastructure, learning environment, parental support and programs used in the process. The teachers offered

solutions regarding the infrastructure as "providing adequate technical infrastructure and equipment for students and teachers (f=32)". As for those regarding the learning environment, teachers recommended "following-up absenteeism (f=10) and students should also turn on the camera (f=10)". Regarding the parental support, the participants provided some solutions such as “homework monitoring by parents (f=7); moreover, the teachers offered solutions regarding the used programs as “Improvements in the EBA system (f=5), and “conducting online practice exams during the evaluation process (f=1)” related to the infrastructure.

Some excerpts of teacher responses to this question are as following:

M6: “*Equal opportunities should be provided to each student, ensuring active participation in all lessons, opening a camera should not be optional but mandatory.”*

M17: “*Equality of opportunity must be ensured in distance education. There may be technical factors such as high-quality internet connection, at least being able to attend the lesson from a device such as a tablet, not a phone, from a larger screen, and having equipment such as camera and microphone. I think the biggest problem is the lack of this efficient access.”*

Teachers' recommendations to increase efficiency were mostly about providing internet access and necessary devices. Monitoring the student during the synchronous lesson was one of the views with the highest frequency for the obligatory follow-up of the student's atttendance and mutual interaction.

4. Discussion

This study was carried out to reflect the experiences of secondary school mathematics teachers who actively participated in the distance education process. They found the mathematics lesson curriculum "partially" appropriate for distance education. In the study conducted by Kilit and Güner (2021), the majority of teachers thought that web-based distance education was not effective and efficient on mathematics. Fedele and Li (2008) also concluded that web-based distance education for mathematics courses was insufficient on its own. Distance education alone may not be sufficient for effective teaching due to the abstract nature of the mathematics lesson and the fact that it requires high-level thinking skills rather than just doing the operations.

Teachers stated that changes should be made in the curriculum so as to ensure the appropriateness of the mathematics lesson curriculum for distance education. Considering the secondary school level learning outcomes of the mathematics course curriculum, it was recommended to use information and communication technologies in distance education processes. The aforementioned learning outcomes were in the learning areas of "Geometry and measurement" and "data processing" at the 5th, 6th and 7th grade levels, and in the "algebra" and "geometry and measurement" learning areas at the 8th grade level. The 8th grade algebra learning area includes this learning outcome "S/he explains the slope of a line with models, s/he relates linear equations and graphs to slope". The recommendation that “appropriate information and communication technologies are used when necessary” was provided for the explanation of this learning outcome. Mathematics teachers implied that the curriculum should be arranged in a way to increase the use of interactive programs and materials. Besides, they stressed that the subjects should be rearranged to be suitable for visualization and the subject density should be reduced. In this vein, it may be wise to mention that information and communication technologies should not be limited to a few learning areas, but similar learning outcomes should be included in other learning areas. Likewise, the use of information and communication technologies was regarded as a recommendation for the realization of the learning outcome. In order for technology to be integrated into the curriculum in a built-in way, the learning outcomes must be of a quality beyond advice. The familiarity brought by the sudden predisposition of both teachers and students to distance education can be turned into a profit at this point. Alabdulaziz (2020) stated that 98% of the participants consisting of mathematics teachers believed that COVID-19 is the gateway to digital learning in mathematics education. Previously, the use of information and communication technologies in teaching was within the interest and initiative of the teacher, yet today teachers are necessarily informed about how distance education should be done in this process. The ongoing studies on how web-based teaching should be conducted for each subject area in the curriculum should

gain momentum thanks to the detailed studies to be carried out with the support of both curriculum development experts and field experts, and new studies should be carried out. Hence, the advantages of distance education such as being independent of time and place can be benefited more effectively in face-to-face education.

Despite the use of smart board and EBA applications in the lesson, the teachers indicated that they could not receive sufficient material support for the distance education process. This led to the use of direct instruction, question-answer and problem-solving methods in distance education just as in face-to-face education. This finding is in conjunction with those of Özdemir Baki and Çelik (2021). The researchers compared the course materials used by mathematics teachers in the next academic year with the period when COVID-19 first appeared. Accordingly, the teachers were determined to mostly use the source documents (books, lecture notes, practice exam, etc.) in both periods. This may be due to the fact that in-service support was not provided with the sudden transition to distance education. Teachers stated that the problems they experienced were being unable to use the EBA program well, having difficulties in transferring mathematical expressions to the internet environment, and difficulties in transferring the mathematics lesson to the distance education environment. Kaya (2002) pinpointed that distance education had limitations in adequately benefiting from practical courses. At that point, the necessary technical support and in-service training should be given to the teachers if the decision makers come up with the idea of doing distance education for certain subjects or limited course hours in the future.

The difficulties experienced by the teachers in the distance education process suggested that they had the most difficulty due to the lack of internet access. Similar findings emerged in the studies conducted by Çakın and Külekçi Akyavuz (2020), Can (2020) and Özdemir Baki and Çelik (2021). Can (2020) affirmed the necessity of strengthening the education system in Turkey on issues such as infrastructure and access. In this context, it is remarkable that each student did not have personal communication tools such as phones, tablets and computers. This paved the way for the low participation of the students in the lesson and conducting the lesson with a few students. Having asserted that distance education creates the need for infrastructure and equipment, Lau, Yang, and Dasgupta (2020) argued that this results in more problems for individuals with low socioeconomic status. Mathematics teachers also confirmed that they should be provided with internet access and devices in order to increase efficiency in teaching. Just as in the study of Kilit and Güner (2021), the teachers' recommendations regarding internet access did not vary across the place they worked although they were in different regions of Turkey. This infrastructure problem must be urgently solved first to witness efficient distance education. No matter how many improvements and arrangements are made regarding the teaching process, these arrangements will not be meaningful if accessibility is insufficient.

The participants also stated that they needed an environment which would motivate the students in the program used and which they could follow the lesson as in the face-to-face environment, and that the student camera should also be active. It should not be forgotten that active communication can also prevent the decrease in student motivation. İşman (2011) discussed that students felt lonely during the distance education process and that the delayed responses to their questions reduced their motivation. Herein, parents should also actively support student attendance and homework. These findings are in line with those of Karadağ and Yücel (2020), Kurt, Kandemir and Çelik (2021), and Özdemir Baki and Çelik (2021).

The overall study revealed that the disappearance of the infrastructure and device problem in Turkey was considered as the most required solution by the participants. Yıldız and Akar Vural (2020) clarified that moving students around the world to the Internet explicitly led to emergence of the deep inequalities in the education system (lack of device or reliable internet connection, parents' power and privilege etc.). Although this study was carried out for the sake of examining how the mathematics lessons were, teachers had problems in reaching students rather than have students gain mathematical knowledge in this process. The education and training process was finalized with the efforts of the teachers, who did not have any preliminary preparation, in order to provide an effective mathematics teaching for the students. Even if the Ministry endeavored to solve problems, teachers and students experienced some difficulties in this regard. In their study, Özdemir Baki and Çelik (2021) examined

the measures taken by mathematics teachers to improve teaching in the spring term of the 2020-2021 academic year, unlike the fall term. The researchers outlined that the detailed description of the difficulties experienced by the teachers helped them offer specific solutions. They concluded that teachers performed distance education more consciously in the spring semester compared to the fall semester. Although a limited number of studies were conducted specifically for mathematics lesson, this revealed the need for more research on the distance education system. Given that distance education is an inevitable education model in a new lifestyle, there is a need for instructional activities that will integrate mathematics teaching into distance education.

5. Conclusion

This study aimed to reflect the experiences of secondary school mathematics teachers who actively participated in the distance education process. The findings indicated that they found the mathematics lesson curriculum "partially" appropriate for distance education. Additionally, the teachers stated that the curriculum should be arranged in a way that would increase visualization and integrate it into interactive programs that could make the student active. In this process, they made the most of teaching by making use of textbooks and smart board applications. The teachers who conducted the course process with lecture and question-answer methods denoted that they mostly had problems with internet access. The teachers who drew attention to the problem of students and teachers not providing the necessary infrastructure and not having devices with internet access stated that these problems should be solved first to efficiently manage the distance education process. The teachers expressed that some improvements should be made in the programs. They also denoted that they had difficulty in understanding these programs and that both teachers and students needed support to use these programs effectively.

Although a limited number of studies were conducted specifically for mathematics lesson, this revealed the need for more research on the distance education system. Given that distance education is an inevitable education model in a new lifestyle, there is a need for instructional activities that will integrate mathematics teaching into distance education.

The teachers denoted that in order for the curriculum to be suitable for distance education, it should be arranged in a way to increase the use of interactive programs and materials. When we look at the achievements of the mathematics curriculum at the secondary school level, it has been determined that the use of information and communication technologies in distance education processes is included in the program as a recommendation. However, in order for technology to be integrated into the curriculum in a built-in way, the gains should be arranged in a way that is practical rather than advice.

The teachers stated that they could not receive sufficient material support for the distance education process and that they had difficulty in using the programs that were suitable for distance education. At this point, if the decision makers come up with the idea of doing distance education for certain subjects or limited course hours in the future, it is suggested that the necessary technical support and in-service training should be given to the teachers.

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