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The effect of distance education practices during the COVID-19 pandemic on mathematics and geometry teaching

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With the research discussed here I aimed to examine the effect of the COVID-19 pandemic on primary school mathematics teaching processes and specifically the teaching process of 1st-grade geometric shapes. A holistic multiple case study design was used in this qualitative research. The participants were primary school teachers who have taught both processes and geometric shapes in 1st grade primary school and were selected using purposive sampling. Semi-structured interviews based on an interview form developed by me was used as data collection instrument. In this form, questions about the 4 skills in the programme related to geometry were included. Lesson content, materials, and content related to the method of expression related to each skill were examined comparatively during and before the COVID-19 pandemic. Semi-structured interviews during which the questions on the form were asked, were conducted with participating teachers. The content analysis technique was used to analyse the obtained data. The results of the analysis show that the transition to online education during the COVID-19 pandemic had serious consequences. Positive and negative effects were found in both primary school mathematics teaching process and the teaching process of geometric shapes in the 1st grade.

Keywords: COVID-19 pandemic; distance education; geometry; mathematics; primary education

Introduction

Early in 2020, all sectors of society around the world were affected by the outbreak of the coronavirus disease (COVID-19). Since the outbreak, many measures have been taken in many countries to combat COVID-19. Curfews, travel restrictions, quarantine restrictions on education were some of the elementary practices established to protect the public's health (Du Plessis, 2020; Kavuk & Demirtaş, 2021). Although the pandemic process and, therefore, these restrictions had many negative consequences from a health, economic and social point of view, they also had negative consequences for education (Çakın & Külekçi Akyavuz, 2020). One of the goals with the highest priority in all countries was to ensure the continuation of education without interruption (Can, 2020). Although most countries decided to shut down schools in order to prevent the spread of the pandemic, they switched to a distance education model to ensure the continuity of education. However, as the situation happened very quickly, it resulted in many problems (Öztürk Karataş & Tuncer, 2020; Türker & Dundar, 2020).

The COVID-19 outbreak had an intense impact on education. For this reason, researchers in social sciences and education have investigated the effects of the pandemic quite widely, especially with the closing of schools, which resulted in in-person education being replaced with online education. Research conducted in the field of education shows the opinions of different groups like teachers and students affected by this process. In some studies, specific attention was given to mathematics lessons during COVID-19. These studies were mostly carried out with primary school teachers and mathematics teachers. However, not many studies have been conducted on geometry subjects or the first grade in primary school (Aydoğdu İskenderoğlu & Konyalıhatipoğlu, 2021; Barlovits, Jablonski, Lázaro, Ludwig & Recio, 2021; Chirinda, Ndlovu & Spangenberg, 2021; Drijvers, Thurm, Vandervieren, Klinger, Moons, Van der Ree, Mol, Barzel & Doorman, 2021; Erşen & Yumak, 2021; Marpa, 2021; Yurtbakan & Aydoğdu İskenderoğlu, 2022). I thus thought that by examining the effects of COVID-19 on mathematics education in the first grade in primary school would contribute to both education and training processes and the literature in this regard. For this reason, this research was aimed to examine the effects of the COVID-19 pandemic on primary school mathematics teaching processes and on the teaching processes of geometric shapes in the first grade.

The Research Problem

The main research question was: What are the effects of the COVID-19 pandemic on primary school mathematics teaching processes and the teaching process of geometric shapes in the first grade?

Sub-problems

- 1) What are the positive effects of the COVID-19 epidemic on primary school mathematics teaching processes?
- 2) What are the negative effects of the COVID-19 epidemic on primary school mathematics teaching processes?
- 3) What effects did the COVID-19 pandemic have on the teaching of geometric shapes in the first grade in primary school?

Literature

The distance education model has been used in many countries, sectors and levels also in Turkey (Düzgün & Sulak, 2020). Although teachers and students are not physically in the same place during distance education, they connect and continue their educational activities thanks to technological opportunities (Kavuk & Demirtaş, 2021).

Distance education processes need to be planned within a certain systematic framework in order to be carried out at the desired efficiency; therefore, the preparation and planning phase constitutes an important part of the distance education processes (Koç, 2021). In this regard, the suitability of the curriculum is another issue that needs to be addressed (Bakker, Cai & Zenger, 2021). For this reason, the suitability of the content of the primary school mathematics curriculum for distance education was examined. Accordingly, it was determined that the programme did not include any skills or topics related to distance education. However, when the achievements in the programme are examined, it is clear that almost all of these achievements have content that can be integrated into distance education processes. It has been determined that the use of information and communication technologies in distance education processes is recommended for the three achievements in the programme (Koç, 2021). The skills intended to be acquired by students in primary education are called basic learning needs. Cognitive skills, which are individuals' basic learning needs are defined as effective use of native language, arithmetic-processing skills, and problem-solving skills. Especially in primary school it is more difficult for children to understand mathematics given that they only think tangibly and perceive tangible situations. The main purpose of mathematics teaching is to develop mathematical competence in students (Baykul, 2011). In mathematics education, the goal of providing students with mathematical competence will be achieved if knowledge, self-regulation skills, learning in context, and collaborative learning is developed by students (Altun, 2006). To achieve this goal, it is important for students to be more interested in mathematics and learn mathematics by actually understanding it (Olkun & Toluk-Uçar, 2006). Modern-day educational scientists agree that students should learn a separate class of mathematics that they use in school and mathematics that depends on daily activities that help them manage and understand other areas of

their lives (Gezgin & Bal, 2021). In particular, the primary school period is when mathematical concepts are taught to students; abstract mathematical concepts are difficult to understand for primary school students in distance education. The competencies of teachers in providing distance education are also of great importance. Bakioglu and Çevik (2020) state that the majority of teachers did not receive any in-service training for extended education during the COVID-19 pandemic. Based on all this, it is important to examine the quality of mathematics courses presented via distance education (Özçakır & Sümen, 2021).

Methodology

Research Model/Design

In this study, two cases were discussed in the form of reflections of the pandemic process on primary school mathematics education and the effect of the pandemic process on the teaching of geometric shapes in the primary school mathematics course. The participants in this study were 13 primary school teachers of different ages with divergent experiences, working in different schools. Therefore, each teacher presented different situations and different perspectives regarding the research problem. The design of the research was a holistic multiple case study as the findings obtained from each teacher were considered holistically and then compared (Creswell, 2007; Yin, 2017).

Study Group

The study group was 13 primary school teachers selected through purposive sampling according to the criteria presented in Table 1 (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz & Demirel, 2009). The aim with the study was to examine the experiences of primary school teachers regarding mathematics teaching before and during the COVID-19 pandemic. More specifically, the teaching of geometric shapes in the first grade was evaluated. For this purpose, the participating teachers were expected to have taught the first grade in primary school before and after the COVID-19 period and to have covered geometric shapes.

Table 1 Criteria for participation

Criterion number (no)	Criterion
Criterion 1	Participants being primary school teachers
Criterion 2	Having taught first-grade primary school students in the 2020–2021 academic year and having taught geometric shapes during the pandemic
Criterion 3	Having taught geometric shapes through online teaching during the pandemic
Criterion 4	Before the pandemic, having taught first-grade primary school students and having taught geometric shapes at least once in their careers

Data Collecting Tools

Preparation of data collection tool

I used a self-prepared, semi-structured interview form as data collection tool. Based on this form, the

primary school mathematics curriculum was examined (cf. Figure 1).

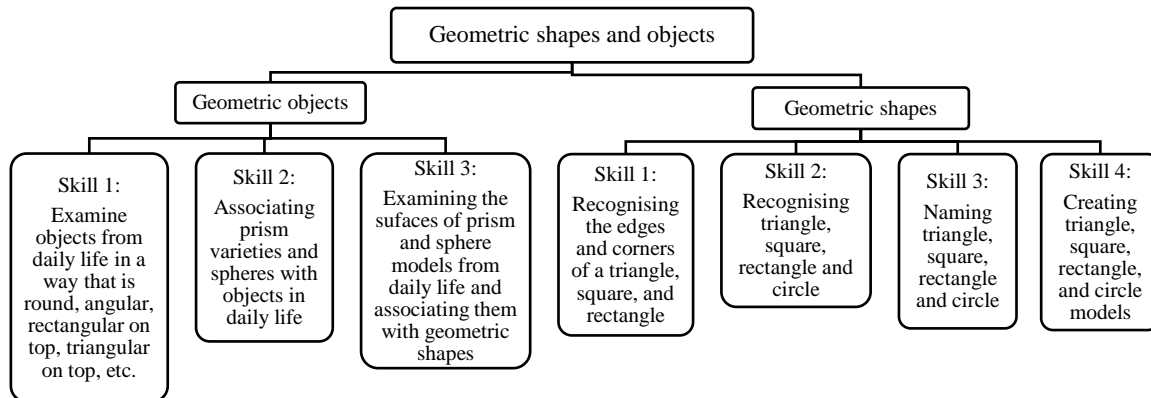


Figure 1 Skills related to geometric objects and shapes (Millî Eğitim Bakanlığı [MEB], 2018)

Using the form that I prepared, I asked teachers to provide me with information on the teaching process of each of these four skills, the curriculum before and during the pandemic, materials and teaching methods used. Furthermore, I included items about the advantages and disadvantages of teaching each of these skills before and during the pandemic. Lastly, I added items about the advantages and disadvantages of teaching mathematics before and during the pandemic.

Reliability of the data collection tool

The first version of the interview form was presented to four expert mathematics academics and two primary school teachers to obtain their expert opinions on the form. The form was also sent to three primary school teachers outside the study group for pilot application. The necessary formal and contextual amendments were made according to the experts' feedback.

Data Analysis

Data obtained from the semi-structured interviews were analysed using content analysis. Content analysis is a technique within the qualitative research method in which the aim is to analyse many different materials such as documents, texts and documents within certain rules (sampling, coding, category, etc.) in order to obtain objective, measurable and verifiable information (Metin & Ünal, 2022). The general purpose of content analysis studies is to guide future academic studies within the scope of the subject discussed and to determine the

general trends on the subject (Ültay, Akyurt & Ültay, 2021). While analysing data on the sub-problems, main categories were created by doing appropriate encoding according to the teacher's answers, and the analysis was performed by creating appropriate sub-categories under these codes.

Validity and Reliability

In content analysis it is important to code the same data set by different coders to ensure the security of codes (Baltacı, 2017). During the encoding phase of the content analysis, the opinions of five mathematics academics and one primary school teacher were applied. The necessary changes and edits in the codes were made in accordance with their views. The final version of the generated codes was presented in a more understandable, more accurate, and more appropriate way. Thus, the reliability of the analysis process was ensured.

Research Procedures

Digital interviews were conducted with teachers in the study group using the semi-structured interview form. I conducted and saved the interviews with the teachers via ZOOM. Each interview lasted approximately 45 minutes.

Findings and Discussions

In this section, findings on the first sub-problem are discussed. As a result of the content analysis of the data, five main categories were identified (cf. Figure 2).

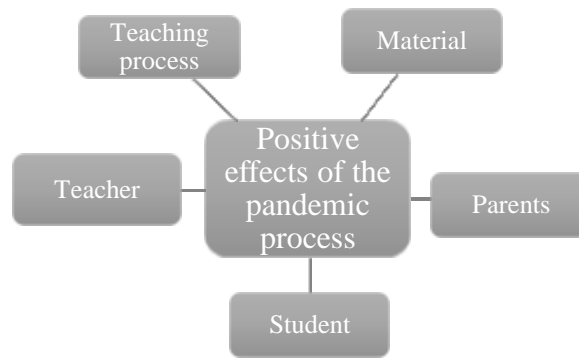


Figure 2 Positive effects of the COVID-19 pandemic on primary school mathematics teaching

Based on Figure 2, the sub-categories under the main categories were created (cf. Table 2).

Table 2 Categories on the positive effects of the pandemic process and distribution of responses

General categories	Sub-categories	Teachers who expressed opinions on these categories
Teaching process (18)	More technology	T1, T2, T3, T7, T8, T11, T12
	Increased parental support	T2, T3, T4, T9, T13
	Making a connection with everyday life	T4, T9
	A learning environment where external stimuli are decreased	T9, T11
	Dividing the class in half, having smaller groups*	T13
Students (7)	Studying often	T3
	Being more active	T1, T5, T6, T10
	Finding more opportunities for individual learning	T6, T11
Material (3)	They were not deprived of education	T2
	Providing audiovisual material	T6
Teacher (2)	Providing material diversity	T8, T9
	Increasing technology knowledge	T4, T13
Parent (2)	They were informed about the teaching processes	T5, T7

Note. *During in-person teaching during the pandemic, classes in Turkey were divided into two groups; each group came to school 2 days per week.

From Table 2 it is clear that the positive effects associated with the lecturing process are the ones that were expressed the most. However, in this category, the positive effects of using more technology were stated the most. These positive effects were listed as using websites more, increased student attention, increase in long-term learning, the opportunity to watch more videos, provide various content to students, and access information faster.

However, the online education process also often allows parents to participate more in the teaching processes. The second most expressed statement was the fact that it enriched the available resources. In addition to the continued availability of some pre-pandemic materials, the positive effects of increasing the utilisation rate of digital materials in the process were mentioned. Teachers T4 and T12 expressed the positive effects of students attending classes from home as follows:

Associating mathematics with everyday life is important in materializing abstract concepts. So, I think using everyday objects in their homes as class

material helped the students to start creating a new perspective (T4).

They can find a lot of different things in their homes as material, and we end up with 25 different visual examples from 25 different houses (T12).

The positive effects of the pandemic process for the students was stated as having more opportunities for individual learning in general and students being able to be more active in the process. And when looking at the positive effects provided to the teachers and parents, it is believed to have helped them increase their technological knowledge. Parents being able to obtain more concrete information on education processes was another positive effect of this process. Teacher T5 expressed the situation as follows: “*Parents were informed about teaching methods and subjects. They learned where they could get the information from. The families and children involved learned to create math-related materials at home.*”

In addition, it has been stated that the online environment is an opportunity for students who lack

self-confidence and cannot express themselves well in front of crowds to express themselves and that those students improved their research/presentation skills.

This section includes findings on the second sub-problem. After analysing, it was determined that the five main categories identified earlier were also appropriate for this data (cf. Figure 2). Table 3 contains data on the results of this analysis.

Table 3 Categories created on the negative effects of the pandemic process and participatory response distributions

General categories	Sub-categories	Teachers who expressed opinions on these categories	
In terms of students (18)	Lack of participation	T1, T2, T3, T4, T5, T6, T7, T10, T11, T12	
	Evaluation process	T3, T5, T6	
	Unsuitable home environment	T2, T6, T7	
	The students being young	T6	
	Disinterest in the lesson	T7	
	Lesson process (16)	Parental intervention	T6, T10, T12, T13
		Inability to contact students	T6, T10, T12
		Monotonousness	T11, T13
		Inability to teach writing skills	T5
		Lack of material	T6
		Not doing the homework	T6
		Inability to play games	T8
		Inability to perform group work	T11
Inability to make a presentation		T11	
Inability to practice lessons		T5	
In terms of teachers (9)	Inability to receive feedback from the students	T3, T8, T13	
	Internet connection problems	T6, T11	
	Inefficient passage of time	T9, T12	
	Lack of technical knowledge	T3	
	Inability to control active participation of students	T9	
Material (4)	Inability to use tangible materials	T1, T5, T12, T13	
In terms of parents (1)	Demand for in-person education	T11	

When the data in Table 3 is examined, it seems that the negative effects of the pandemic process were mostly about students. At this point, teachers most often noted that students had problems with the process of accessing lessons. Disadvantages that lead to access problems in the process of teaching courses online were stated as students not attending classes due to the lack of necessary devices, either lack of internet infrastructure or not having a stable connection, and internet connection problems during the course.

It has also been noted that it was more difficult to get feedback from students in online lesson processes. Students in home environments not conducive to learning through online lessons also experienced negative effects. The negative effects of situations such as students not having their own rooms, being disturbed by their siblings, the presence of guests in the house, and houses being crowded and not suitable as teaching environments were observed. Parent intervention was seen as having the greatest negative effect on the teaching process. Teachers stated that parents often intervened in the online teaching process, which negatively affected, not only the online lessons, but also the student, the teacher, and the class order. The online teaching process also negatively affected

primary school students as it was detrimental for them to be looking at a screen for 6 class hours. Not only did the lessons become monotonous but also posed a danger to students' health. However, due to the danger posed by the pandemic and the lockdown, it was difficult for students to get materials, which negatively affected homework. The negative effect of not being able to play physical games or perform group work was also expressed. Pre-service teacher T8 said the following:

Children have been reduced to studying their environment through the pandemic process. From the beginning of the process, the lesson of awareness for the geometric shapes and objects was specially created with children during playtime. We are playing puss-in-the-corner game. We're running in a circle.

The inability of teachers to control whether the students were actively involved in the online lessons and the fact that tangible materials could not be used in lesson were other negative effects. T2 said the following about using the chalkboard in class: *"It became clear that the examples analysed and described on the class's blackboard were more effective than the examples given in the live lesson."*

The findings on the third sub-problem are discussed in the following section. These findings were obtained from analysing the data obtained

about the four skills intended to be acquired related to the subject of geometric shapes in the primary

school curriculum.

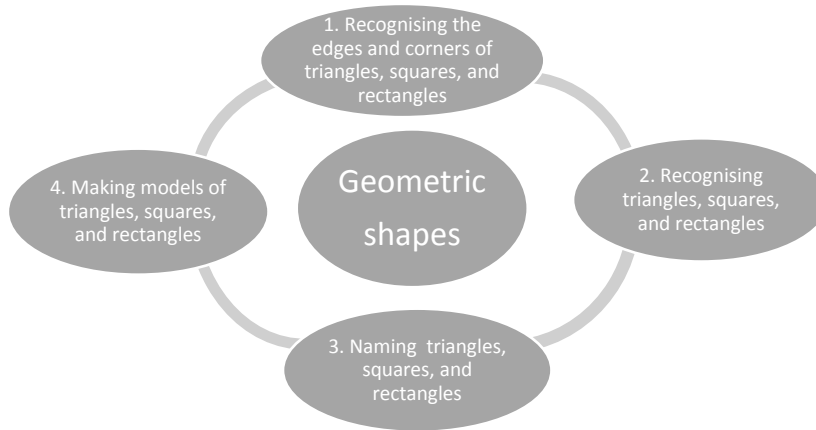


Figure 3 Skills to be acquired on the subject of geometric shapes

The results of the analysis related to these skills were examined under three main categories, namely, lesson content, material, and teaching method.

Conclusions about Lesson Content

Data on the teaching process is included in this category. Situations in the teaching process that were frequently referred to were encoded as sub-categories, which are presented in Table 4.

Table 4 Conclusions on the main category, lesson content, with regard to geometric shapes

Main categories		Sub categories	Definition	Detailed description
Lesson content	Learning and teaching activities that take place during the lesson	Showing and using tangible material	Teachers and students using geometric shapes and object models during lessons	The teacher creating a model before the lesson Creating models with students during the lesson
			Pre-made materials	Using a geometry board Using geometric shape/object sets
		Performing topic-specific activities	Doing activities to create models using purpose-specific materials or to address the details of the subject	Play dough, number sticks, counting beans, chenille, matchsticks, Q-tips, elastic bands, tongue sticks, straws
		Blackboard and notebook activities	The teachers and students using the blackboard, and the students using their notebooks	Drawing on board, drawing on notebooks, cutting, gluing, painting
		Playing	Play games in teaching the subject	Puss-in-the corner game "Which basket?" game
		Drama acting	Drama used for teaching the subject	Classroom Yard
		Using whiteboard	Using the screen to draw and write important notes	Teacher use Student use
		Object display	The teacher or students finding suitable items for modelling	Ball, medicine box, shoebox, various toys, matchbox, ...
		Using digital content	Accessing necessary information from websites, educational portals, video/visual content pools	Lecture Video/Visual Exercise/Study paper Applications (Education Information Network [EBA]), Morpa campus, Wordwall,...)
	Using a textbook/Workbook	Using practices to deeply understand the subject	Official textbook Official workbook Special assisting resources	

The nine sub-categories about the content of the course are shown in Table 4. Descriptions and detailed descriptions and examples are provided where necessary. For the study, the main point regarding the sub-problem is to show how the data

in Table 4 differed before and during the COVID-19 pandemic. Accordingly, the situations in which the nine sub-categories in Table 4 were used prior to and during the pandemic are indicated in Table 5.

Table 5 Use of sub-categories in the lesson content category before and during the pandemic

Sub-categories	Pre-pandemic	During the pandemic
Showing and using tangible material (7-6)*	T1, T3, T5, T6, T7, T10, T12	T1, T2, T3, T6, T7, T10
Performing topic-specific activities (12-10)	T1, T2, T3, T4, T5, T6, T7, T9, T10, T11, T12, T13	T2, T3, T5, T6, T7, T9, T10, T11, T12, T13
Board and notebook activities (4-0)	T1, T5, T8, T9	-
Playing (3-0)	T1, T2, T4	-
Drama acting (3-0)	T9, T10, T13	-
Using the whiteboard (0-3)	-	T7, T9, T13
Object display (6-7)	T2, T3, T5, T7, T8, T11	T2, T3, T4, T7, T8, T9, T11
Using digital content (9-12)	T1, T4, T5, T6, T7, T8, T9, T12, T13	T1, T2, T3, T4, T5, T6, T7, T9, T10, T11, T12, T13
Using a textbook/Workbook (5-3)	T2, T6, T7, T12, T13	T2, T3, T12

Note. *The numbers between brackets show the use of the relevant item prior to and during the pandemic. The same applies to the tables following hereafter.

From Table 5 we deduce that teachers can take very different approaches. Some teachers used some

content only before the pandemic, while others only use it during the pandemic, some used the same

content in both instances while others did not use it in either process.

The most commonly used content before the pandemic was using tangible material, doing subject-specific activities, and using digital content. It seems that the same applied during the pandemic process. But based on teachers' points of view, it seems that preferences can differ.

Blackboard and notebook activities, playtime, and drama were used exclusively prior to the pandemic. None of the teachers used this content during the pandemic. T2 stated that he had the students play games in the lessons and explained as follows:

Pre-pandemic, I had them play 'guess the basket'. I gamified some triangles, squares, rectangles, and circles cut from various sizes and coloured cartons by asking the students to group them. During the pandemic, I introduced the shapes I had cut into cartons to the children by explaining it to them one by one, as it would be difficult for me to use the method of playmaking that I used in the classroom environment in front of the screen.

Such games could not be played in online teaching during the pandemic. For the same reason, drama activities and activities in which students would participate in groups could not be performed. Furthermore, the use of notebooks was also negatively affected.

Teachers used the blackboard prior to the pandemic and the whiteboard during the pandemic.

One of the notable results from Table 6 is related to object display. This content was used less than others, but it seems as though the frequency of use before and during the pandemic was quite similar. Considering that mathematics is a course

with abstract concepts to be associated with everyday life, it is important to use object display in lessons. However, we observed that some teachers who used this content held some misconceptions.

Talking over the Internet (okulistik, morpa campus) about the shape of the ball they use when playing games after solving the examples and saying that the ball's geometrical shape is a circle (T8).

A rectangular model is made with play dough. Students are informed that we will build a school model, and this rectangle will be the school body. They are asked to build it. They are made to also build various figures using other geometric shapes. (T9)

T8 compared a ball to a circle. However, as the ball is a full round, it can only serve as an example of a sphere. T9 compared a rectangle to a school building, however, a school building can only be modelled with a rectangular prism and not a rectangle. From these examples it is clear that teachers should be very careful when using object display to compare everyday objects to geometric shapes. It is important that the matching of objects or articles from everyday life with geometric shapes or geometric objects is done carefully and accurately in order for students to learn these concepts precisely.

Conclusions about Materials

Data on using materials during the lessons are included in this section. Situations that were frequently mentioned by the participants are presented as sub-categories. The sub-categories created in this category, their definitions, and detailed descriptions are presented in Table 6.

Table 6 Conclusions in the main category of materials on geometric shapes

Main categories	Definition	Sub categories	Definition	Detailed description
Material	All equipment used in the teaching process	Tangible materials	Geometric shape and object models made by teachers and students	Made of paper Made of cardboard Made of wood
		Tangible ingredients	Purchased geometric shape and object models Materials used by the teacher or students in the activity or material creation processes	Geometry board Geometric shape set Ruler, special papers (Isometric, dotted, checkered), play dough, number sticks, counting beans, chenille, matchsticks, Q-tips, elastic bands, tongue sticks, straws
		Printed material	Materials used as paper-and-pen activities in class	Notebook Book Exercise/Study paper
		Digital material	Environments used based on on-screen use in the class	Smartboard, projection, educational websites, whiteboard, videos, and images
		Object	Items used to model geometric shapes and objects and objectify the concepts of edge/corner	Ball, medicine box, shoebox, various toys, matchbox, ...
		Blackboard	A blackboard against the wall in the classroom	Teacher use Student use

The six sub-categories are defined under the main category, materials, in Table 6. Each sub-category contains its description and detailed

information. The use of materials in the sub-categories before and during the pandemic are shown in Table 7.

Table 7 Use of the sub-categories of materials before and during the pandemic

Sub-categories	Pre-pandemic	During the pandemic
Tangible materials (8-5)	T1, T2, T3, T5, T6, T7, T10, T12	T2, T3, T6, T7, T10
Tangible ingredients (11-8)	T2, T3, T4, T5, T6, T7, T8, T9, T10, T12, T13	T3, T5, T6, T7, T9, T10, T12, T13
Printed material (6-5)	T1, T2, T5, T6, T11, T13	T1, T2, T6, T11, T13
Digital material (9-12)	T1, T4, T5, T6, T7, T8, T9, T12, T13	T1, T2, T3, T4, T5, T6, T7, T9, T10, T11, T12, T13
Objects (5-7)	T2, T3, T5, T8, T11	T2, T3, T4, T5, T7, T8, T11
Blackboard (3-0)	T3, T4, T8	

From Table 7 it is clear that different materials were often used in both processes. Tangible materials and tangible ingredients were used a little more commonly before the pandemic. T1 stated that concrete materials and ingredients were used in lessons in both processes:

... in both processes, I ask them to draw and paint geometric shapes using various objects on the paper they prepared at home. And after that, I want them to cut these shapes with scissors and glue them into their notebooks.

The use of printed materials was used in both processes. The use of digital materials during the

pandemic stands out. The blackboard, on the other hand, was only used in in-person teaching. Situations involving misconceptions about the use of objects were once again identified. T2 stated the following: *“For example, in the game, I asked my students to find an object in their house in the form of a square and show it on the screen. They found and showed square trays, pillows, scarves.”*

Conclusions about Teaching Method

The results on the teaching methods that the teachers used in lessons are shown in Table 8.

Table 8 Conclusions in the main category of teaching methods on geometric shapes

Methods	Pre-pandemic	During the pandemic
Question and answer (8-11)	T1, T2, T3, T5, T7, T11, T12, T13	T1, T2, T3, T4, T5, T7, T8, T9, T11, T12, T13
Narration (11-10)	T1, T2, T3, T5, T6, T7, T8, T9, T10, T12, T13	T1, T2, T3, T5, T6, T7, T8, T10, T12, T13
Demonstration (10-11)	T1, T2, T3, T4, T5, T6, T7, T9, T12, T13	T1, T2, T4, T5, T6, T7, T8, T9, T10, T12, T13
Brainstorming (3-4)	T3, T6, T11	T3, T4, T6, T11
Learning through exploration (3-2)	T1, T6, T10	T6, T10
Observation (3-2)	T2, T5, T7	T5, T7
Group work (1-0)	T3	-
Problem-solving (0-1)	-	T3
Playing (8-0)	T1, T2, T3, T4, T5, T6, T7, T10	-
Drama acting (3-0)	T4, T9, T13	-
Storytelling (0-1)	-	T4
Computer-aided teaching (0-2)	-	T3, T4

The question-answer method, narrations and demonstrations were used the most prior to and during the pandemic. Brainstorming, learning through exploration, and observation were also used, albeit less frequently.

It seems that playing, which is of great importance for primary level students was often used before the pandemic, but it could not be used at all during the pandemic. Similarly, drama acting, which is an important method for primary level students, could not be used during the pandemic. It seems that T4 used storytelling instead of drama acting during the pandemic.

A remarkable finding on teaching methods was that only two teachers used computer-aided teaching, which is actually very suitable for use in the online teaching.

Conclusion and Suggestions

Teachers play a decisive role in achieving curriculum goals (Koç, 2021). From the answers given by teachers, it is clear that some of the teachers were already using digital media in the pre-pandemic process. Not much has changed for them. But some teachers noted that they were starting to use digital media more during the pandemic. They noted that the digital environment was useful for them in creating lesson content and in providing materials. Özçakır and Sümen (2021) revealed a similar finding. Since not all teachers were at a sufficient level in terms of using technological equipment, it seems that at this point, they noticed their shortcomings, and the pandemic actually created an opportunity for them to develop themselves in this sense. In similar vein, Bakioğlu and Çevik (2020) also interpreted the pandemic as an opportunity for the increase of teachers' technological teaching competencies.

When we look at the results about parents, some studies show that parents did not provide adequate support (Çakın & Külekçi Akyavuz, 2020).

Online lessons during the pandemic usually took place when the parents and students were in the same environment, so it seems as though this resulted in unnecessary parental intervention. Çakın and Külekçi Akyavuz (2020), Gezgin and Bal (2021), and Kavuk and Demirtaş (2021) note that inappropriate home environments or parental intervention can sometimes negatively affect, not only individual students, but sometimes even the entire class. For this reason, in order for distance education applications to be properly supported by families, they must have sufficient knowledge about the curriculum and teaching content (Koç, 2021).

During the pandemic some of the students (and even some of the teachers) were unable to attend/present classes due to the lack of electronic devices (laptop, personal computers [PCs], tablets, etc.). Because there is no internet access in rural areas, many learners could not benefit from online teaching. Situations such as disconnection of internet connections during classes and poor connections led to similar results. According to Koç (2021), EBA applications are used to ensure that students are not deprived of teaching and learning when there is no internet access.

For teachers whose knowledge and skills related to digital education environments had increased with the introduction of online teaching, this process has been an opportunity to create richer content. However, teachers who need support with regard to technological education services should also be supported at this point (Johns & Mills, 2021).

Teaching students in a computer environment makes it necessary to plan the course well and to ensure that different methods and materials are applied efficiently (Özçakır & Sümen, 2021). The use of tangible materials in lessons and the realisation of activities in accordance with the objectives of geometric shapes and objects are also important in primary education (Gezgin & Bal, 2021). However, because children are young, they

may often have difficulty using small motor skills in the first grade of primary school. In addition, some of them had not received any pre-school education. When all these factors are combined with education in front of the screen, it is expected that drawing, cutting and gluing activities using concrete materials will become more difficult, but the research has shown different results. Despite these negative factors, teachers stated that they carried out these activities both before and during the pandemic. They stated that students were able to progress with feedback by sharing each step they made with their teachers and friends on the screen. This result also supports the fact that one of the frequently used methods in the teaching methods section has emerged as the demonstration method, which is supported by other studies in the literature (Gezgin & Bal, 2021). This was the most popular method among teachers in in-person and online lessons. It was observed that they often used the question-answer method and explaining during activities that develop small motor skills such as drawing, cutting and gluing using concrete materials. This finding is in agreement with those in studies by Bakioğlu and Çevik (2020), Kavuk and Demirtaş (2021) and Özçakır and Sümen (2021). Furthermore, it was found that teachers, in spite of their best efforts, struggled to ensure that students paid attention when applying these teaching methods, which agree with the findings in the work of Bakker et al. (2021), Çakın and Külekçi Akyavuz (2020), Gezgin and Bal (2021) and Sadeghi (2019).

Although the vast majority of the subjects in the curriculum are adaptable to distance education, it is important that some of these are reviewed and regulated so that students do not experience learning loss. However, although some elements and achievements pointing to distance education are included in the curriculum, sample experiences and evaluation activities these achievements cannot be done through online teaching, which may prevent the desired effect being achieved through distance education (Koç, 2021). As a solution to internet and connection access, free and unlimited internet services can be offered to all students and parents for use on certain platforms. Satellite internet can be provided to rural areas where internet access is limited (Çakın & Kulekçi Akyavuz, 2020; Türker & Dündar, 2020). Bernstein and Batchelor (2022) state that resource needs related to education have become more evident during the COVID-19 pandemic. Additionally, informative publications and posts can be created to increase parental support (Çakın & Külekçi Akyavuz, 2020). It will be useful to focus on visual elements in activities to appeal to more senses, add more play to teaching and include activities that will ensure permanent learning. For distance education applications to be effective, it is important that teachers choose teaching models that attract students' attention and allow students to be

more active during lessons (Düzgün & Sulak, 2020; Gezgin & Bal, 2021).

An important conclusion that became clear from the results of the study is that teachers should undergo in-service training on the teaching of not only geometric shapes and objects, but on all topics in the curriculum in the event of extraordinary situations similar to COVID-19. Siyepu and Vimbelo (2021) recommend that teachers be exposed to in-service training that will guide them in the development of mathematical engagement and reasoning in geometry teaching. Additionally, due to the pandemic, there is a need to establish a scientific committee in the field of education as well as in the field of health (Can, 2020).

Notes

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