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The Opinions of Classroom Teachers on Mathematics Learning Losses During the Pandemic Period*

Aysel FERAH-OZCAN** Elife Nur SAYDAM***

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Abstract: This study aimed to determine the experiences of classroom teachers about learning losses in Mathematics during the pandemic period. This research, which was designed in the pattern of phenomenology, one of the qualitative research methods, was carried out with ten (10) primary school teachers working in different regions of Turkey in the spring term of the 2020-2021 academic year. As a result of the investigation, it was found that classroom teachers experienced that the presupposed skills of students with learning disabilities in mathematics are insufficient. In the teaching process, learning disabilities have negative effects in terms of learning and teaching, related to lack of knowledge and losses in mathematical learning areas, as well as emotional and social effects such as loss of self-confidence and emotional trauma in students. It has been found out that according to classroom teachers, the mathematics learning losses/deficiencies are explained by the sub-themes of student-environment, student-knowledge, subject and technical condition. Children's future academic achievement may be adversely affected due to losses/deficiencies. In the study, it is suggested to examine effects of learning losses/deficiencies with longitudinal studies.

Keywords: Primary school mathematics lesson, mathematics learning losses, causes of learning losses

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** *Corresponding* Author: Sakarya University, Turkey, aferah@sakarya.edu.tr

*** Sakarya University, Turkey, elifenursaydam@sakarya.edu.tr

Introduction

Learning loss is accepted as a concept that expresses the losses that occur in students' subject-specific or foundational knowledge, skills, and academic performance due to various natural disasters, epidemics, and disruption of instruction during summer holiday (see also Slates, Alexander, Entwisle & Olson, 2012; Campbell, Sutter & Lambie, 2019; Kuhfeld, Soland, Tarasawa, Johnson, Ruzek & Liu, 2020; Paechter, Luttenberger, Macher, Berding, Papousek, Weiss & Fink, 2015). It can be implied that researchers started to examine the learning losses of students in the fields of literacy and mathematics after disasters such as earthquakes, floods, hurricanes, and epidemics such as cholera, plague and typhoid in the world, or after summer holidays (see also Bakle, 2015; Campbell et al., 2019; Cooper, Nye, Charlton, Lindsay & Greathouse, 1996; Maldonado & Witte, 2020; McEachin & Atteberry, 2017; Pelavin & David, 1977; Shaw, 1982, Toptas & Oztop, 2021). Some of these studies determined that the interruption of education for various reasons and the inability to maintain education led to learning losses (Aucejo & Romano, 2016; Cooper et al., 1996; Goodman, 2014). Moreover, it can be noted that the knowledge and skill gaps that occur when children cannot continue their education for reasons such as illness, work, migration, displacement, epidemics, are also assessed within the concept of learning loss (see also Entwisle & Alexander, 1992; Googman, 2014; Stanat et al., 2012; Tomasic, Helbling & Moser, 2020). Based on the statements so far, it is understood that this loss cannot be treated only as a situation related to natural disasters and epidemics.

Learning losses can also be defined as learning losses and deficiencies that occur in children due to being unable to continue their education or forgetting what they have learned before due to taking a break from education for various reasons, and unable to learn new subjects. There are two remarkable points regarding this concept. The first is that children forget what they have learned before, and the second is that they would fall behind their peers at school because they cannot learn new subjects. Therefore, it can be stated that learning loss is a concept that is too comprehensive to be considered within the scope of being deprived of new learning merely because of being unable to attend school. As a matter of fact, in the Current Turkish Dictionary (TDK, 2021), the word lost is defined as yitme (vanishing), yitim (disappearance), kaybedilen sey (lost thing), yitik (lost). When examined in detail, it is understood that this word means the disappearance of something that was previously acquired, something at hand. However, suppose the education is interrupted and cannot be continued. In that case, students may not only lose the knowledge and skills they have learned before, but they may also have deficiencies in learning since they cannot acquire the knowledge and skills learned by their peers who attend school. Because the word "eksik (incomplete)" meaning "bir bolumu olmayan (without a part), noksan (lacking), mukemmel olmayan (imperfect), ihtiyac duyulan sey (what is needed) (TDK, 2021)" indicates that students may fall behind their peers because they cannot continue their education and learn some of the subjects due to a break. In fact, in the studies on summer learning loss in the literature, it is articulated that it is not easy to evaluate the learning losses and deficiencies exactly by measuring the success of the children in the time they take a break from education, and

it is necessary to investigate the variables that may be effective in this education break period (Paechter et al., 2015).

When the literature on learning losses is examined, it is understood that studies on mathematics learning losses come to the fore especially during summer holidays, and it is determined that these losses are more common in children with lower socio-economic status (Entwisle & Alexander, 1992; Entwistle, Alexander & Olson, 2001; Moore, 2010). However, it has also been reported in studies on learning losses during the pandemic period that parents with a high socio-economic culture level and showing interest in their children continue school from home in a determined and stable manner and eliminate negativities (Kuhfeld et al.,2020). In this case, it can be considered that the mathematics learning losses during the pandemic period may lead to the widening of the level differences between students depending on the socio-economic level.

As matter of fact, Cooper et al. (1996) drew attention to the increase in heterogeneity and underlying social inequalities in this loss, as well as learning loss during the summer period. This situation reveals that even if they start school with the same skills, taking a break from school may increase children's knowledge and skill differences depending on the socio-economic level during the summer holidays. However, in another study conducted on secondary school students, it was determined that there were summer learning losses in arithmetic, problem solving and spelling skills, reading skills that could also be done at home developed during the summer, and arithmetic and spelling learning losses could be compensated in the first nine weeks after school started (Paechter et al., 2015). It is one of the research results clearly expressed that summer term learning losses can be seen in children in skills such as arithmetic, problem solving and spelling, which are emphasized in school environments. It is likely that families at a lower socioeconomic level do not support their children in terms of education and neglect the continuity of learning because, for example, they change residence, have to work, the children waste their time during the summer months, etc. Considering some of the studies in the literature that focus on learning loss during epidemics, migration, summer vacations, and similar periods, it is understood that they focus on many age groups from elementary to high school (see also Campbell et al., 2019; Paechter, Luttenberger, Macher, Berding, Papousek, Weiss & Fink, 2015; Santibañez & Guarino, 2021; Zajic, 2017). It can be said that basic disciplines such as mathematics and language stand out in some of the studies on learning loss (Campbell et al., 2019; Hodgen, Taylor, Jacques, Tereshchenko, Kwok & Cockerill, 2020; Maldonado & Witte, 2020; McEachin & Atteberry, 2017; Santibañez & Guarino, 2021; Paechter et al., 2015; Tomasik, Helbling & Moser,2020). However, it is predicted that learning losses would occur in children during a pandemic that affects the whole world, such as COVID-19. In a study conducted on learning losses during the COVID-19 pandemic period, it was stated that the learning loss during the eight-week closure period in primary schools corresponds to one-fifth of the one-year learning acquisition, and the learning losses of children with parents with a lower education level can reach 60% (Engzell, Frey & Verhagen, 2021).

In the studies of learning losses with the pandemic period COVID -19, it is observed that the impact of the pandemic on success and some risks are the focus (see also Burgess &

Sievertsen, 2020; Clark, Nong, Zu & Zu, 2021; Dietrich, Patzina & Lerche, 2021; Di Pietro, Biagi, Costa, Karpiński & Mazza, 2020; Engzell, et al., 2021; Hodgen et al, 2020; Kaffenberger, 2021; Kuhfeld, et al., 2020). For example, one study that called attention to the various risks of learning absenteeism noted that when absenteeism is taken into account, children's problem-solving skills could be impaired, that postponing school entrance exams could delay recognition of both gifted and learning children, and that measurement error on online assessments could increase (Burgess & Sievertsen, 2020). And in a study conducted on the computerised formative feedback system during the pandemic period, it was concluded that elementary students would be more affected than secondary students by eight-week school closures, that learning variability, disparities, and math losses would increase among students, and that not all students could benefit equally from distance learning (Tomasik et al., 2020). In a similar vein, long-term absences from distance education and missing lessons would have negative effects in the context of mathematics lessons for secondary school and primary school young age groups, and children with low socio-economic level, and create possible level differences in the classroom. Therefore, it is anticipated that students would need academic, emotional and social support to make up for the time they would lose (Santibañez & Guarino, 2021).

When the studies in the literature are examined, it is understood that the learning losses of children in the field of mathematics are more than the losses in the field of literacy due to being unable to attend or the interruption of school during natural disaster-pandemic periods and summer holidays. For example, according to the results of a study based on the simulation of summer learning loss, it was anticipated that normal children would be able to return to school with 63-68% of their reading learning acquisitions and 37-50% of their mathematics learning acquisitions after a period due to the closure of schools and the transition to distance education during the COVID-19 process, that some students might fall behind in mathematics for a full year and their learning losses in both mathematics and writing/spelling could be quite high (Kuhfeld et al., 2020). In the same study, it was emphasized that the students in the top 1/3 segment were considered to turn this period into an advantage and gain a potential profit. This situation was associated with the prediction that parents could direct their children to reading activities at home. Similarly, in a study on basic education students in disadvantaged groups, it was estimated that children may lose 66% in numerical skills compared to their previous learning acquisitions, according to calculations made during the three-month transition period after the COVID-19 period (Sabates, Carter & Stern, 2021). In the study mentioned above, it was thought that children's inability to ask for help at home, lack of opportunities to participate in learning opportunities due to technological inconvenience at home, and difficulties in accessing resources may lead to this result. In contrast, Kaffenberger (2021) notes that children could lose more than a full year of education as a result of the three-month school closures during the pandemic period, that they could fall behind the curriculum, that they would fall further behind over time, that permanent learning losses could occur for many children left behind, and that the learning losses of third grade elementary students would be equivalent to more than 1.5 years of education by the time they reach tenth grade. The above-mentioned research results

revealed that children in both normal and disadvantaged groups might experience serious learning losses in distance education, and that the long-term effects of these losses would be quite large even in normal people. It is also understood that several measures are required to compensate for these losses.

On the other hand, Hodgen et al. (2020) focused on the measures taken by schools to compensate for losses in learning mathematics in their study. According to the findings, schools and mathematics departments followed three paths in providing distance education: continuing to follow existing mathematics curricula as planned, following at a slower pace and/or reduced content, or aiming to review and reinforce prior learning. It has been determined that students with previously low acquisition and other disadvantaged students attend classes less due to limited access to technology, have personal-family difficulties and have low interest in the lesson. It has been reported that schools with built-in online learning applications and infrastructure could switch to distance education more easily than those without, and they did not receive feedback because there is no live interaction between students and teachers. As a result, it is determined that some of the students continue their education by placing them in mixed and some in special achievement groups.It is understood from the studies as mentioned above that primary school students may experience learning losses in the distance education process due to not being able to continue classes, not getting adequate support at home, not being able to attend classes and inconvenient technological conditions,that these losses can be quite high in the field of mathematics, and that children living in low socio-economic conditions and in disadvantaged groups may be the groups most affected by negativities, that children in the upper socio-economic segment can benefit from this process because they are supported at home, and the reasons for these losses should also be determined. However, the researches given above regarding the COVID-19 pandemic period were carried out either through simulations based on summer vacation mathematics learning losses or through interviews with secondary school students. However, it is known that primary school students are at the forefront of the group with the highest loss of mathematics learning due to absenteeism from school. The people who can make the assessment and evaluation of the process are the classroom teachers. Therefore, this differs from other studies in the literature because its target is learning losses/deficits in elementary school mathematics classes during the pandemic period.

Essentially, the foundations of mathematics teaching begin to be laid in primary school years. It is an inevitable phenomenon that some difficulties are experienced in teaching mathematics in distance education, which is considered to be one of the most difficult lessons due to its structure. Children also experience loss in learning mathematics. As a matter of fact, some studies point to the future academic-emotional and social effects of these losses (see also Kaffenberger, 2021; Sabates, Carter & Stern, 2021). Tomasik et al. (2020) stated that determining the causal effects of learning losses is a much more difficult issue due to the abundance of factors. However, it can be thought that determining these possible reasons based on the teachers' experiences who assess and evaluate the success in the mathematics lesson in short periods of face-to-face education

may be a limited guide in understanding the mathematics learning losses and producing solutions for these losses.

Identifying elementary teachers' experiences of learning losses in mathematics, their perceptions of children's deficits related to mathematical learning areas (numbers, four operations, geometry, etc.), and teachers' reflections on the causes of and solutions to these deficits is an extremely important topic because these losses affect future mathematics instruction and children's success. Therefore, the problem situation of this research is that primary school children may experience some mathematics learning losses-deficiencies in the distance education process, these learning losses-deficiencies may also affect classroom teachers in the teaching process, but the causes and solutions of these losses/deficiencies have not been examined thus far. This research is authentic in that it is the preliminary study in the literature to investigate teacher experiences on the causes and solutions of mathematics learning losses. The research is considered essential in guiding teachers and officials of the Ministry of National Education to compensate for post-pandemic learning losses/deficiencies.

This qualitative research aims to reveal the thoughts of primary school teachers about mathematics learning losses and deficiencies. For this purpose, the questions answered in the research are presented below:

- What do mathematic learning losses mean?
- What are the experiences of classroom teachers on mathematics learning losses in the context of mathematics lesson content?
- What are classroom teachers' perceptions regarding behavioral-emotional effects of mathematics learning losses on primary school students?
- What are the solution suggestions of the classroom teachers to compensate for the mathematics learning losses and deficiencies?

Method

In this part of the research, the research design, study group, data collection tools and processes, data analysis, credibility and so on are included.

Research Design

This study, which was carried out to determine classroom teachers' experiences on primary school mathematics learning losses, was carried out in the phenomenology design, which is one of the qualitative research methods. The phenomenology pattern focuses on phenomena that we are aware of but do not have an in-depth and detailed understanding of. These phenomena can appear in various forms such as perceptions, events, experiences, and concepts in our world. Phenomenology, one of the main perspectives of qualitative research, basically aims to explain the basic meanings of

understandings formed through facts and describe their essence (Yildirim & Simsek, 2016; Creswell, 2017; Patton, 2014). The case addressed in this research is the phenomenon of what meanings elementary school teachers attach to the mathematics learning losses experienced during the pandemic, the impact of this process on the course of instruction in the context of the mathematics learning domains, the causes responsible for it, and the implications for the future. Since it is aimed to understand the experiences of primary school teachers about this phenomenon, the phenomenology pattern focusing on understanding human experiences was used (Van Manen, 2007). In the study, semi-structured interview technique, which is one of the main tools to determine these perceptions in depth, was opted for. According to Turnuklu (2000), the semi-structured interview technique is complemented with questions at the end in order to make the interview questions detailed.

Study Group

The study group of this research consists of 10 participant teachers who were teaching different grade levels and working as classroom teachers in different provinces of Turkey in April-May of the 2020-2021 academic year, determined by maximum diversity sampling, one of the purposive sampling methods. In maximum diversity sampling it is aimed to identify and define themes that contain a set of differences (Patton, 2014). By using this sampling method, the dimensions of the phenomenon, different stakeholders can be reached and their experiences about the phenomenon can be determined in different respects (Suri, 2011). As it is known, there are four grade levels in primary schools in Turkey. There are also schools with combined classes.

For this reason, the study attempted to ensure maximum diversity at the level of classroom teachers by reaching at least one randomly selected classroom teacher who teaches different grade levels and combined classes. One (n=1) of the teachers participating in the study teach the combined class, one (n=1) first grade, three (n=3) second grade, one (n=1) third grade, and four (n=4) fourth grade. It is stated that the purpose of qualitative research is not to generalize the results, one or two cases are sufficient to study (Collins, Onwuegbuzie and Jiao, 2006). Demographic information about the participants is presented in Table 1.

When Table 1 is examined, it is seen that 60% of the classroom teachers participating in the study are male (n=6) and 40% are female. It is understood that all of the teachers were educated at the undergraduate level, but they have different ages and years of seniority. In addition, 40% (n=4) of the teachers work in the rural area and 60% (n=6) work in the city, and classroom teachers who continue their education and training activities at every grade level, including combined classes, are among the participants. When examining the number of times, they taught the grade level they instructed, it was observed that 50% of the teachers taught the grade level they instructed for the first time, and the remaining 50% had taught the grade level they instructed at least once before.

Table 1.

Demographic Information about Participants

Participant No.	Gender	Age	Education Level	Year of Seniority	Location of Occupation	Grade Level Taught	How Many Times the Grade Level Taught Was Instructed
P_{1P}	Female	26	Bachelor's Degree	4	Rural	3	First Time
P_{2P}	Male	29	Bachelor's Degree	8	Rural	2	3rd
P_{3P}	Male	38	Bachelor's Degree	15	Rural	Combined Class (1-2-3-4)	First Time
P4	Female	26	Bachelor's Degree	3	Urban	4	First Time
P_{5P}	Male	28	Bachelor's Degree	4	Rural	4	First Time
P6	Female	26	Bachelor's Degree	2	Urban	2	First Time
P7	Male	35	Bachelor's Degree	14	Urban	4	3rd
P8	Male	40	Bachelor's Degree	16	Urban	4	3rd
P9	Female	49	Bachelor's Degree	27	Urban	2	5th
P10	Male	38	Bachelor's Degree	16	Urban	1	6th

Data Collection Tool

In this study, the "*Interview Form*" which was developed by the researchers and finalized by taking the opinion of a field and an assessment and evaluation expert, was used as a data collection tool. The form consists of 2 parts: 7 questions on demographic information in the first part, and 4 semi-structured questions in the second part. The semi-structured questions were prepared in the research as it is more flexible and allows specific data to be collected from each participant (Merriam, 2013). It was possible to get examples and explanations by adding probe questions to semi-structured interview questions. Thus, it was possible to go into detail in the interview. While preparing the interview form used in individual interviews with classroom teachers who teach different grade levels at primary school levea literature review was first carried out to determine the scope. After the literature review, a list of questions was prepared to reveal the teacher'sto reveal the teachers' experiences regarding the learning losses and deficiencies in the mathematics lesson during the pandemic process, covering the learning areas of mathematics. To ensure the content validity of the prepared questions, the opinions of two (2) experts were consulted, and the interview questions were finalized according to the expert opinions. After this interview, one (1) question that was stated to be within the scope of the research was added to the data collection tool, and one (1) question that exceeded the scope was removed. A classroom teacher was then interviewed to determine the clarity of the questions. As a result, it was seen that the questions were understandable by the participants.

Data Collection Process

The study data were collected through interviews with classroom teachers and getting written answers following the phenomenology pattern. The interview is one of the most widely used tools for qualitative data collection (Creswell, 2017). Before starting the research data collection process, a form prepared electronically and containing voluntary participation approval was sent to the classroom teachers in the study group. Before the research was conducted with the participant classroom teachers, a preliminary interview was held and the researchers explained the purpose and questions of the study. Interviews with classroom teachers who participated in the study on a voluntary basis were conducted individually online, using the institutional e-mail addresses of the researchers. The interviews were conducted in April-May 2021 using one of the Google Meet and Zoom programs, according to the classroom teachers' use preferences in the research. In this way, the personal intuitions of the researchers regarding their expressions were preserved by observing the participants. In the preparation phase of the interview, individual appointments were first made from the participants. Then, the interviews were started through the platforms agreed on the date of the appointment. During the interview, the participants were first asked comforting questions about their work and daily lives. Hence, it was ensured that the interview was conducted in a comfortable environment. Individual interviews lasted an average of one (1) hour. The interviews were completed in an average of ten (10) hours in total. At the end of the interview, the participants were thanked and asked if they could provide support in the next research steps. In addition, the participants were assured about the confidentiality of the interviews and recordings. After all participant interviews were completed, the online interviews were transcripted and converted into written documents using the Word program. After the answers from the interviews had been evaluated, the report with the topic and the results was presented to the participants again for approval and their direct quotes on the topic were confirmed.The participant confirmation effectively understands the degree to which the results obtained represent the truth (Yildirim & Simsek, 2013). During this process, it was understood that the participants also approved the research themes and quotations. The themes, methods, and results of the research were then presented to the opinion of a scholar with PhD studying in the field of qualitative research and discussed in detail. Expert review is a method based on reviewing all stages of the research and providing feedback from experts who have knowledge of the researched subject and have a good command of qualitative research methods (Creswell, 2017). In the study, it was attempted to increase the validity, reliability and credibility of the research employing participant confirmation, long-term interaction with the participants through multiple interviews, detailed description of the participants and the environment, reducing the possible prejudices of the researcher, expert review, etc.

Data Analysis

The data obtained from the research were analyzed using the content analysis method. The fundamental process in content analysis is gathering similar data within the framework of certain concepts and themes and interpreting them by arranging them in

a way that the reader can understand (Yildirim & Simsek, 2016). The answers given by the classroom teachers participating in the study to the questions in the interview form were evaluated with the formed theme and sub-themes. Determining the theme and sub-theme efforts were carried out through zoom meetings. The common codes were expressed descriptively with direct quotations from the opinions of classroom teachers within the same theme and sub-theme and presented in the findings section. Some of the direct quotations that are considered important were presented during the description and interpretation of the findings. To protect the personal information of the classroom teachers participating in the study, considering the ethical principles, the teachers working in rural areas were coded as P_{1p}, P_{2p}, P_{3p},**P** , $_{5P}$ and those working in the city as P4, P6, P7, P8, P9 and P10. To calculate the reliability of the research, the formula "*Reliability= Consensus/ (Consensus + Disagreement)*" created by Miles & Huberman (1994, 2016) was used. Accordingly, the reliability of the study was found to be 84%. According to Miles & Huberman (1994, 2016), the reliability level should be 70% and higher. When the reliability value (84%) obtained from the study was compared with the critical value (70%), the results obtained from this study were considered reliable. For the sake of reliability of the research, the opinions of scholars with PhD studying in the fields of primary school mathematics teaching and, qualitative research, computer and instructional technologies were also taken. As a result of the obtained indications, it was understood that the findings were reliable.

Credibility and Ethics

In the context of research credibility, some precautions were taken in preparing the interview questions, conducting the interview with the participants, and compiling the interview recordings.First of all, the literature was meticulously scanned during creating the conceptual framework. Then the conceptual framework was created. Before the interviews were conducted with the participants, their voluntary consent was obtained electronically, and the principles of human research and scientific ethics were meticulously adhered to. It was agreed with the participants that the data and names collected before the interview was recorded would be kept confidential, that the names would never be used, that the participants' opinions would be coded, and that the data collected would be used for academic study purposes, and these established rules were strictly followed. The documents prepared after the interview were shared with the participating teachers and their approval was obtained again. In transferring and interpreting the results, an attempt was made to increase consistency by including direct statements and quotes from the participants in the report. From the beginning to the end of the content analysis of the research, care was taken to ensure inter-coder reliability at all stages (interview, coding, thematization, description and interpretation). For this purpose, the opinion of a field expert academician was also consulted. The research report explains the research design, study group, data collection tool, data collection process, and data analysis processes in detail. Lastly, the findings were interpreted by supporting the studies in the literature. In this way, the transferability of the research was attempted to be ensured.

This research was carried out with the permission approved by the decision of the Ethics Committee of Sakarya University Rectorate dated 29.03.2021 and numbered 34 and numbered 19.

Findings

In this part of the research, the findings obtained in line with the research questions determined on the meaning of mathematics learning losses, experiences of classroom teachers on the effects and causes of mathematics learning losses on the course of the lesson, the emotional-social effects of mathematics learning losses on children and suggestions of the teachers for mathematics learning losses were thematized and presented in parts. The findings regarding the themes and sub-themes obtained were attempted to be supported by direct quotation examples from the statements of the teachers. Accordingly, the themes and sub-themes for each research question were firstly determined by coding.

The meaning of math learning losses during the pandemic period

The subthemes identified in the survey in accordance with teachers' responses to the question, "What does the loss of learning in mathematics mean to you (The impact of the teacher on the course of instruction and student learning)?" are shown in Table 2.

Table 2.

Meaning of Mathematics Learning Losses

Sub-Theme	Code	Participant
Student	Deprived start to life	P7
	Lack of knowledge and skills	P_{P1}, P_{PK2}, $P_{P3,}$ P4, $P_{P5,}$ P6, P7, P8, P9, P10,
Teacher	Having to look for a new method	P7, P4
	Having constantly to make up for deficiencies	P_{P1}, P_{PK2}, $P_{P3,}$ P4, $P_{P5,}$ P6, P7, P8, P9, P10,
	The challenges arising from level difference	P_{P1}, $P_{P3,}$ P4,P6, P7, P8, P9, P10,

As shown in Table 2, the meaning of mathematics learning losses is explained in two sub-themes: "Student and Teacher". In the student sub-theme, the codes of deprived start to life and lack of knowledge-skills were determined. In the teacher sub-theme, the codes that stand out are the constantly having to make up for deficiencies and the level differences codes. Examples of quotes from teachers' opinions within the scope of the question of the meaning of mathematics learning losses are given below.

> For the student, it means a deprived start to life. Because mathematical expressions appear in front of the child her/himself at every stage of life.... The child may encounter difficulties because s/he cannot internalize mathematical processes. For example, I teach 4th graders this year. I believe that they lack prior knowledge because they will start secondary school. … This situation affects not only the student but also the teacher. When they move to the next grade, the teacher

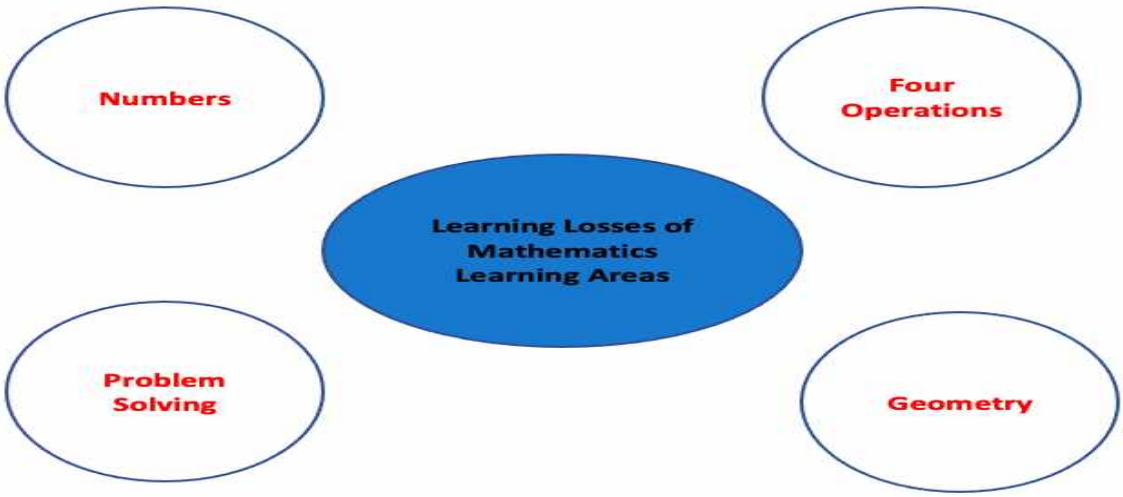
will force the gap between good and bad. And as a teacher, this leads me to look for different methods. P7; Not only during the pandemic, but also during normal times, learning losses affect students. Some children go down a shade lower even if the level of the class is high. The child may experience difficulties in terms of realizing and reaching some of the acquisitions. It will be accepted as "This child has acquired this" and information will be added on. For example, those who cannot do some digits in rhythmic counting will have difficulties in multiplication. This will be reflected in problem solving. When the teacher sees the shortcomings, s/he will have to go back to the beginning. S/he will have difficulties in completing the curriculum while completing the shortcomings. P10.

The experiences of classroom teachers on mathematics learning losses in the context of mathematics lesson content

It is a known fact in the literature that students experience loss of mathematics learning during epidemics, natural disasters and summer holidays. However, it can be articulated that it is not easy to determine these learning losses and their causes. Based on the fact that teachers are the only people who observe students one-on-one and measure and evaluate success in learning environments, it is possible to detect, albeit limited, how teachers experience mathematics learning losses. The opinions of the teachers regarding the interview question "Can you share your experiences about the effects of these losses on your teaching process by taking into account the areas of learning mathematics (numbers, four operations, geometry, etc.) during the pandemic process? Can you give examples of these mathematics learning area losses that you see in students?", which was prepared for the second question of the research, are presented in Figure 1.

Figure 1.

Learning Losses of Mathematics Lesson Learning Areas



As shown in Figure 1, experiences of classroom teachers regarding learning losses in mathematics during the pandemic period were grouped under four sub-themes: "*Numbers*", "*Four Operations*", "*Problem Solving*" and "*Geometry*". This finding indicates that there were mathematics learning losses in almost every area in the primary school

mathematics lesson taught online during the pandemic. The codes obtained from the numbers sub-theme are given below in Table 3.

Table 3.

Learning Losses/Deficiencies of Counting in Mathematics Class During the Pandemic Period

Sub-Theme	Code	Participant
Numbers	Being unable to perform rhythmic counting	P7, P10
	Being unable to concretize	P10
	Deficiencies in counting forward-backward three-by-four	P4

Regarding the learning losses/deficiencies within the scope of the "Numbers" sub-theme, the teachers mostly stated that the students could not "Count Rhythmically" in the mathematics lesson taught in distance education. In addition, the teachers stated that they experienced that the students had problems of "Being Unable to Perform Mind Addition" and "Being Unable to Concretize". However, many teachers implied that the students "had no loss in the area of numbers". Example:

> I have found that I have great difficulty with rhythmic counting. However, I taught rhythmic counting by tapping our hands up and down in the air in a playful way, and reinforced and repeated it with similar activities. P7; When counting, students do rote counting.Children in the period of concrete processes lead to more abstract thinking in the distance education process. And this causes loss in learning. Students who cannot fully comprehend rhythmic counting have difficulties in understanding that there is a increase in addition and decrease in subtraction while adding and subtracting. P10; ... I have observed that some children could not count forwards or backwards, especially in threes and fours. While a successful 4th grader was mentally counting, children who had problems in counting had difficulty in front of the screen many times. We had to go back to the beginning all the time P4.

The results obtained from the four operations sub-themes are given in Table 4 below.

Table 4.

Four operations learning losses/deficiencies in mathematics lesson during the pandemic period

Sub-Theme	Code	Participant
Four Operations	Losses and deficiencies in hand addition	P_{2P}, P_{5P}, P6, P7, P8, P9
	Not understanding the increase in addition	P10
	Losses and deficiencies in subtraction by decimal	P_{2P}, P_{5P}, P6, P7, P8, P9
	Inability to understand what is missing in subtraction	P10
	Inability to do multiplication by hand	P_{1P}, P4, P8
	Loss in multiplication	P_{2P}, P6, P7, P9
	Loss in division	P_{2P}, P6, P7, P9
	Inability to comprehend the concept of segment	P_{1P}, P4
	Problem in dividing large numbers	P8

Under the subtopic "Four Operations," teachers indicated that "losses and deficits in addition by hand" occurred most frequently in distance learning mathematics, there were "losses and deficits in subtraction by the decimal system," there were "losses in multiplication," and students had "inability to do multiplication by hand," "losses in division," and "inability to understand the concept of segment." From some teachers' experiences, children's inability to grasp the concept of numerals negatively impacts their learning of the four operations. Below are examples of direct quotes from teachers' opinions about these codes:

> There are losses in four operations. There is more loss in multiplication and division operations. P2P; There are four operational mistakes students make. They cannot understand the concept of segment in distance education. Also, since there are deficiencies or forgotten subjects in addition and subtraction, the basis of division is incomplete. The student, who cannot perform multiplication by hand, has difficulty in dividing two-digit numbers. S/he cannot understand the subject. This becomes more evident in manual addition, subtraction, multiplication and division of large numbers. P8.

The codes obtained from the problem-solving sub-theme are given below in Table 5.

Table 5.

Learning Losses/Deficiencies in the Field of Problem Solving in Mathematics During the Pandemic Period

Sub-Theme	Code	Participant
Problem-solving	Inability to comprehend the process steps of the problem	P_{1P}, P4, P6, P7, P9
	Inability to understand-concertize the problem	P_{1P}, P_{2P}, P_{5P}, P8, P9, P10

Within the scope of the "problem solving" sub-theme, classroom teachers stated their experiences regarding learning losses and deficiencies in the distance education mathematics lesson as students “Inability to Comprehend the Process Steps of the Problems” and “Inability to Understand-Concertize the Problems”. According to the findings, the classroom teachers stated that the students could not concretize their problems in the mathematics lesson, they could not understand, only understand after a few examples. They experienced that some of the children, especially the disadvantaged children, could not solve the problems. It is seen that teacher experiences on this subject can also vary depending on the social conditions within the classroom. It is understood that the teachers are aware of the level differences between the students depending on their social conditions in terms of problem-solving skills in the classroom. Some of the thoughts of teachers on this theme are presented below:

> In problem-solving subjects that are too abstract for children, students who particularly had problems in operations experienced learning losses. Even the students who were quite successful in their classes had difficulty in performing the operations during the written exam although they did it in front of the screen many times in the mind. Process errors were made because the concepts and steps were not fully understood. P4; ...Since the students cannot concretize the problems, they have difficulty in understanding what and how to solve them P10; ... But there are refugee students here. There are four of five in each class. ..... S/he cannot even read. In

> mathematics, they can only do addition. I did a free online study for them one day a week voluntarily. This year, there is a slow-learning child in my class with dyslexia. I can have trouble with them. One of my students also comes from a love house. We taught him/her multiplication. But when performing operations, s/he adds instead of multiplying.... Although middle-level children cannot solve the first problem, they start to solve a similar problem after giving an example. P9.

The codes obtained from the geometry sub-theme are given in Table 6 below.

Table 6.

Geometry Learning Losses/Deficiencies in Mathematics Lessons During the Pandemic Period

Sub-Theme	Code	Participant
Geometry	Focusing on four operations and not be able to cover geometry subjects at the relevant grade level	P_{1P}, P_{2P}, P3, P6
	Losses due to superficial teaching of subjects	P4, P_{5P}, P8
	Losses due to not processing all of the acquisitions	P7, P9
	Losses due to not being able to draw three-dimensional shapes	P_{5P}
	Not having problems with geometry	P10

As shown in Table 6, within the scope of the "Geometry" sub-theme, the teachers emphasized the losses/deficiencies experienced in geometry subjects by stating that " Geometry topics could not be covered in distance education mathematics classes." However, teachers indicated that they had "difficulty teaching geometry," "geometry topics may have had to be taught superficially," and "three-dimensional shapes could not be drawn" in distance education. In contrast, there is one classroom teacher who indicated "having no problems with geometry."The participant who expressed this opinion works in a city school and teaches the fourth grade. According to the findings, geometry subjects can also be taught in the first grades in city schools with good facilities. In contrast, in the upper grades, due to the students' lagging in operational skills, weight is given to operational skills, and geometry subjects cannot be taught. In the upper grades of the primary school, geometry subjects are taught either superficially or difficult. Examples of quotations from the participants regarding these themes are as follows.

> ...There were no problems with geometry. P10; .... Geometry subject could not be covered in the online education. P_{1P}; I cannot say much about geometry. I could not stick to the curriculum a little bit. I particularly focus more on addition, subtraction, multiplication, division and problem solving, which children lag behind. We could not pass on to geometry subjects. P_{2P}; Geometry; I was only able to teach whole, full and quarter..... But they falter when asked how many wholes there in 6 halves. I asked mothers to make these at home with apples. When you address the whole class, you have to explain the subject with visuals. ..... P9.

Causes of Mathematics Lesson Learning Losses During the Pandemic Period

To seek an answer to the second question of the study, the sub-themes obtained from the answers given by the teachers to the interview question "What do you think are the

reasons for the mathematics learning losses during the pandemic period (teacher, student, subject, etc.)?" are presented in Figure 2 below.

Figure 2.

Causes of Learning Losses in Mathematics Lesson

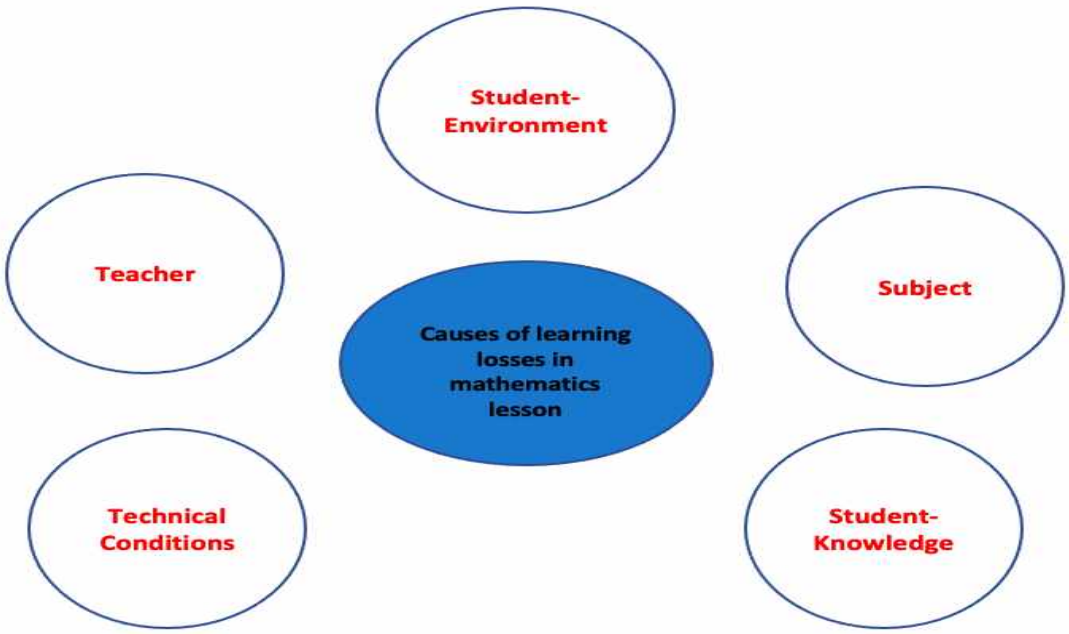


Figure 2 includes classroom teacher experiences regarding the causes of learning losses in mathematics during the pandemic period. The thoughts of the classroom teachers regarding the causes of learning losses were gathered under 5 *sub-themes: "Teacher", "Student-Environment", "Subject", "Student-Knowledge" and "Technical Conditions"*. This finding shows that in teachers' experience, learning loss in mathematics in elementary school is not only related to class participation, but even if they participate in class, some factors such as teacher, subject, student environment, and student knowledge also lead to learning loss in mathematics. The codes obtained from the teacher-induced sub-theme are given below in Table 7.

Table 7.

Teacher-Induced Learning Losses/Deficiencies Mathematics Lesson in the Education During the Pandemic Process

Sub-Theme	Code	Participant
Teacher-Induced	Inability to concretize subjects	P_{1P}, P4, P6, P7, P9
	Inability to detail the subject/timing problem	P4, P7, P9
	Lack of techno-pedagogical knowledge	P4, P_{5P}, P7, P8, P9
	Psychological fatigue of teachers	P_{2P}
	Being teacher-centered/communication problem	P10
	Limitation of assessment and evaluation	P8, P9, P10
	Lack of technological means	P_{2P}, P_{3P}

As shown in Table 7, under the sub-theme "Teacher-induced", the classroom teachers stated that they thought the students' learning losses in the mathematics lesson mainly were due to the "Lack of Techno-Pedagogical Knowledge" of the teachers. After that, it was stated that the teachers were mostly to have "Inability to Concretize the Subjects". And also the views of teachers on "Inability to Detail the Subject", "Lack of Time", "Psychological Fatigue", "Being Teacher-Centered", "Failure to Communicate Effectively", "Assessment and Evaluation Limitation" and "Insufficient Technological Means" are among the teacher-induced reasons for the losses. The following are the example teacher statements for the "Teacher" sub-theme:

> Teachers' insufficient knowledge of technological tools and devices and their inability to put them into practice, the fact that distance education is a method of training that requires a very different expertise than face-to-face teaching, and ignorance of the innovations demanded by the age are among the reasons for students' learning losses. P_{5P}; In distance education, the teacher did not capture the connection in the classroom environment. While s/he could do the subjects that need to be concretized in the lessons with various activities in the classroom environment, s/he could not manage to do this fully in distance education. This is one of the main causes of learning losses. P6; Teachers' narrative in the classroom needs to be supported by adequate visual and auditory materials. The fact that the mathematics lesson was based only on verbal communication led to learning losses in students.... P_{3P}.

The codes obtained from the student-environment sub-theme are given below in Table 8.

Table 8.

Learning Losses/Deficiencies in Mathematics Lesson Caused by Student-Environmental During the Pandemic Process

Sub-Theme	Code	Participant
Student-Environment	Technology addiction	$P_{1P,}$ P4, P_{5P}, P6, P9, P10
	Entering late/leaving early to lesson	P9
	Not being able to attend the lesson	P_{1P}, $P_{2P,}$ P_{3P} ,P_{5P}, P10
	Negative domestic environment	P_{1P}, P9, P10
	Lack of attention, interest and motivation	P4, $P_{5P,}$ P9, P10
	Low level of the student	P7, P8, P9
	Family indifference	P6, P7
	Lack of repetition and inability to get feedback	P6, P7, P9, P10

As shown in Table 8, under the "Student-environment" sub-theme, the classroom teachers stated that they thought that the learning losses occurring in students in the mathematics lesson were mostly due to "Technology Addiction" and "Not Being Able to Attend the Lesson". After that, the "Lack of Attention and Motivation" of the students are among the student-induced learning losses. The statements of one participant, ".... Parents mostly complain about the following issues; Classes coincide with meal times. The children go to turn the geese and herd the sheep. The lessons also coincide with these hours. $P_{3P)}$" is quite striking. This finding reveals that class participation cannot be seen only as a situation dependent on technological conditions. Children are perceived as an active part of the family economy in rural areas. Economic duties even come before school duties. It is established from

the experiences of the teachers that the living conditions, especially in the rural areas, also affect the loss of participation in the lesson and learning mathematics. In addition, one of the findings of this study is that students who are unable to focus on instruction due to negative conditions at home, even when participating in class, playing games behind the screen, or even turning on the screen and moving away from the classroom environment, also experience learning losses in mathematics. Some other teacher statements regarding this theme are as follows:

> The fact that students are addicted to technology, play games in the background during class, are not interested in class, have problems with the device they use to participate in class and the internet connection, do not complete the assigned tasks because they believe the teacher does not control them, students' inability to focus on the lesson, their unwillingness to turn on their cameras, their reluctance to talk in front of the screen, the lack of textbooks, the incomplete use of classroom resources, and the lack of a quiet, school-like environment at homehave unfortunately led to learning losses in distance education.P4; ... At the same time, the low level of participation in the lesson caused the students who did not attend the lesson to fall behind from the subjects completely. Having missing subjects also made it difficult to learn next subjects. Then, the repeated students who participated later caused the same subject to be repeated many times. It was impossible to immediately recognize and correct any misconceptions that might occur. P_{1P}; Not attending the lesson, coming late, being distracted during the lesson, for example, in the online lesson, the child can take out her/his cat and show it. Some of them have their cameras turned off. Some turn on the camera and leave. You do not know if the child is there. You say turn on your camera, there is no sound. S/he can take out their toy and play. Some may have siblings with them. In some houses, two or three children can attend classes simultaneously. There may be children who have to have classes with their siblings in the same room.... P9.

The codes obtained from the subject sub-theme are given below in Table 9.

Table 9.

Learning Losses/Deficiencies Caused by Subject-Acquisition in Mathematics Lesson During Pandemic Process

Sub-Theme	Code	Participant
Subject-Acquisition	Subjects are abstract	P_{1P}, P_{2P}, P_{3P}, P4, P_{5P}, P7, P10
	Too many acquisitions	P6
	Inability to access time-based acquisitions	P_{1P}, P_{2P}, P6, P8, P9, P10
	Not interesting subjects	P10
	There is no problem arising from the subject	P8

As shown in Table 9, the teachers mostly expressed the view that "Subjects are abstract" in the mathematics lesson within the scope of the "Subject-Acquisition" sub-theme, and they stated that their learning losses are due to the abstractness of mathematics subjects. In addition, reasons such as "Too many acquisitions", "Inability to access time-based acquisitions", "Not interesting subjects" were also put forward, and on the contrary these, it was stated by a classroom teacher that "There is no problem arising from the subject". Example:

> Difficult-to-learn subjects in mathematics create many limitations. The child cannot grasp the subject from a distance..... P_{2P}; The given subjects are not suitable for distance education, some

> subjects remain abstract and do not arouse students'..... P10; .....Since it is a combined class, we cannot achieve all of our acquisitions due to the insufficient number of hours we have determined for each class. Substantially, because there are also accumulated acquisitions that should have been given in the previous year but could not, I can say that we have a very serious loss. P_{3P}; Some subjects and achievements were very intense and excessive. Not all of them could be covered. This leads to learning deficiencies in children. P6.

The codes obtained from the technical conditions sub-theme are given below in Table 10.

Table 10.

Learning Losses/Deficiencies Caused by Technical Conditions in Mathematics Lesson During the Pandemic Period

Sub-Theme	Code	Code
Technical conditions	Insufficient/lack of technical equipment	P_{1P}, P_{2P}, P_{3P}, P4, P_{5P}, P6, P7, P8, P9, P10
	Insufficient Internet connection/quota	P_{1P}, P_{2P}, P_{3P}, P4, P_{5P}, P6, P7, P8, P9, P10

As seen in Table 10, under the "Technical Condition" sub-theme, the classroom teachers stated that the learning losses experienced by the students were caused by "Lack of technical equipment" and "Lack of internet connection/quota". Example:

> ... In addition to these, the lack of materials (mobile phone, tablet, computer, etc.) that students can attend the lesson, problems related to access to the Internet and disconnections on the Internet..... All of the hardware problems led to losses. P10.

The codes obtained from the student-information sub-theme are given below in Table 11.

Table 11.

Learning Losses/Deficiencies Caused by Student-Knowledge in Mathematics Lessons During the Pandemic Period

Sub-Theme	Code	Participant
Student-knowledge	Inadequacy of reading comprehension	P_{1P}, P_{2P}, P7
	Difficulty in concretization	P_{1P}, P6, P9, P10
	Inability to grasp the concept of digits	P4
	Four operations knowledge gaps	P_{2P}, P_{3P}, P_{5P}, P8
	Inability to reason and think creatively	P_{5P}

Table 11 shows that for the sub-topic "student knowledge" the teachers mostly attribute the reason for these losses to the "insufficient reading comprehension" of the students and the "concretization difficulties". The statements of the teacher with the code (P2P) given below are pretty remarkable. It has been profoundly stated that the learning losses in mathematics lessons are related to the inability of children to acquire reading comprehension and operational skills, and that the task of reading had to be left to the parents of the students during the period when the children took a break from education.

It can be claimed that this finding indicates that the most problems in learning losses can be seen in the field of learning mathematics. Examples of quotations from the participants regarding these themes are as follows.

> ..... Also, since there are deficiencies or forgotten subjects in addition and subtraction, the basis of division is incomplete. The student, who cannot perform multiplication by hand, has difficulty in dividing two-digit numbers. S/he cannot understand the subject. For example, problem-solving requires knowledge of Turkish at the initial stage. Reading skills in children are deteriorated ..... When reading skill is poor, children do not read and understand the problem to solve it. The second stage is related to the losses in the four operations skills. Because in the meantime, the children forgot some addition, subtraction and multiplication that they had learned. S/he cannot read and understand the problem and does not know the mathematical operation. S/he either adds or subtracts the numbers s/he sees without understanding them. At least s/he learned a little bit about addition and subtraction. She tries her luck by adding without understanding what she reads. P_2; ....For example, problem-solving is partly related to the reading comprehension of children. Reading comprehension is not easy for children. In the classroom, the child would pick a storybook and when s/he did not understand, s/he would say, 'Teacher, I could not understand the book, can I get another book?'..... P_{1P}.

Social-Emotional Effects of Mathematics Learning Losses in Children

The answers given by the teachers to the question "What can be the effects of the mathematics learning losses on the students? What are your experiences in this regard (Social-emotional)?" regarding the third question of the research are presented in Table 12 below.

Table 12.

Social-Emotional Effects of Mathematics Learning Losses in Children During the Pandemic Period

Theme	Code	Participant
Emotional-Social Effects	Unhappy children	P7
	Loss of self-confidence	P_{P1}, P_{P2}, P_{P3}, P4, P_{P5}, P6, P8, P10
	Isolation-Communication problem	P_{P1}, P6, P7, P10
	Phone-Internet addiction	P_{1P}, P4, P9, P10
	Inability to play games	P10
	Emotional trauma	P7
	Fear of mathematics-disliking the lesson	P4

In Table 12, the views of classroom teachers on the social-emotional effects of learning losses experienced in distance education mathematics lessons are presented. Classroom teachers' opinions collected under the theme "Social-emotional impact of mathematics learning loss" were shaped under the codes "Unhappy children", "Loss of self-confidence", "Isolation", "Emotional trauma", "Phone/Internet addiction", "Inability to play", "Fear of mathematics - dislike of teaching".Examples of quotations regarding the participants' thoughts within the scope of the "Emotional-Social Effect" theme are given below.

> The student, who could attend the online lessons, is emotionally very unhappy and hopeless due to the impossibility of meeting with her/his friends. Some students have problems with keeping

up with society, isolation, communication. For example, the family of a student of mine overwhelmed them a lot because s/he had low immunity. I observed the anxious state of the child when s/he came to face-to-face education....Multiple children are studying in the same family. But the number of devices is insufficient. That child experiences emotional devastation. Because s/he sees and hears that their friend or neighbor is entering the lesson. I can say that this emotional trauma experienced in this process deepens the mathematics learning losses. P7; Now, I have observed that when children come to face-to-face education, there is a difference in self-confidence between those who can and cannot.... The child who lags behind and does not know is aware of their situation. The other child with learning losses is also hesitant to raise her/his hand because s/he lacks in this regard. They have problems with socialization. Children do not know the rules. They do not even know how to play with each other. Phone-Internet addiction has begun. They have been affected by Internet games. I saw them playing the game of beating each other during break. P10; ....There would be children who are afraid of mathematics lessons, prejudiced in the lesson, and do not like the lesson. I have been already observing this in some children. P4.

Solution Suggestions of Teachers for Mathematics Learning Losses

In the study, the answers are given by the teachers to the question "How do you think the mathematics learning losses in mathematics teaching can be compensated? Can you specify?" were analyzed and presented in Table 13 below.

Table 13.

Suggestions for Learning Losses in Mathematics Lessons During the Pandemic Period

Theme	Code	Participant
Suggestions	Content suitable for the setting (activity-online game, movie, etc.)	P_{1P}, P_{2P}, P_{3P}, P4, P9
	Technological improvements	P_{3P}, P4, P_{5P}, P8
	Techno-pedagogical training for teachers	P_{1P}, P_{2P}, P4
	Cooperation between stakeholders	P7
	Compensatory education	P_{1P}, P_{2P}, P_{3P}, P4, P_{5P}, P7, P8, P10
	Ensuring equality of opportunity	P4, P6, P8, P10

In Table 13, the suggestions of the classroom teachers regarding the learning losses experienced in the mathematics lesson in distance education are given. The opinions of the classroom teachers gathered under the theme of "Suggestions" were shaped within the framework of the codes "Content suitable for the setting (activity-online game, movie, etc.)", "Technological improvements", "Techno-pedagogical training for teachers", "Cooperation between stakeholders", "Compensatory education" and "Ensuring equality of opportunity". The teachers mostly suggested that "Content suitable for the environment (activity-online game, movie, etc.)" should be created. However, the teachers also stated that "Ensuring equality opportunity" should be established and that "Technological improvements" are required. Examples of quotations regarding the participants' thoughts within the scope of the suggestions theme are given below.

First of all, inequality in education should be eliminated... Teachers, students and parents should be trained in distance education. Support should be provided for the teacher on their technical

problems. Materials to be used in mathematics should be developed... Alternatives should be considered for these students with whom we can allocate a separate time in face-to-face education (such as break, a certain part of the lesson). For example, opportunities such as learning groups, study classes that would provide peer learning, and access to different lesson materials can be created. P4; By maximizing teacher-parent cooperation, activities that can be done in face-to-face education can be carried out at home in parent-student collaboration..... P7; It is absolutely necessary to make up for the subjects taken by the students in distance education. While applying the program, I think that the subjects taught here should be integrated into the next classes..... P10. ....If all children are provided with equal opportunities, platforms such as EBA and Zoom will become very productive indeed. P6.

Discussion and Conclusion

In this section, the results of the research are presented and discussed with the help of the relevant literature. Discussion and conslusion topics are: Meaning of Mathematics Learning Losses, Mathematics Learning Losses Experiences of Primary School Teachers in the Context of Mathematics Lesson Content, Social-Emotional Effects of Mathematics Learning Losses in Students, Solutions of the Primary School Teachers for Learning Losses in Mathematics Teaching.

Meaning of Mathematics Learning Losses

It was found that teachers' thoughts on the research question "What do the learning failures in mathematics during the pandemic period mean for the course of instruction?" were explained by the themes of teachers and students. Accordingly, it has been understood that primary school teachers mostly evaluated the mathematics learning losses as "difficulties caused by level differences, having to look for new methods, constantly making up for deficiencies" in the teaching process during the pandemic period. According to the classroom teachers, one of the most negative aspects of mathematics learning losses during the pandemic process is the difficulties it creates for teachers. Depending on the mathematics learning losses, the differences between the levels of the students in the classroom increase, and the teachers are constantly forced to complete the subject deficiencies of the students and seek new methods. It can be suggested that the results obtained that level differences between students increase are similar to the results of some studies on learning loss in the literature (see also Burgess & Sievertsen, 2020; Dietrich, Patzina & Lerche, 2021; Di Pietro, Biagi, Costa, Karpiński & Mazza, 2020; Hodgen et al., 2020; Kuhfeld, et al., 2020; Santibañez & Guarino, 2021; Tomasik et al., 2020). Due to the inability to continue education for various reasons, interruption of education, technological inconveniences, inefficiency of the lessons taught, mathematics learning losses, and level differences between students who could not attend the mathematics lesson may increase and teachers may have difficulties teaching mathematics lesson. The increase in level differences among students is also associated with cognitive-psychological characteristics such as the lack of autonomy and self-learning abilities in young children (Tomasik et al., 2020). Therefore, it can be

assumed that the developmental processes of the students may affect both the teacher and the teaching in the mathematics lesson.

Mathematics Learning Losses Experiences of Primary School Teachers in the Context of Mathematics Lesson Content

It was found that the participants' responses to the second question of the survey, "What is the teachers' experience of learning loss in mathematics in relation to the content of mathematics instruction?. It has been concluded that the Losses in Primary School Mathematics Learning Areas was explained with the sub-themes of "Counting, Four Operations, Problem Solving and Geometry". Accordingly, it has understood from the teachers' opinions that children could not achieve the acquisitions on four operations and operations by hand/number digits in addition, subtraction, multiplication and division operations, and that there have been learning losses in mathematics lesson in primary schools.

It is an important result obtained from teachers' opinions that problem-solving, which is another learning area of mathematics, cannot be acquired due to the deficiencies and losses of children in four operations and reading comprehension. As a result of this section, it was determined that geometry subjects could not adequately processed during the pandemic process and that most participating teachers had problems teaching these subjects- except for one teacher. It has been also understood that the majority of the participants stated that they had learning losses in mathematics learning areas. Since the participants who expressed these views were teachers who teach different elementary grades and work in different settlements, it can be stated that learning loss in the mathematical learning areas of elementary school is common among most students at different grade levels in both rural and urban settlements, predominantly in rural areas.In the literature, there is no study that determines the mathematics learning areas in which mathematics learning losses are observed. However, the results of a study in the literature showed that primary school children made little or no progress in learning from home during the pandemic process (Engzel et al., 2021). The same study also predicted that losses would be even greater in countries with weaker infrastructure or subject to longer school closures. The similar results can be regarded as valid for this study as well. It has been understood that socio-economically disadvantaged children had losses in mathematics learning areas. Some of them fell behind their class level, which means that the level differences in the class are widened.

Some of the participant teachers pointed out that they could not cover all the acquisitions in the mathematics learning areas during their lessons or that the subjects remained abstract even if they did. Only one teacher states that s/he did not have any problems in teaching the geometry acquisitions, and s/he teaches the first grade in one of the city settlements. This is an important result. Because, it has been clearly understood from this participant's view that the achievements of the geometry learning area of mathematics can also be studied in conditions where good opportunities are available in the city settlement. Therefore, it has been concluded that the acquisitions for the first grade

geometry learning area of primary school, which includes fewer acquisitions, could be easily processed with students in city settlements with good conditions. There would be no learning loss related to that learning area. It can be said that this result constitutes strong evidence for the inequalities of opportunity in education.

In this study, some of the teachers stated that "some of the students were in the third grade but remained at the second grade level, or the students who were in the third grade could not understand at least 70% of the subjects, they could not learn the math subjects because they could not understand what they were reading, and they had losses."Therefore, it can be set forth based on the opinions of the teachers that the learning losses in the mathematics areas may differ among the students and that the majority of the students may not acquire the subjects in the mathematics learning area. Similarly, Toptas & Ozbas (2021) determined that teachers associate the deficiencies in learning mathematics lessons with reasons stemming from the structural features of distance education, student-family-teacher-support services-technical etc. However, some research findings in the literature also support the above prediction of learning loss in mathematics (Kuhfeld et al., 2020; Sabates et al., 2021). Kaffenberger (2021) calculated that children's learning losses at three-month school closure during the COVID-19 pandemic may correspond to more than a year's acquisition because these children would lag behind the curriculum and continue to lag behind in the course of time. Other results of the same study showed that with compensation when children return to school, their long-term losses would be reduced by half, but children would still have a half-term loss. Based on the results of the above studies and the current research, it can be argued that mathematics learning losses may continue to a serious extend in some of the students even after the schools start normal education. It can be supposed that these students live in rural areas or are in the economically-socially disadvantaged group.

According to the results of the second part of the second research question, it was found that the theme "Causes of learning loss in elementary school mathematics classrooms" was explained with the subthemes "Teacher, student environment, subject, technical conditions, and student knowledge". It was found that some of the learning losses and deficits in elementary school mathematics teaching are due to the teacher's failure to teach effectively. Reasons for this include a lack of technological pedagogical knowledge, the prevalence of teacher-centeredness when teaching in front of a screen, which has a negative impact on communication, and the limitation of assessment and evaluation.The most important reason that stands out according to the teacher's opinions in this sub-theme is that some of the teachers do not have sufficient techno-pedagogical knowledge. In fact, this result contradicts the results of some studies in which it was determined that primary school teachers have sufficient techno-pedagogical content knowledge and that gender does not make a difference (see also Chai, Ling Koh, Tsai & Lee Wee Tan, 2011; Horzum, 2013; Kula, 2015). But knowing something is one thing, and applying it is another. For this reason, it can be assumed that some of the teachers in the class have some problems related to practical knowledge. In fact, one of the necessary factors for the successful implementation of distance education is the teachers' competent use of

technology (Can, 2020; Konig, Jaeger-Biela & Glutsch, 2020). This situation shows that part of the learning loss in mathematics can be explained by teachers' inadequacies.

The second result of the second question of the study states that the most important other causes of loss of mathematics skills are in the student's environment, such as "not being able to attend class, coming to class late, leaving class early, the home environment not supporting education, low attention and motivation of the student, loss of the student's learning habits in the distance education process, and the indifferent attitude of the family in this process." This sub-theme is also related to the "technical condition". In addition, it was found that students who could not understand what they had read and had a lack of knowledge about subjects they had already learned could not understand mathematical subjects and their learning losses increased. It can be argued that these findings of the study are supported by the research findings that discussed that students with prior low acquisition could not participate or participate less in class due to limited access to technology, families were indifferent, and students' interest was low and learning speed could decrease (see also Cakın & Akyavuz, 2020; Hodgen et al., 2020, Tomasik et al., 2020). Mathematics learning losses gets deeper for students with financial impossibilities and unsuitable technical conditions (Tomasik et al., 2020). In fact, it is necessary for students to have access to technological tools for the success of distance education (Konig et al., 2020)

In a study conducted with secondary school students, it was determined that students who took lessons from other high-quality teachers and attended the classes with a computer showed higher academic success in the exams than the students who took lessons from their teachers and attended the lessons with a mobile phone (Clark et al., 2021). According to this, despite all the technical equipment used on learning losses in distance education, it can be thought that the shortcomings of teachers in knowledge transfer may also be effective, even if they are small. Therefore, from these results, it can be thought that the reasons for the mathematics learning losses are universal, that this problem cannot be seen as a problem only in Turkey, and that similar inequalities of opportunity occur all over the world during the pandemic period. It can be stated that mathematics learning losses may increase due to student-related reasons such as the inability of students with missing learning acquisitions to attend the lesson or their limited participation. These losses may become deeper in cases where the teacher has a lack of techno-pedagogical knowledge.

According to the second result of this part of the study, another reason for the mathematics learning losses is the subject-acquisition-based reasons: "some mathematics learning area subjects are abstract, the number of acquisitions is high, and the process cannot be controlled". The acquisitions of Primary School Mathematics Teaching Lessons were surely determined according to the teaching in normal classes. In fact, it can be stated that the main question here is beyond whether the acquisitions are suitable for distance education or the number of acquisitions is excessive, the teaching content may also be affected by the fact that it is not suitable for the learning environment. From the results of the sub-theme of the second question of this study, it is clear that the content of mathematics teaching in elementary school also needs to be

prepared for the learning environment and the acquisitions need to be reviewed. The conclusion that there are some difficulties in the implementation of teaching for reasons such as appropriation and content density was also found in a study in the literature (Hodgen et al., 2020). It can be assumed that this result is common for some countries.

It has also been emphasized in the studies in the literature that the distance education process could be turned into an advantage by 1/3 of the students, that some students could make a potential acquisition in mathematics, and some of them could stay a full year behind (Kuhfeld et al., 2020; Santibañez & Guarino, 2021). These results also support the current research results. In this study, it can be stated that the opinion expressed by some teachers that "students are one grade below their level and that those who are supported by their families make great progress" is consistent with the above research findings. In this case, based on the teachers' opinions, it can be predicted that there may be learning losses in mathematics in particular due to the students and the technical conditions as well as the teachers and the subject in the distance education process, that some students fall at least one year behind their current grade level, that some of them develop in the normal process, and that some of them make achievements far beyond their current level. It was considered that the research findings that suggest that academic-social and emotional support training may be needed based on previous experiences, since serious level differences can be observed in elementary grades and in children whose families belong to low socioeconomic conditions when normal education is started due to these experienced mathematics learning losses (Santibañez & Guarino, 2021), are also valid for this study.

Social-Emotional Effects of Mathematics Learning Losses in Students

It has been determined that the research question "What are the social-emotional effects of mathematics learning losses on students?" was explained with the theme of "Social-Emotional Effect". It has been understood from teachers' opinions that students who experience mathematics learning loss face emotional and social effects such as "unhappiness, loss of self-confidence, isolation and emotional trauma" and the effects on the academic field. In fact, it can be considered that the social and emotional effects of mathematics learning losses on primary school students also bear the traces of distance education and the pandemic process. Emotional and social effects cannot be regarded only as a situation related to mathematics learning losses. However, it has been theorised that student learning and motivation may be affected during the pandemic period, that younger children may be more vulnerable to stressful conditions due to the pandemic and this low individual adjustment may be among the causes of their learning losses, and that family resilience may also play a role in the adjustment process (Tomasik et al., 2020).It can be asserted that there is a need to investigate the emotional and social effects of academic failure in the long term.

Solutions of the Primary School Teachers for Learning Losses in Mathematics Teaching

It has been understood that the question of the research "What do you think could be the solutions to the problems encountered in teaching mathematics during the pandemic period and to compensate for the learning losses" was explained with the theme of "Solution Suggestions". It can be assumed that teachers' suggestions, such as preparing content suitable for the environment, improving technological conditions, creating equal opportunities, and providing compensatory teaching to make up for mathematical learning losses, are indeed suggestions for the distance education process. These results are also in line with some of the research findings in which teachers' recommendations for distance education were identified (Cakın & Akyavuz, 2020). In one research, it was suggested that programs to compensate for learning failures in the world should be prepared urgently and teachers should be trained for this process through distance education (Kaffenberger, 2021). For this reason, it can be assumed that proposals for learning loss in mathematics classes are actually necessary proposals for other lessons.

Recommendations

Considering that mathematics learning losses of primary school students may be high during the pandemic period, it may be recommended to take urgent action by the authorities by performing a needs analysis to prepare compensation programs. The long-term effects of learning losses can be studied with longitudinal studies. In future studies, it may be recommended that the research be carried out with student/parent participant groups. Online training can also be organized for teachers to provide adequate support to their students about compensatory education.

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Authors

Contact

Dr. Aysel FERAH-OZCAN studies on Turkish Primary Reading and Writing Teaching, Turkish Teaching, Development of Language and Thought in Children, Number Concept and Development of Numerical Thinking in Children, Philosophy of Language.

Dr. Aysel FERAH-OZCAN, Sakarya University, Faculty of Education, Department of Primary Education, Division of Classroom Teaching Hendek/Sakarya

E-mail: aferah@sakarya.edu.tr

Research Assistant Elife Nur SAYDAM studies on Early Turkish Reading and Writing Teaching and Early Literacy.

Research Assistant Elife Nur SAYDAM, Sakarya University, Faculty of Education, Department of Primary Education, Division of Classroom Teaching Hendek/Sakarya

E-mail: elifenursaydam@sakarya.edu.tr