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Examining the Effect of Parental Support and Education Provided to Parents

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The study aims to investigate parental involvement in children's mathematics education, with a particular focus on the subject of circles, in the absence of tailored support programs for parents in this area. In this study, the action research method was used. The study sample consisted of voluntary participants among the parents of 6th-grade students. The data collection tools of the study consisted of achievement tests administered to students and their parents, semi-structured interviews with students and parents after the program, and observations of the participants. We found that parents could learn the subjects depending on their level of education, they could be helpful to their children through their existing knowledge, they understood their children better and their beliefs that they could help their children increased. Likewise, children's belief that their parents could help them strengthened, and their academic success in the subject of circles also increased. Consequently, children experience greater happiness in student-centered lessons and display increased proficiency. Moreover, when faced with parts of the subject that they did not understand, they could quickly seek assistance from their parents. Furthermore, the children and parents expressed satisfaction with this study and a desire to continue training.

Introduction

Many learning theories have been developed until today and these theories have provided different definitions of how learning occurs (Sarı, Arıkan & Yıldızlı, 2017). One of these approaches, the constructivist approach, emphasizes that the learning process requires active participation and that the individual constructs knowledge through his/her own experiences (Akınoğlu, 2020). Like the diversity in the definitions of learning, there are various schools that use the constructivist approach. Among these, two main schools of

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thought stand out. The first of these is cognitive constructivism. Cognitive constructivism focuses more on how the individual learns internally. The second is social constructivism. Social constructivism puts learning at the center of social interaction. In the social constructivism, of which Vygotsky is the architect, the individual constructs knowledge as a result of interactions with his/her environment and in this context, the social environment is in a critical position (Altun & Çolak, 2014). Especially when the social environment is analyzed, the individual's school, family, and friends come to the fore (Savaş, Taş & Duru, 2010). These environmental factors play a significant role in the constructivist approach to the learning process. These environmental factors that affect learning and thus, student achievement need to be clearly understood and managed by educators and researchers.

Vygotsky explains the effect of an individual's interaction with his/her environment with the concept of zone of proximal development (ZPD). The ZPD describes the difference between the performance an individual can achieve through his/her efforts and the performance that he/she can achieve due to interaction with an expert in his/her environment (Altun & Çolak, 2014). This area is a dynamic area beyond the student's current ability. This gap between the child's current situation and potential can be reduced by interacting with more experienced people (teachers, parents, peers, and alike) and supporting the child (Kale & Aslan, 2021). Studies on students' characteristics, teachers and educational environments are essential and valuable. However, it should not be forgotten that the role of parents, who are always around the student, in student success is also critical. As guides and supporters of children in their educational processes, parents can make significant contributions to their academic success (Becker & Epstein, 1981, 1982b; Civil, Guevara & Allexsaht-Snider, 2002; Grolnick & Slowiaczek, 1994).

Parents' involvement in their children's educational process will greatly benefit teachers because teachers deal with many classroom problems. Inadequate time in their practices, insufficient materials, excessive working hours, excessive number of students or problems with the school administration can be examples of some of these problems (Sarı et al., 2017). In the shadow of these problems, teachers cannot fully recognize the characteristics of all students in their classrooms and cannot provide a fair education to students. At this point, it is essential to involve parents in their child's education and make them a resource they can always support because parents, as the people who know their children best, can better understand their strengths, interests and difficulties.

Educators and researchers widely recognize the need for parental support (Civil et al., 2002). However, parents are expected to supervise and support their children's learning at home and school, with no support offered to parents. The differences between the mathematics taught at school and the mathematics that parents learned during their student years, the fact that they had forgotten the mathematics topics they have learned in the past, parents' beliefs about themselves in mathematics and their mathematics anxiety can be counted as the reasons for this situation (Becker & Epstein, 1982a; Jay, Rose & Simons, 2018). Nevertheless, parents can learn topics they do not know or have forgotten with an appropriate support program, and their anxiety and fears about mathematics can be alleviated. In this way, parents can build social and intellectual foundations for their children and support their development and learning in mathematics (Jay et al., 2018).

It is known that most parents try to support their children's physical and mental development. However, modern life's busy work schedule and digital activities make this support process difficult. For this purpose, they must improve their time together to increase their child's

success (Becker & Epstein, 1981, 1982b). School administrators and teachers should contact parents, develop appropriate tools, design collaborative learning programs, convince parents of their valuable role in this process, and, if necessary, help develop any skills they may lack. Advocates of parent-mediated learning argue that parents can have a sense of competence to deal with their children's learning problems, engage their children more frequently and more productively, and thus close the academic gap caused by inequalities arising from different family environments and different lives (Becker & Epstein, 1982a).

In Turkey, most studies on parental involvement are related to parents with preschool children (Şahin & Özbey, 2007). This is thought to be because parents can understand the topics of preschool more easily. Generally, the studies on parents in mathematics lessons are divided into two categories. The first one is the studies on parental involvement (Bozkurt & Dülger, 2021; Carmichael & MacDonald, 2016; Dauber & Epstein, 1989; Epstein, 2018; Huang, Li & Zhang, 2021; Özcan, 2016; Wilder, 2017; Yenilmez, Özer & Yıldız, 2006). These studies used questionnaires and interviews to obtain information from parents and teachers about parental involvement and its impact. The second category involves interventions related to the parent (Civil, 1998; Civil & Quintos, 2002; Civil, Diez-Palomar, Menendez & Acosta-Iriqui, 2008; Eisenreich & Andreasen, 2016; Jay, Rose & Simmons, 2017; Mangram & Metz, 2018; Morkoyunlu & Konyalıoğlu, 2020; Xiao, Namukasa & Zhang, 2016).

The researcher's experiences as a teacher were influential in conducting this study. In order to support students' academic development outside of school, the instructional videos presented to students were also carefully watched by parents. Parents, like teachers, guided the points that their children had difficulty understanding and even contributed to their children's education. Based on this, the researcher realized that parents can be evaluated in mathematics education and their involvement in student learning can be improved. According to Özcan (2016), secondary school parents perceive mathematics lessons as more complex and essential than primary school parents. Despite this, the support they give their students in mathematics lessons decreases compared to primary school. For this reason, the study was conducted with the parents of middle school students to be more effective. In this context, to enable parents to support their students in mathematics education effectively, the aim was to strengthen their knowledge of mathematics and increase their pedagogical competencies during the training. This approach aims to involve parents as active participants in the mathematics learning process of students and thus provide a more effective learning experience for students. This experience aims to surpass the potential students can reach without any support. The primary purpose of this study is to examine the development and interactions between parents and their students by providing lessons to improve their students' knowledge and skills in mathematics and by improving their teaching techniques directly or indirectly through these lessons, parents can help their students when they need it without being dependent on external support.

The main research question of this study is; 'How does the participation of parents in the process of learning and teaching circle subjects in mathematics contribute to their children's development and parent-child interaction?'

The sub-questions of the study were decided as follows:

(1) How do parents address their children's academic support needs in mathematics?
(2) What impact does parental involvement in learning and teaching have on students' academic progress in the 6th-grade subject of circles?

(3) How are parents' perspectives on their personal development throughout this educational process? Additionally, how have the perceptions of parents and students about each other been influenced during this period?
(4) How does joint engagement in academic activities affect the development and interaction between parents and their children?
(5) How has the training provided to parents altered their beliefs about their capability to assist their children academically? How are the views of both parents and students regarding this training?

Method

Research Design

This study evaluated the effectiveness of the parent support program using a qualitative approach based on the perspectives of both parents and students. The research used action research, a qualitative research design, during the data collection and interpretation phases. Action research, a qualitative research design, was used in the data collection and interpretation phases. It is a systematic form of research that enables the understanding and solution of practical problems (Yıldırım & Şimşek, 2021). This methodology is inherently practice-based, and its most important aspect is its focus on problem-solving (Patton, 2018). In action research, under the premise that "the practitioner is also the researcher," the researcher can implement interventions and simultaneously collect data on the identified problems (Yıldırım & Şimşek, 2021, p308).

In this study, parents were given a two-week training of eight hours a week to increase students' achievement and self-confidence in mathematics and examine the interaction between parents and children. This training was aimed to improve parents' knowledge of the circle and to help them to help their students with their problems.

Participants

The study started with nine parents who voluntarily participated and was completed with five parents and their students due to different reasons. Participants were selected from non-random sampling using the convenience sampling method. In this way, the study was conducted more easily and quickly (Patton, 2018; Yıldırım & Şimşek, 2021).

Parents were coded as P1, P2, P3, P4 and P5 and students were coded as S1, S2, S3, S4 and S5. Information about the participants is presented in Table 1. All of the parents were female. Among the parents, one is a primary school graduate (P2), one is a middle school graduate (P3), two are high school graduates (P1 and P5) and one is a university graduate (P4). Regarding student gender distribution, P3 and P4 were male, while P1, P2 and P5 were female.

Table 1 Information about participant

Participant	Gender	Education Level
Parent 1 (P1)	Female	High school graduate
Parent 2 (P2)	Female	Primary school graduate
Parent 3 (P3)	Female	Secondary school graduate
Parent 4 (P4)	Female	Bachelor's degree
Parent 5 (P5)	Female	High school graduate
Student 1 (S1)	Female	6th-grade student

Student 2 (S2)	Female	6th-grade student
Student 3 (S3)	Male	6th-grade student
Student 4 (S4)	Male	6th-grade student
Student 5 (S5)	Female	6th-grade student

Data Collection

Qualitative and quantitative research methods can be used in action research (Kuzu, 2009). This study used achievement tests, interviews, and observations as data collection tools. The achievement test consists of 20 questions. The questions were prepared to be suitable for the curriculum in light of the opinions of two academicians who are experts in mathematics education. The achievement tests were administered to both students and parents.

The materials prepared for parents were filed and delivered to the participants before the program started. Since two of the parents were out of the province, they were sent by cargo. The remaining parents were invited to the school to collect their materials in person. After the program, the materials and permission papers were collected similarly.

One week before the mathematics education for parents began, students were asked to fill out achievement tests with their solutions. Afterward, parents were asked to keep these tests and emphasized that these solved tests should not be given to the students again. During the lessons with parents, parents were observed as much as possible and necessary introductory notes were taken. After the parent training was over, a one-week break was taken. Exactly three weeks after the first achievement test solution was applied before the training, both parents and students were asked to fill in the achievement tests again. Warnings were given about taking the necessary precautions while completing the achievement test. Data sources were then requested from all participants and collected and distributed. After reviewing the collected data sources, one-on-one interviews were conducted online with parents and students. Audio recordings were taken during the interviews, transcribed, and analyzed on a computer afterward.

By triangulating data sources, the situation can be viewed from different angles and the situation can be understood more clearly (Işık & Semerci, 2019). In addition, different findings to be obtained from different sources with data triangulation do not mean that any sources are invalid. This situation provides diversity, and if the researcher can explain the reason for this in a general framework, it will contribute to the credibility of the findings (Patton, 2018). In order to increase the credibility and quality of this research, data sources were triangulated through one-on-one interviews with students and parents, observations made during lessons and interviews with parents, and achievement tests.

Data Analysis

This study's interview questions used content and descriptive analysis due to the variety of questions. Although there is no clear understanding of the use of content analysis, Patton (2018, p453) states, 'In general, content analysis is used to refer to any attempt to reduce and make sense of qualitative data by taking voluminous qualitative material and attempting to identify key consistencies and meanings.' In this study, the interviews with parents and students were analyzed to maintain the original structure of the text, make it understandable, and make it less voluminous.

Numerical analyses can be presented as an additional and supportive supplement to the findings obtained in qualitative research (Yıldırım & Şimşek, 2021). This study descriptively analyzed achievement tests administered to students and parents and presented additional information to the content and descriptive analysis findings.

In this study, we observed the participants as much as possible during the training with parents, interviews with parents and interviews with students. Although observation was less practical than face-to-face observation due to the online nature of the training and interviews, the students' and parents' reactions and tones provided as much information as necessary. The observations were not presented under a heading, but observation-based comments were made at some points.

Validity and Reliability

The most crucial criterion in the evaluation of qualitative research is that the study is credible and reliable (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz & Demirel, 2020; Yıldırım & Şimşek, 2021). In this study, the findings were presented consistently with each other by providing diversity in data sources.

In this study, the achievement test and the interview questions were developed with input from academic experts. First, nearly 100 questions were created for the 6th-grade achievement test, and the number of questions was reduced to 27 according to the suitability of the questions. Then, the questions were sent to two academicians who are experts in their field, and in light of the feedback received, a few more questions were eliminated, and this number was reduced to 20. The expert academics reviewed the questions according to their appropriateness to the learning outcomes and the equal distribution of the learning outcomes as much as possible, the Bloom taxonomy and the questions' difficulty level and gave positive feedback on the test.

The interview questions directed to parents and students were analyzed with the help of two academicians who are experts in their fields. In this study, Miles and Huberman's (1994) formula for the Reliability of coding [Reliability = Number of agreement / (Number of agreements + Number of disagreements) x 100] was adapted (Büyüköztürk et al., 2020). While categorizing parent and student responses, the researcher and two expert academicians made independent evaluations and this formula was used for the agreement index. Parent interview questions consisted of 35 and student interview questions consisted of 26. The reliability coefficient of the parent interview questions based on the opinions of the expert academicians was 97.14%, and the reliability coefficient of the student interview questions based on the opinions of the expert academicians was 96.15%.

The interviews were recorded to prevent any data loss. Transcriptions of the records obtained at the end of the interviews were created by computer. These transcriptions were read repeatedly without prejudice and the findings were presented in detail.

External validity in qualitative research depends on the generalizability of the results to similar environments and situations (Büyüköztürk et al., 2020; Yıldırım & Şimşek, 2021). Although the study group was small, the fact that the educational levels of the participating parents differed makes the study's results generalizable in terms of educational level. However, the fact that socio-economic levels were not investigated in this study is a phenomenon that limits generalization.

In this study, although the fact that parents participated in the program voluntarily seems to be a sampling bias, the fact that some of the participants participated at the insistence of their students improves this situation. From the outside, it is thought that the parents who participate in this program are already believed to be able to overcome such a program. However, the fact that the students were convinced, even their parents, who were not planning to participate, eliminated such a bias as much as possible.

Findings

In this section, the findings related to the sub-questions of the research will be presented.

Results regarding the first sub-questions

The first question of this study aims to understand the influence of parents in meeting a child's academic support needs. At this point, we aim to draw a general framework for parents' support for their children in mathematics.

Table 2 Statements of participants regarding the first sub-question

Statement	Parent
I think you need me sometimes	P2, P3, P4, P5
I can always help	P4
I can help occasionally	P1, P3, P5
I cannot help you	P2
When I cannot help, I ask for help from acquaintances	P1, P3
There are times when I cannot help because I find it challenging to understand	P5
There are times when I cannot help because I forget the topics	P1
There are times when I cannot help because I do not know the topics	P2, P3
There are times when I need my parents	S1, S2, S3, S4, S5
Most of the time she helps, but there are times when she cannot help	S1, S2, S3, S5
There are times when she cannot help because she forgets topics	S1
There are times when she cannot help because she does not know the topics	S2, S3, S5
I try to manage on my own when my parents cannot help	S2, S5
When my parents cannot help me, I get help from people around me	S1

As seen in Table 2, students' requests for help from their parents in mathematics lessons were expressed by both parents and students. This is because students have always had and will continue to have difficulties in mathematics.

Regarding the child's call for support, which both parties accepted, one parent (P2) stated they could not help their child, while another parent (P4) stated they could always help their child. The rest of the parents said they tried to help their children as much as possible but could not always help them. The parents mentioned not knowing the subjects or forgetting them as reasons for this situation. Some parents made the following statements in this regard:

> "I can say that we are not-that-competent. We are lacking the necessary knowledge in some subjects. The math coverage of our time is not the same as the math coverage now. I mean, we were presented with addition, subtraction, and division. I saw the circle for the first time." (P3)

It is seen that the students also knew the reasons why their parents could not help them and gave answers in the exact parallel. In such cases, they stated they were directed to acquaintances who knew mathematics. However, one student (S2) was deprived of such help.

Although she said she sometimes received help, her parent (P2) said she could not help her child.

Results regarding the second sub-questions

The second question of this study sought to understand the influence of parents in meeting a child's academic support needs. The answers given by the parents in the interview were only their comments on their children's achievements. They needed to find out their children's exam results. Likewise, the children tried to make comments without knowing their results.

Table 3 Statements of participants regarding the second sub-question

Statement	Participant
My child's success in the circle has increased	P1, P2, P3, P4, P5
Increased success thanks to difficult questions	P3
Increased success due to increased attention on the subject	P4
With the implementation of such a program in different subjects in mathematics, my child's success would increase again.	P1, P2, P3, P4, P5
Increased achievement	S1, S3, S4, S5
I don't know if my success is increasing	S2
By implementing such a program in different subjects in mathematics, my success will increase.	S1, S2, S3, S4, S5

As seen in Table 3, all parents stated that their students' achievement increased. Except for one of the students (S2), the others stated that their success had increased. All parents and students think such programs will make students more successful in mathematics. In this regard, P3 said, "*In every subject, teacher, not only in mathematics but in all subjects, there is no way without parental support. Unfortunately, it cannot be one-sided. It should be teacher, student and parent-based*." One parent (P4) stated that it would be more logical to help her child only when she needs it rather than constantly studying with her child.

Quantitative data can also be collected in action research. Achievement tests were administered before the program started and after the program ended to interpret the change in students' achievement. The results of the achievement tests are presented below:

Table 4 Participants' grades from the achievement test

	Students					***Parents***				
	S1	**S2**	**S3**	**S4**	**S5**	**P1**	**P2**	**P3**	**P4**	**P5**
Pre-Test	90	40	55	70	65	-	-	-	-	-
Post-Test	100	45	65	100	90	100	65	70	100	90

The achievement tests revealed some facts. First, the children of high school and university graduates showed more transparency than those of other parents. This reveals that the parent's education level is a determining variable for this training. Second, all parents scored higher on their children's post-tests. When the achievement tests were analyzed, the questions that the parents could not answer were also not answered by their children. This reveals that the parts that the parents could not fully grasp were not fully grasped by their students.

In the lessons with parents, four parents (P1, P3, P4 and P5) stood out as parents who strived to succeed. Two parents (P1 and P4) quickly gave feedback on the questions. However, one

parent (P2) could have been more active in the lessons and had difficulty giving the correct answers to the questions. This parent, a primary school graduate parent, stated that she could get stuck even in multiplication and division. On the other hand, one parent (P3) appeared to be a parent who was engaged in the lessons and could give correct answers to the questions asked. She was expected to score higher. When the achievement tests of both the student and the parent were analyzed, it was seen that they could not answer the two questions about the concepts in the circle, but they could answer the questions requiring complex operations.

One parent (P5) is a high school graduate parent. However, she stated that she needs to remember most subjects. She was seen as an eager and successful student in the lessons. Although she could answer some questions, she made minimal mistakes. However, this was rare, and she could usually solve the questions comfortably.

Findings regarding the third sub-questions

The third question of this study was to reach the parents' thoughts about themselves and the student's thoughts about their parents regarding the education provided.

Table 5 Statements of participants regarding the third sub-question

Statement	**Participant**
I was able to learn about the circle	P1, P2, P3, P5
I already knew about the circle, I just repeated it again	P4
In the lessons we took, there were places we did not understand or could not do about the circle.	P1, P2, P3, P5
I understood what I was stuck on when teacher was explained again	P1, P3, P5
I was afraid to ask questions in the lectures	P2
My child was not active in school lessons, I was not active in these lessons like her	P2
I understood my child's efforts in math class	P1, P3, P5
Our child was aware that we were working hard for him/her and in return he/she was studying	P1, P2, P3, P4
I would like to have this kind of education in math during the year	P1, P2, P3, P4
I am excited that my parent participated in this training	S2
I am happy that my parent participated in this training	S3, S5
My parent has been a good student in the classes she has attended	S1, S3, S4, S5
My parent must have been a student like me	S2

The table shows four parents (P1, P2, P3, P5) stated they could understand the subject. The remaining parent (P4) stated that she already knew the subject and had only repeated it.

One parent (P3) stated that she fully understood the circle topic. She stated she needed help understanding a few places in the lessons and asked the instructor about this. She even said, *"I mean, just as I tell my son to be active in the lesson, I tried to be like that in the lessons I had with you. It went well."*

Most of the parents (P1, P2, P3, P5) stated that there were parts they did not understand or got stuck while learning the subject of circles. However, they stated they comprehended the subject after the lecturer explained it again. One parent (P5) made the following statements on this subject:

> "There were both times when I could not do it and did not understand it. But later, when I pay attention, I try to understand immediately. I understand when you explain it to me. I say okay, this is like this. I repeat them at home anyway. I look at them over and over

> again. Then let's say I get stuck on one of them. I tell my daughter to come, she says what happened mom, I say how can this happen, she says it is happens in this way. I say okay."

Another parent (P2) stated that her child could not participate in school lessons. She said that she, like her child, could not be active in these lessons and even hesitated to ask questions. Made the following statements in this subject:

> "I could understand her better, at least what she was going through. I did not know, for example, I was pushing her telling why don't you answer, why don't you know? But sometimes when I was to say a thing, I felt like that."

Some of the parents (P4, P5) thought that the courses taken by their children should not be compared with their courses. They stated that they had gone through the same paths that their children had gone through in the past, that their children's opportunities had increased compared to the past, and that they should know the responsibility of these paths and hold on to their lessons more. However, other parents mentioned that their approach to their students had become more understanding. One parent (P1) made the following statements in this regard:

> "It was really not an easy thing. You know, sometimes we can say that. This is valid for me too. Why don't yousolve this problem, why don't you do it? But we have also witnessed this. Let's say a child has done something wrong. Why cannot you do it? We - used to say others can do it, why can't you do it? Now we have experienced the same thing. There were times when we could not do it either. No one is perfect." (P1)

Students expressed that they were excited and happy about the efforts their parents made for them. One student (S5) said, *"I felt happy. Because my mother both learns and teaches me andI learn new information. I think it was perfect. I felt happy, I was happy".*

Children evaluated their parents as students. Most students (S1, S3, S4, S5) said their parents were good students. One of them (S1) said, "*I think my mother is an outstanding student because I saw the papers she did in class. I also saw she got stuck in 2-3 places in your class. I think she is a successful student*." She stated that she followed her parents and thought they were good students. Another student (S4) stated that he thought his parent was a good student because she remembered the subjects. The last remaining student (S2) stated that her parent was a student like her. At this point, it is understood that students examine their parents in lessons.

Findings regarding the fourth sub-questions

The fourth question of this study aims to examine the development and interaction of parents and their children regarding the lessons they have done together.

Table 6 Statements of participants regarding the fourth sub-question

Statement	**Participant**
I explained topic well to my child	P1, P4
I explained the topic as I understood it	P2, P5
My child liked my lectures very much	P4
My child imagined me as a teacher in his class	P4
My child now thinks that I can help her with her studies	P2
There were places I could not explain, in such cases my child helped me	P3

I understood where my child was stuck and explained it again without having to ask questions	P1, P4
My child could ask me about the parts of the lesson she/he did not understand	P2, P3
I was stepping in when my child made a wrong solution	P5
There were times when I did not understand some points while explaining, I had difficulties at those times	P3
He was interrupting me when I was explaining the subject, so it was a bit difficult	P5
I did not experience any difficulties in my lessons with my child	P1, P2, P4
My parent's teaching was good	S1, S2, S3, S4
My parent sometimes got stuck while lecturing	S5
I was able to ask my parents what I could not do without hesitation	S1, S2, S3, S4, S5
I had no difficulty in understanding the topic	S1, S2, S3, S4
There were times when I did not get along with my parents, it was difficult at those times	S5

As seen in table 6, some parents (P1, P4) thought they explained the the subject of circles well to their children. Two parents (P2, P5) stated that they could convey the circle subject to their children as much as they were taught. The other parent (P3) stated that she had difficulty explaining some parts of the subject. She stated that her child helped her when she could not explain.

One parent (P1) made the following statements about the development in the lessons with her child:

> "At first we did it like this, teacher, I explained. Then, after these simple questions, the questions that came before us were getting harder. So, I wanted to test my daughter, too see if she can do them. You said that in the live broadcasts. In fact, you said,"Change this question in this way and make your child solve it." I was wondering if that question would have been like this instead of like that. I was leaving it up to her whether she could solve it or not."

One of the parents (P4) stated that she helped her child with questions he could not solve when he needed help before the program. She also stated that she taught the subject to her child for the first time through the program. She also stated that her child liked lectures in their lessons. According to the parent's statement, her child even imagined that his parent was a teacher at his school and that she came to class as if she were his math teacher. In this regard, P4 made the following statements:

> "He told me that he wished you were a teacher. He repeated it a lot. He had such a dream. He said that he wished you were my teacher in my class. Why did not you become a teacher anyway, he said, in a humorous fashion."

During their lessons, all parents stated that their children did not understand parts of the circle. Some parents (P1, P4) stated that they noticed the parts their children did not understand and explained them again before asking questions. One of these parents (P1) said, "*I could see the parts they did not understand from their facial expressions because we had been through this many times,*" while the other parent (P4) said, "*I could see the parts they did not understand from their eyes and immediately explained them again.*" This shows that parents know their children very well. One parent (P5) said that her child got stuck while solving only one question and she let her solve it incorrectly. She stated that she told her the correct answer after her child solved it incorrectly. Some parents (P2, P3) stated that their children asked them about the parts they did not understand and then they explained those

parts again.

Two parents (P3, P5) stated that they sometimes had difficulties in their lessons with their children. One of these parents (P5) stated that her child interrupted her too much and that it was difficult for her while she was lecturing, while the other parent (P3) stated that she did not fully understand some parts and had difficulty with them. She also stated that her child helped her with these difficulties. The remaining three parents (P1, P2, P4) stated that they did not experience any difficulties in their lessons with their children.

Most students (S1, S2, S3, S4) stated that their parents were good teachers. One of these students (S1) said, *"I learned a lot of things I did not know, and I repeated what I knew. I think my mother is a very good teacher. Because she does her best to the end in the best way she can"*. One of the students (S5) said that her parents were forgetful while she was explaining the subject and that she explained it to her parents in some places.

Most of the students (S1, S2, S3, S4) stated that they did not experience any difficulties during the lessons with their parents. Three of them (S1, S2, S4) stated that they got stuck in some concepts or questions during the lectures but understood after their parents explained the subject again. One student (S5) stated that she had difficulties in places where she could not get along with her parents, but otherwise, she did not have any problems.

All students stated that there were places where they got stuck in the lessons with their parents and that they could ask their parents where they got stuck without any hesitation. The fact that a student can ask his/her parents where he/she gets stuck without hesitation seems to be a pleasing development in terms of the student's academic development.

Findings regarding the fifth sub-questions

The fifth question of this study aimed to reveal the parents' beliefs that they can help their children in math lessons.

Table 7 Statements of participants regarding the fifth sub-question

Statement	Participant
Thanks to this training, I have a belief in myself that I can help my child	P1, P2, P3, P4, P5
Thanks to such programs, I can help not only my own child but also the children of others	P4
It would have been better if the trainings were held before the circle subject was taught at school.	P4
I would like to have this kind of education in math during the year	P1, P2, P3, P4
I liked learning from my parents	S1, S2, S3, S4, S5
I believe that my parents can help me with such programs	S1, S2, S3, S4, S5

All parents think they can help their children thanks to the training they have received. One parent (P4) made the following statements in this regard:

> "Of course, I would like to have such a program. I am a person who likes to learn for myself. I do not think learning can harm anything, so I would like to have it. Not only for my child, but also to be useful for other children. I mean, I have nieces and nephews around me. My neighbors have children. When they come one day and ask, "Sister, can you help me with this?", I would like to appear in front of them confident. This was also happening with my neighbors. A child whose mother graduated from primary school would bring him to me. He would ask, "Sister, can we solve this problem? I was happy to help him."

All students enjoyed being taught by their parents. One student (S1) said, "*One ofthe things I liked was that the teacher who explained the parts I did not understand was someone I knew*." Another student (S5) stated that the arguments with her mother were terrible, but she liked the program overall.

Most parents said they would like to participate in such programs throughout the year and improve themselves. The thoughts of some of these parents are as follows:

> "I would attend, teacher. In fact, I would attend all the classes if there were all classes. I was very enthusiastic when I was young, I was able to study until the fourth grade of primary school. I only learned subtraction in math. I could not do multiplication at that time. I really want to learn, so that I can go and get knowledgeable, so that I can at least answer my child's questions with such confidence. You know, maybe my child can learn better than me. She gets excited in front of her teacher, but maybe it will be better if she learns from me. Sometimes she is also afraid of her friends. You know, how our friends would look at us if we got it wrong, they are also a little afraid of their friends. I mean, if I knew, if I told them, I would actually help them a lot. At least we can buy a test book or something, we can solve it together. I mean, I would help the children." (P2)
> "Now, if there is determination and effort, there is nothing that human beings cannot do. I think it is a necessary thing for every parent. You know, after a certain point, the parent gets blocked, they cannot do it. Then they try to get help for their child from people around them. This is what happens with us. Personally, both me and his sister said when we could not do it, you know, call him on video so that he can explain the question. So, this is how we spend our time at home. Or we check the internet? We watch videos from there. In that way. So if there is such a program, I think it would help parents." (P3)
> "Actually, I wish there was such a program, I would like to learn mathematics again, even the second part of mathematics. I would love to help my son studying in high school with his lessons. I would like to learn and explain subjects to him." (P4)

Only one parent (P5) said, *"This kind of practice is good for me, but we are older now and it is difficult for us to perceive. Children are not like us. They take in what is explained immediately"*.

Conclusion and Discussion

Parents know that their children need them in mathematics (Jackson & Remillard, 2005). However, many parents cannot help their children at every point where they get stuck. As a solution, some of them send their children to private courses, while others turn to acquaintances who know mathematics (Jackson & Remillard, 2005; Kutluca & Aydın, 2010; Mok, 2020; Özakça, 2015).

In this study, only one parent stated that she could help her child at every point where he got stuck in math class. The student confirmed this, stating that his parent could always help him. The fact that this parent (P4) could always help her child in middle school mathematics is likely since she is a university graduate. In this study, the development of parents with a higher level of education was more positive than other parents. In previous studies (Kutluca & Aydın, 2010; Morkoyunlu & Konyalıoğlu, 2020; Yenilmez, 2006; Yenilmez et al., 2006), it was revealed that parents with higher education levels were more active and more effective in their participation in their student's education. Therefore, Yenilmez (2006) stated that out-of-school support for students can also be increased by increasing the parents' educational level. Of course, this does not imply that all mathematical problems can be resolved by elevating parents' educational levels. Instead, this approach can help address some of the challenges.

Both parents and their children stated that parents sometimes cannot help their students in mathematics lessons. When previous studies are examined, it is seen that parents' inability to help their students in mathematics lessons can be attributed to a lack of knowledge (Alkan, 2011; Bozkurt & Dülger, 2021; Jay et al., 2018), forgetting old knowledge (Jay et al, 2018), past negative experiences (Marshall & Swan, 2010; Reaburn & Roberts, 2018), and differences between what parents used to learn and what they are currently teaching their children (Jackson & Remillard, 2005; Jay et al., 2018; Marshall& Swan, 2010; Civil vd., 2008). For these reasons, parents could not be helpful, did not trust themselves to help, and felt inadequate (Bozkurt & Dülger, 2021). In this study, when students and parents were asked why their parents could not help them with math, they generally said that their parents did not know the subjects, that they had forgotten the subjects, or that there were differences between what was taught in their time and what is taught now. Such challenges for parents in the mathematics education process can be expected. However, these situations that prevent parents from supporting their children in mathematics can be resolved and overcome.

When the pre-test and post-tests of the students are analyzed, all students' post-test scores are higher than the pre-test scores. However, it was noteworthy that all students scored as high as their parents on the post-tests. This suggests that parents can positively influence their children to the extent that they improve themselves. With a larger group of participants, the realism of this situation can be revealed more clearly.

Previous studies have shown that parental involvement increases students' academic achievement (Becker & Epstein, 1981, 1982a, 1982b; Epstein, 1983, 1985, 2016, 2018; Epstein & Becker, 1982; Grolnick & Slowiaczek, 1994; Grolnick, Benjet, Kurowski & Apostoleris, 1997; Hill & Tyson, 2009; Knapp, Landers, Liang & Jefferson, 2017; Morkoyunlu & Konyalıoğlu, 2020; Özakça, 2015; Reaburn & Roberts, 2018; Yenilmez, 2006; Yıldırım, 2019). All students thought they would be more successful in mathematics if such parental support were provided throughout the year. All of the parents also supported these thoughts.

The achievement test results showed that students of parents with university and high school degrees exhibited desirable improvements. On the other hand, no significant advancements were observed among students of parents who had only completed primary or middle school education. Upon analyzing the post-test results of secondary and primary school graduates, it became evident that their parents could not transfer the parts of the lessons they did not comprehend to their children. Although the attentiveness and learning exhibited by the middle school graduate parent (P3) were positive, it was observed that she could not answer some basic questions on the exam, and her child likewise struggled with these questions. It is worth mentioning that this parent (P3) was able to tackle more complex questions in the achievement test. This situation suggests two possibilities. First, the parent may have become overexcited during the exam and mismarked the answers. The other possibility is that both the parent and the student may have yet to fully grasp the fundamental information regarding the subject at the start of the educational program. In a long-term parent education program, occasionally assessing the participants' conceptual knowledge would be an appropriate approach.

Epstein, Simon, and Salinas (1997) asserted that supporting parents benefits children, parents, and educators. Children become aware of parental supervision and thus respect their parents and studies more. Parents also get to know and understand their children better in every aspect and receive more precise information about their children's development. Through programs

that support parental involvement, parents also experience numerous positive developments in their communication with their children (Şahin & Özyürek, 2021).

Knapp et al. (2017) found that mathematics programs offered to parents can increase their knowledge of mathematics and teaching mathematics, thus increasing students' mathematics perception and achievement. Similarly, Mok (2020) reported that a parent contributed to her child's academic development by learning the school curriculum and teaching materials from books. In this study, which was conducted in parallel with the studies of Knapp et al. (2017) and Mok (2020), parents generally stated that they could learn the mathematics lesson and transfer what they learned to their students.

Both parents and students stated that they had no difficulties in the lessons they taught together. All students stated that they had occasional difficulties with the subject of the circle but that they could overcome these difficulties with the help of their parents. This situation will lead to positive development in parents' confidence in their ability to help their children and their perceptions of their competence. This is because parents' sense of efficacy is associated with positive outcomes for their children (Grolnick, Lewitt, Caruso & Lerner, 2021). With this enhanced sense of efficacy, parents will likely be more engaged in their children's education and contribute more positively.

Eisenreich and Andreasen (2016) found that parents' beliefs that they improved their teaching skills increased significantly. Similarly, Marshall and Swan (2010) reported that before a workshop, only 22% of parents felt confident in assisting their children in math classes; this number rose to 81% by the end of the workshop. In addition, Marshall and Swan (2010) stated that as a result of this study, parents' willingness to help their children when they needed help in mathematics increased instead of directing them back to the teacher or not being able to help them. In this study demonstrated increased parents' belief in assisting their students. Fueled by this enhanced confidence, parents showed increased eagerness to participate in parent education programs and support their students. After the study, parents expressed a strong desire to continue the program.

The large number of students in classrooms within our country makes it challenging for teachers to get to know each student, negatively impacting both the teacher's and the student's performance and success (Aktepe, 2005). Given this situation, it is evident that support can be sought from parents who often have a deep understanding of their children. This study found that some parents were familiar with their children's characteristics. With appropriate support, parents can be informed about their children's prior knowledge of mathematics, their thoughts, learning difficulties, errors, and the reasons behind these mistakes. Consequently, this can enable parents to effectively address their children's educational needs one-on-one, utilizing their enhanced teaching skills as a resource.

Note

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