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Araştırma Makalesi ● Research Article

An Overview of Dyscalculia from the Perspective of Mathematics Teachers

Matematik Öğretmenlerinin Perspektifinden Diskalkuliye Genel Bir Bakış

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Abstract: This study was conducted using the phenomenological research design to examine mathematics teachers' common experiences who were aware of dyscalculia and who thought they had students with dyscalculia diagnosed with learning disabilities. The study also aimed to reveal the common perception. The participants were seven elementary mathematics teachers from public schools in the provinces Van and Urfa. Ethical permission was obtained from the Scientific Ethical Evaluation Committee of the Dean of the Faculty of Education of Yüzüncü Yıl University on 24.03.2024 with the number 21788. Semi-structured interview was used, supported by video and audio recordings. The data were analysed using descriptive and content analyses. Reflecting on their experiences, the teachers said students with dyscalculia were mostly introverted and asocial, and they had problems in many areas of mathematics like performing four operations, rhythmic counting, multiplication tables, reading clock, and expressing place and direction. As the most appropriate teaching approach to be applied to students with dyscalculia, the teachers mentioned demonstrating and teaching how to do, teaching mathematics through games, individualized teaching, associating with daily life, applying activity-based, and technology-supported teaching approaches. Moreover, the teachers reported they needed family and expert support regarding the interventions for the development of children's mathematical skills.

Keywords: Dyscalculia, Mathematics learning disability, Mathematics teachers

Öz: Bu çalışma, diskalkuli farkındalığı olan ve özel öğrenme güçlüğü tanısı almış çocuklar arasında diskalkulik öğrencilerinin olduğunu düşünen matematik öğretmenlerinin, yaşamış oldukları ortak deneyimlerin incelenmesi ve ortak algının ortaya konulması amacı ile yapılan fenomonoloji araştırmasıdır. Araştırma grubu, Van ve Urfa illerindeki devlet okullarında görev yapan 7 ilköğretim matematik öğretmeninden oluşmaktadır. Araştırmanın etik izni, Yüzüncü Yıl Üniversitesi Eğitim Fakültesi Dekanlığı Bilimsel Etik Değerlendirme Kurulu'ndan alınmıştır (Tarih: 24.03.2024 ve Sayı: 21788). Araştırmada yarı yapılandırılmış görüşme tekniği kullanılmış, görüşmeler video ve ses kayıtları ile desteklenmiştir. Araştırmadan elde edilen veriler betimsel analiz ve içerik analizi yöntemleri kullanılarak analiz edilmiştir. Öğretmenlerin kendi deneyimlerini yansıtarak, diskalkulik öğrencilerinin daha çok içe kapanık, asosyal öğrenciler olduğunu belirttikleri, dört işlem yapma, ritmik sayma, çarpım tablosu, saat okuma, zamanı anlatma, yer-yön ifade etme gibi matematiğin pek çok alanında sorun yaşadıklarını tespit

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ettikleri görülmüştür. Öğretmenlerin diskalkulik öğrenciler için en uygun öğretim yaklaşımı olarak; gösterip yaptırma, oyunla matematik öğretimi, bireyselleştirilmiş öğretim, günlük hayat ile ilişkilendirme, etkinlik temelli, teknoloji destekli eğitim yaklaşımlarını belirttikleri görülmüştür. Öğretmenlerin aile desteğine ve çocukların matematiksel becerilerinin gelişimi için yapılacak müdahaleler konusunda uzman desteğine ihtiyaç duyduklarını ifade ettikleri görülmüştür.

Anahtar Kelimeler: Diskalkuli, Matematik öğrenme güçlüğü, Matematik öğretmenleri

Introduction

In today's rapidly transforming societies, the necessity of knowing mathematics, understanding mathematical concepts, and being able to use mathematical knowledge and skills to solve daily life problems are becoming more important day by day. However, many factors such as mathematics anxiety, attention deficit, psychological, pedagogical and epistemological reasons, socio-economic conditions, and mental retardation cause children to be unable to do mathematics, to be unable to use mathematics in daily life and to fail in school mathematics. One of the factors that prevent children from doing mathematics is specific learning difficulties. Specific learning disabilities are permanent and persistent neurodevelopmental disorders which are associated with a child's having very low academic skills for his age which appear as inability to listen, think, speak, read, write, and perform mathematical calculations and which are not caused by adverse conditions like intellectual disability and lack of education (APA, 2013; IDEA, 2004). Dyscalculia, which is among these difficulties, is a learning disability specific to mathematics.

Dyscalculia, without any impairment in general mental functions, refers to a permanent learning disability which arises from differences in function and structure in the mathematics-related areas of the brain or from the dysfunction of these areas (Kosc, 1974), and which prevents individuals from understanding numbers, remembering mathematical information, calculating correctly, and comprehending arithmetical concepts (Glynis, 2013). It was revealed that individuals with dyscalculia had abnormalities in the structure and functioning of the parietal cortex of their brains, which is associated with mathematical problem solving (Bugden & Ansari, 2015, p. 37). However, what causes this abnormality or dysfunction is still a matter of debate.

Reasons such as the heterogeneous nature of individuals with dyscalculia, their confusion with other specific learning disabilities, the coexistence of more than one difficulty in the individual, their different developmental origins and the different diagnostic criteria of different researchers affect the sensitivity in detecting and correctly diagnosing these individuals in the society, and their general prevalence is said to be between approximately 5% and 7% (Zhou & Cheng, 2015, p. 78). It is also pointed out that both male and female students are equally susceptible to dyscalculia in terms of impairments in number sense, arithmetic operations and working memory (Eteng-Uket & Amaechi-Udogu, 2023).

Although the areas in which children with dyscalculia have difficulties in mathematics and their levels of difficulty differ from each other, it is possible to outline the difficulties experienced by these children based on the results of different studies (Geary, 2003; Haberstroh & Schulte-Körne, 2019; Kaufmann et al., 2003; Mutlu, 2019):

- Starting from their preschool years, they have problems in processing numbers and quantities. For example, they have difficulty establishing a relationship between the number 3, and the quantity it represents (such as 3 apples). They have problems in situations like counting, comparing two numbers or quantities, establishing relationships between numbers, determining the position of a number on the number line, and understanding the place value system.
- As their number sense is not developed, they have difficulty in basic arithmetic operations and advanced mathematical tasks. They do not know which operation to choose in simple arithmetic calculations; they recalculate the answers each time; and they cannot recall the result of the

operation directly from memory because their mathematical memory is weak. These difficulties become worse when mathematical topics become complex.

- They have difficulty recognizing and ordering the patterns, creating simple geometric shapes, and understanding visual-spatial concepts.
- They have problems understanding the symbolic language of mathematics and mathematical reasoning.
- They have problems in understanding time and calendar (reading the analog clock, indicating time such as day-month-year), calculating money, and making quantitative predictions.

Not only the negative experiences of children with dyscalculia in situations where they encounter mathematics in daily life, such as shopping, reading the clock, finding a place, and remembering or recording a phone number but also their constant failure in school mathematics is likely to cause them to avoid mathematics, to have a decrease in their self-confidence and to experience mathematics anxiety. It is possible to say that these negativities may also be reflected in the socio-economic status of the individual in later years. Children with dyscalculia need more support from their peers in order to develop a positive attitude towards learning mathematics and to be able to learn mathematics, and parents at home and teachers at school should therefore motivate these children so that they can overcome difficulties (Devisri & Tharani, 2021). In order for children with dyscalculia to learn mathematics, they should be provided with sufficient time when dealing with mathematics; learning should be made fun for them by using teaching methods involving games; collaborative learning should be applied; relationships with real life should be established; modern technologies should be made use of; and teachers should establish bonds with these children (Devisri & Tharani, 2021). In addition, as is generally recommended in mathematics teaching, the use of concrete and multi-sensory materials is also recommended for children with dyscalculia, and special computer games and special learning materials such as dot notation method (Touch Math) and touchpads are designed for these children (Mutlu & Akgün, 2017). For example, as shown in Figure 1, concrete materials and pictorial representations should be used, and a gradual transition should be made before moving on to abstract representations of numbers in teaching mathematics to children with dyscalculia. It is pointed out that progressing in this way will help children with dyscalculia visualize mathematics and develop their mathematical reasoning (Hornigold, 2015):

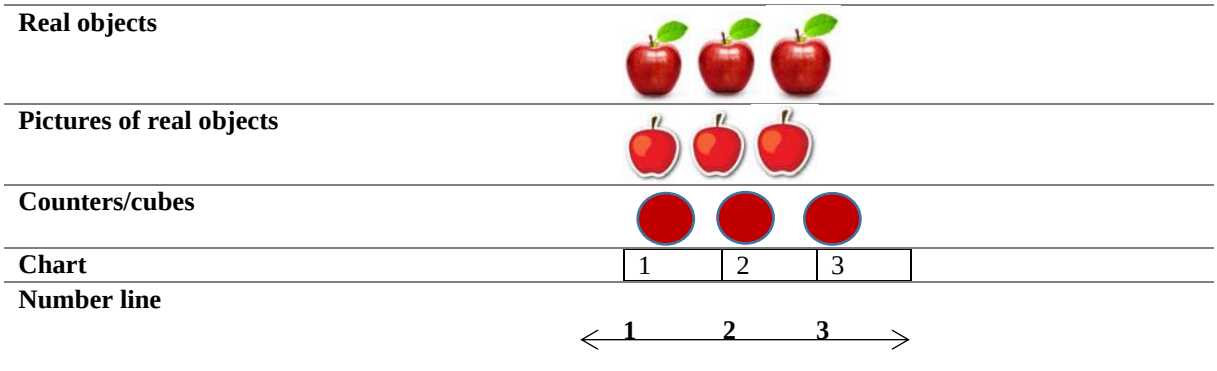

Figure 1. Progress from Concrete to Abstract

Of course, first of all, these children need to be recognized and diagnosed. Children's individual history, test findings, clinical examination, and information obtained from advanced psychosocial evaluation are examined, and if they are found to exhibit below-average mathematics performance, they are diagnosed as dyscalculia and individual interventions are made for problem areas in mathematics (Haberstroh & Schulte-Körne, 2019). Children with dyscalculia need to be able to continue their education with early diagnosis and early intervention. Individualized education which is appropriate to their strengths and weaknesses, and which is offered to them from an early age can prevent failure in

their academic lives as well as various psychological crises in later ages. For example, Silverman (2002) is of the opinion that diagnosing dyscalculia in primary school is much more effective in terms of both the cognitive and social development of the child.

In order for children with dyscalculia to be recognized in schools, it is important for teachers to be aware of dyscalculia, to know the characteristics of students with dyscalculia, thus, to identify and guide children at risk of dyscalculia at an early age and to carry out a successful educational intervention for these children (Mutlu et al., 2022). Otherwise, confusing dyscalculia with other obstacles that prevent children from doing mathematics may not only result in failure to identify children with dyscalculia but also cause these children not to be able to receive education in line with their needs. The reason is that in some cases, it may be difficult to distinguish which of the specific learning difficulties affects the child, and at the same time, the presence of one of these difficulties may also affect the impairment in another area. Some studies indicate that these difficulties are highly likely to occur together. For example, Chung et al. (2020) found that a large majority of children with difficulties in writing also experience difficulties in reading, and Moll et al. (2019) and Haberstroh and Schulte-Körne (2019) stated that the probability of dyslexia in children with dyscalculia is higher than other children. Although teachers have very important responsibilities in this regard, it has been observed that both classroom teachers and mathematics teachers are not aware of dyscalculia; that even if they have heard of the concept of dyscalculia, they do not have sufficient knowledge in this field; and that they lack the competence to help these students learn mathematics. For instance, Mutlu et al. (2022) conducted a study with 489 teachers to determine the knowledge levels of primary school teachers, mathematics teachers, special education teachers and counselling teachers regarding dyscalculia and found that the majority of the participating teachers did not have sufficient knowledge and experience about the meaning, effects, root causes of dyscalculia or about the intervention strategies for children with dyscalculia. Similarly, Sezer and Akın (2011), in their study with elementary school teachers and primary school mathematics teachers, found that the teachers did not know the concept of dyscalculia and that they used the concept of learning disorder instead of dyscalculia. Hacısalihoğlu-Karadeniz (2013), in his study with experienced teachers, reported that dyscalculia was not known by teachers; that the teachers used concepts such as learning disability, attention deficit and hyperactivity instead of dyscalculia; and that they did not have any knowledge about the need for expert support. Chideridou-Mandari et al. (2016) showed in their study with high school mathematics teachers that the teachers knew the term dyscalculia yet failed to identify the characteristics of these children. Besides all, it is also known that teachers' implicit or explicit attitudes, beliefs, concerns, motivations, and prejudices regarding inclusive students, such as students with specific learning difficulties, are reflected in both their education and their communication with these children (Gallego-Ortega & Rodríguez-Fuentes, 2012). In this respect, it is clear that the high level of knowledge of teachers about special learning difficulties in general and about dyscalculia in particular will affect the cognitive, social and affective well-being of the child with special needs.

It can be stated that most of the studies on dyscalculia, especially in Türkiye, are aimed at determining the dyscalculia awareness of teachers or of pre-service teachers (Baldemir & Tutak, 2022; Hacısalihoğlu-Karadeniz, 2013; Mutlu et al., 2022; Nurkan, & Yazici, 2020; Sezer & Akın, 2011). As it is known, in Türkiye, students are diagnosed with learning disabilities, and no official method is used to diagnose individuals with dyscalculia. For this reason, it can be stated that the ability to recognize children diagnosed with learning disabilities that are at risk of dyscalculia depends on the teachers' competence in this subject. In addition to recognizing those at risk of dyscalculia, teachers should also be aware of mathematics teaching strategies specific to these children so that the difficulties experienced by children with dyscalculia do not turn into a disability. This study was conducted with the aim of examining and analysing the common experiences of mathematics teachers who thought that there were students with dyscalculia among the children who were aware of dyscalculia and diagnosed with specific learning disabilities as well as with the purpose of reveal the common perception. It is thought that the opinions of mathematics teachers who have had this first-hand experience about students who they think may have dyscalculia are important, and in this respect, this study could therefore be said to differ from

previous studies. In line with this general purpose, the sub-problems of this study were determined as follows.

- According to mathematics teachers, what are the characteristics of students with dyscalculia?
- According to mathematics teachers, what are the difficulties that students with dyscalculia experience in mathematics?
- According to mathematics teachers, what are the appropriate teaching approaches for students with dyscalculia?
- According to mathematics teachers, what support can be given to teachers with students with dyscalculia?

Method

Research Model

This study was conducted using the qualitative research method, which highlights the participants' point of view, envisages researchers' discovery and interpretation, follows a process aimed at meaning and understanding, and uses qualitative data collection techniques (Yalçın, 2022). It is thought that the qualitative research design, which was most suitable for the purpose of the study, was the phenomenology design, which aims to reveal the essence of the common experiences of a small number of people about a phenomenon (Creswell, 2020). Dyscalculia, the phenomenon to be examined in this study, was analysed in line with the experiences of elementary school mathematics teachers, and it was interpreted from the perspective of these teachers.

Participants

The study was conducted with seven elementary school mathematics teachers working in different schools in the provinces of Van and Urfa in the academic year of 2023-2024. While determining the participants in the study, purposeful sampling method was used, which allows in-depth investigation of situations that are thought to have rich information (Yıldırım & Şimşek, 2008). In this respect, considering the fact that the opinions of the teachers working in different schools in different provinces may change due to different factors like environment, culture and so on, care was taken to select teachers from different provinces and schools in the selection of the participants. In addition, the criteria for the selection of the participants included participants' being aware of dyscalculia, having worked with students who were diagnosed with learning disabilities and thought to have dyscalculia, and having different professional experiences. Moreover, some of the participants were male, and some were female. While determining the participants, the principle of volunteering was taken into account, and within the framework of ethics, the names of the participants were kept confidential, and code names such as T1, T2…T7 were used. Table 1 presents information about the participants:

Table 1. Information about the Participants

Participants	Gender	Province	Duration of Professional Experience
T1	Male	Van	4
T2	Male	Van	18
T3	Male	Van	4
T4	Male	Urfa	3
T5	Female	Urfa	3
T6	Female	Van	2
T7	Male	Van	4

Data Collection Tool and Data Collection

In this study, semi-structured interview technique, one of the data collection techniques most frequently used in the phenomenology design, was applied, and the interviews were supported by video and audio recordings. The first part of the interview form included questions regarding the participants' characteristics. In the second part, there were questions regarding the characteristics of the dyscalculic students at the elementary school mathematics teachers, the subjects they had difficulties in mathematics, appropriate teaching approaches for students with dyscalculia, and the support that should be given to teachers regarding students with dyscalculia. After being examined by two experts, the form developed was piloted with two different teachers. Based on the feedback received, one of the questions was thought to be unnecessary and was removed; any incomprehensible expressions were corrected; and the interview form was finalized. When it was considered necessary while transcribing the data, the interviewees were consulted again about the contents of the video and audio recordings, which were used to support what was said by the interviewees. The interview questions are presented below:

- What are the characteristics of students with dyscalculia?
- What are the difficulties that students with dyscalculia experience in mathematics?
- What are the appropriate teaching approaches for students with dyscalculia?
- What support can be given to teachers with students with dyscalculia?

Data Analysis

In the study, the data collected using the semi-structured interview form and the video and audio recordings were analysed using the methods of descriptive analysis and content analysis. In descriptive analysis, the data obtained based on the participants' opinions, and through file or document analysis are placed under predetermined themes. In content analysis, the collected data are examined in more detail; the data are coded in order to reach concepts and relationships that can explain the data; and the codes related to each other are gathered under the same themes and interpreted (Yıldırım & Şimşek, 2008). In this study, the questions in the semi-structured interview form were taken as basis when determining the themes in the descriptive analysis of the data. During the coding process of content analysis, the answers given by the participants were grouped according to their similarities, and similar codes were created. The codes obtained via the content analysis were grouped under themes determined within the framework of descriptive analysis by frequency classification. In the findings, the teachers' opinions were presented and interpreted without any modification by the researcher. The interviews were coded separately by two field experts; the independent codings were compared; and the different codes were discussed until reaching an agreement. In these analyses, the inter-rater reliability coefficient for agreement or disagreement of the study was calculated as 88% (Miles & Huberman, 1994), confirming that the analysis is reliable.

In this study, ethical permission was obtained from the Scientific Ethical Evaluation Committee of the Dean of the Faculty of Education of Yüzüncü Yıl University on 24.03.2024 with the number 21788.

Findings

The findings are presented under four main themes: characteristics of students with dyscalculia, difficulties experienced by students with dyscalculia in mathematics lessons, appropriate teaching approaches for students with dyscalculia, and support that teachers can receive regarding students with dyscalculia.

Findings Regarding the Characteristics of Children with Dyscalculia

The mathematics teachers were asked what their opinions were about the characteristics of students who they thought might have dyscalculia among the students diagnosed with learning disabilities. Their answers are presented in Table 2 under the theme of “Characteristics of the students

with dyscalculia". As the teachers expressed more than one opinion, only the frequency values were given.

Table 2. Characteristics of the Students with Dyscalculia

Themes	Codes	f	Examples from the teachers' opinions
Characteristics of the Students with Dyscalculia	Introvert	5	"They can be especially withdrawn in mathematics class, that is, they can be introverted." (T7)
	Asocial	2	"They become asocial. The student has difficulty communicating with his friends" (T3) "As far as I have observed, friendship relations are not very good. Their social relationships are not very good or strong." (T6)
	Attention deficit	1	''They are easily distracted and can be careless. They may have concentration problems in general. I mean they focus on something, and they don't focus on what they are supposed to focus on." (T4)
	Aggressi-veness	1	"They can be very aggressive. This aggressiveness reflects negatively on them." (T4)
	Energetic Quiet	1	"Actually, there are both types. Sometimes they are active, and they try to show themselves. There are also those who silently show that they don't understand anything. Generally, the latter is more in number. They usually wait quietly without understanding anything." (T2)
	Excited Shy	1	"They can be a little excited or shy. They may feel shy because they can't do it." (T7)

According to Table 2, five out of seven teachers stated that children with dyscalculia were introverted. It was noteworthy that they thought this situation was observed especially in mathematics lessons. In addition, being asocial, failing to communicate with their friends, and having problems in their social relationships are among the characteristics that teachers observe in students. Moreover, it was also reported that children with dyscalculia had attention, and focus problems and that they could be aggressive. Of the teachers, two of them pointed out that the children with dyscalculia had different characteristics. It was among the opinions reflected by the teachers that some of these students were quiet, some active and energetic, and some excited, or shy. Lastly, regarding the characteristics of the students who the teachers thought might have dyscalculia; they said these students were rather introverted and asocial.

Findings Regarding the Difficulties Experienced by Children with Dyscalculia in Mathematics Class

The mathematics teachers were asked for their opinions about the difficulties experienced in mathematics lessons by the students who were diagnosed with learning disabilities and who the teachers thought might have dyscalculia. The answers given by the teachers are presented in Table 3 under the theme of "Difficulties Experienced by Children with Dyscalculia in Mathematics Class." As the teachers expressed more than one opinion, only the frequency values are given.

Table 3. Difficulties Experienced by Children with Dyscalculia in Mathematics Class

Themes	Codes	f	Examples from the teachers' opinions
Difficulties Experienced by Children with Dyscalculia in Mathematics Class	Four operations	7	"In general, let me tell you, they have difficulty in many basic subjects in mathematics. Especially addition, subtraction, multiplication and division." (T1)
	Number orientation	1	"I see that these children write the numbers upside down; they write the number '3' upside down, '9' upside down. Even though I show them these kinds of numbers, there are still children who cannot write properly. For example, there is someone who perceives the reverse, I mean its symmetry." (T4)
	Rhythmic counting	3	They don't know how to count backwards." (T1) For example, they cannot count rhythmically." (T4)
	Abstract thinking	2	"I guess the problem with these students is generally abstract. I think they lack abstract thinking." (T1) "They mostly have trouble doing abstract operations in mathematics. For example, they have trouble solving problems with natural numbers because they cannot concretize the problem in their minds." (T6)
	Fractions	2	"I see that they have the most difficulty with fractions in mathematics." (T2) "I think fractions are the most." (T7)
	Multiplication table	2	"So usually when I ask questions on the multiplication tables, they count with their fingers or sometimes they can't even use their fingers." (T1) "Because such students of mine do not know the multiplication tables very well, they cannot do four operations, such as division and multiplication." (T6)
	Telling the time	2	"Various problems arise in these situations because they have difficulty telling the time." (T1) "They may have difficulty with things like reading the clock or telling the time." (T7)
	Geometrical shapes	1	"They cannot recognize geometric shapes." (T6)
	Number line Directions	1	"...Various problems arise in these situations because they have difficulty with the subject of finding directions while explaining the number line." (T1)

As seen in Table 3, all the teachers stated that students with dyscalculia had difficulty in performing four operations. These teachers reported that children with dyscalculia could not even perform very simple operations; they could do some of them by counting with their fingers; and that they sometimes failed to do calculation even with their fingers, though. One of the teachers reported that some of her students diagnosed with learning disabilities wrote numbers backwards and continued to write them backwards even though she repeatedly showed them the correct writing of the numbers. In addition, three teachers stated that their students had problems in counting rhythmically, and one of them said that the students with dyscalculia could not count backwards rhythmically. Moreover, two of the teachers pointed out that the children with dyscalculia could not solve problems because they could

not think abstractly. The teachers also stated that their students with dyscalculia had difficulty with fractions, could not learn the multiplication tables and therefore had problems with operations such as multiplication and division. There were also teachers who stated that their students had problems reading the clock, and telling the time, and that they had difficulty in recognizing geometric shapes. One teacher stated that the children had problems finding direction on the number line. Furthermore, the fact that the students whom the teacher coded as T1 thought to have dyscalculia had problems in many areas of mathematics such as performing four operations; counting backwards rhythmically, using the multiplication tables, reading the clock, and telling the time, expressing place and direction and using the number line was striking and was generally a summary of the problems experienced by the students with dyscalculia.

Findings Regarding the Teaching Methods and Techniques Appropriate for Children with Dyscalculia

The mathematics teachers were asked for their opinions about appropriate teaching approaches for students who were diagnosed with learning disabilities and who they thought might have dyscalculia. The answers given by the teachers are presented in Table 4 under the theme of "Appropriate Teaching Approaches for Children with Dyscalculia". As the teachers expressed more than one opinion, only the frequency values were given.

Table 4. Appropriate Teaching Approaches for Children with Dyscalculia

Themes	Codes	f	Examples from the teachers' opinions
Appropriate Teaching Approaches for Students with Dyscalculia	Demonstrating and teaching how to do	3	"…look, I get it done by giving a few examples like this. For example, when it is 1 in hand in the case of 4 of 14, it is again 1 in hand in the case of 3 of 23, but instead of that, I say we will take 2 there as in hand, and I give examples there. 2 in hand is obtained like that in 26; we write 6. When it is 35, we write 5, and 3 in hand; I show a few examples like this. I tell him to do it like that, let's see what is in hand then and what we will write. I first demonstrate how to do it. I take them through the practice process by giving examples. Otherwise, it's hard, and they don't understand." (T4)
	Teaching with games	3	"I generally try to teach with games to attract students' attention: teaching by playing games." (T6) "…That's why activity with games. This kind of thing should be done more often." (T7)
	Individualized instruction	3	"I think more individual instruction should be given. It is very difficult for such students to learn in the classroom environment. Therefore, I think the teacher should communicate with such students one-on-one, ask them one by one about the parts they are stuck on, note down the parts they are stuck on, and work on the things they can do; I think we can be useful only in this way." (T2) "Let me tell you in the name of mathematics, a mathematics class can be created. I think these students can be given separate lessons." (T1)
	Association with daily life	2	"It is necessary to explain the event with examples from daily life. … They cannot do it because they cannot understand the abstract things that can be concrete in daily life; they cannot achieve success that is why they focus on problems that can be concrete in daily life." (T1) "For example, I use the egg technique during the subtraction process so that the child can understand. I say you have these eggs in your hand, and you have dropped some of the eggs. I have him draw the eggs and ask how many are left, but we couldn't start subtraction with borrowing." (T4)
	Activity-based teaching	2	''…or creative drama, where the child learns mathematics by making sense of it and enjoying it. I think that children with dyscalculia should be made to love mathematics because they are more afraid of mathematics. If he likes it and overcomes that fear and gains self-confidence in operations, he will do better. That's why games, activities and such things should be included a lot more." (T7)
	Technology-supported teaching	2	"As I said, teaching with games, or concretization, is more about computers, smart boards and games. These are mathematical games; we try to attract the student's attention with such methods." (T6)
	Using concrete materials	1	"In general, using more materials rather than traditional methods. There must be a classroom environment with all kinds of appropriate audio-visual materials involved." (T7)

As presented in Table 4, three of the teachers stated that the most appropriate teaching approach for students with dyscalculia was demonstrating and teaching how to do it. Based on their own experiences, these teachers explained how they applied this method to students with dyscalculia, saying that they first did it themselves showing, and explaining how to do the operation, and then had the

students do it. Three teachers reported that they taught mathematics to their students with dyscalculia through games and that they attracted their students' attention thanks to this method. In addition, three teachers stated that the students whom they thought to have dyscalculia should be provided with individualized instruction. These teachers pointed out that it was difficult to deal with students with dyscalculia in crowded classes; that instant feedback and immediate correction were given in the case of one-on-one teaching; that they communicated better with the teacher; and that planning teaching according to the student's learning speed was more efficient. Two teachers reported that when teaching students with dyscalculia, the examples given should be associated with daily life; that the student could only concretize mathematics in their mind in this way; that they were more motivated; and their attention was attracted more. Two teachers stated that activity-based teaching should be carried out with students with dyscalculia; that only in this way could they prevent fear and avoidance of mathematics; that the children's mathematics anxiety could decrease; that their negative attitudes towards mathematics could change; and they could approach mathematics more confidently. Two teachers drew attention to the use of technology and mathematical games played on computers in teaching mathematics to children with dyscalculia, and the two teachers claimed that this learning environment increased the child's interest and made mathematics concrete. One teacher stated that use of concrete materials in mathematics lessons was advantageous. In general, it could be stated that not all the teachers used the traditional teaching method in teaching mathematics to children with dyscalculia and that the teachers gave priority to the student's motivation and interest in mathematics.

Findings Regarding the Support to Be Given to Teachers for Students with Dyscalculia

The mathematics teachers were asked what support they needed regarding the students who were diagnosed with learning disabilities and who they thought might have dyscalculia. The answers given by the teachers were gathered under the theme of "Support That Can Be Provided to Teachers Regarding Children with Dyscalculia" and are presented in Table 5. As the teachers expressed more than one opinion, only the frequency values were given.

Table 5. Support That Can Be Provided to Teachers Regarding Children with Dyscalculia

Themes	Codes	f	Examples from the teachers' opinions
Support That Can Be Provided to Teachers Regarding Children with Dyscalculia	Family Support	7	"Nothing can be done without family help because sometimes we need to be able to do something with them outside of school hours." (T3) "It may be effective for the family to monitor their child's condition, to see the child's level of concern, to talk to the teachers accordingly, to make them do the homework we give them in the evening, and to follow our directions like 'show them like this', where and when they need." (T4) ''I think family support is very important for students in the Individualized Education Plan because if there is no cooperation between the family and the teacher, not much progress can be made. Then, students' knowledge they learn at school should be supported by their families at home. When the communication between the parent and the teacher, the staff at the school and the guidance counsellor is good, the student's development gets better, and I think the student's self-confidence increases. That's why the work done for the benefit of the student needs to be supported at home. Homework needs to be done at home, or if there is work that needs to be done, it should be supported at home by the family. I think this will be a good thing for the student's development if the parent frequently asks about the student's condition." (T6)
	Expert Support	6	"We are also very inadequate in this regard. We don't know much about it; it's a concept we've only just heard about in recent years. Therefore, I think that teachers should also be informed about this issue and that expert support is needed" (T4) "I don't think I have much knowledge about students who need special education. I'm trying to achieve this by living or researching. According to the characteristics I observe in my students. I am trying to shape the educational environment accordingly. I think it will be good for the teachers and for the development of the students if the teachers are informed by the experts about what special education means and if the teachers cooperate with the experts about what should be done through in-service training or something else." (T6)

It was observed that all the mathematics teachers needed family support regarding the students who were diagnosed with learning disabilities and who they thought might have dyscalculia. In addition, the teachers emphasized that the family should be in constant communication with the teacher; that the family should support the child in mathematics matters at home; and that the family should follow their child's homework. Moreover, it was seen that these children forget very quickly what they had learned at school if they did not rehearse it at home; that there was no progress in the child if there was no cooperation; that no support from the parents was provided on some issues; that the family did not cooperate; and that some families did not share some of the child's special cases with the teacher. At this point, it could be stated that all the teachers said the family's support for the child at home and

communication with the school had a very important role in the child's development and learning process.

It was seen that six of the mathematics teachers needed expert support regarding the students who they thought might have dyscalculia, and who were diagnosed with learning disabilities. The teachers reported that they found themselves inadequate about dyscalculia; that they had just learned this concept through their own efforts; and that the teachers should also be informed about this issue as they did not know much about it yet. The teachers stated that they could learn more about children with dyscalculia if they were informed about this subject through in-service training. Moreover, the teachers stated that as they did not receive expert support on dyscalculia, they learned many characteristics of these children through their own experiences and shaped the education process in line with these experiences. Lastly, they pointed out that they needed guidance on this issue.

Conclusion and Discussion

This study was conducted with the aim of examining and analysing the common experiences of mathematics teachers who thought there were students with dyscalculia among the children who were aware of dyscalculia and who were diagnosed with specific learning disabilities. The study also aimed to reveal the common perception regarding this issue. In line with this purpose, mathematics teachers were asked for their opinions about the characteristics of students with dyscalculia, the difficulties experienced by students with dyscalculia in mathematics lessons, appropriate teaching approaches for students with dyscalculia, and the support that teachers can receive regarding students with dyscalculia.

According to the results, the teachers reported in relation to the characteristics of the students who they thought might have dyscalculia that these students were mostly introverted, and asocial. Based on the experiences of some teachers, it could be stated that these children had communication problems in the classroom that they had attention, and focus problems, and that they could be aggressive, quiet, active, excited, and shy. Considering the fact that each child has his or her unique social, and affective characteristics, it is thought that it is normal for teachers to express different opinions. In addition, as it is known, children diagnosed with learning disabilities in our country continue to take regular education with their peers through inclusive and integrative education practices. However, it is pointed out in the literature that students receiving inclusive education have problems in their socialization process; that they are shy and introverted; that the attitudes and behaviours of the teacher and classmates are influential in this regard; and that failure to accept the child's individual differences causes him or her to demonstrate violent behaviour and leads to absenteeism (Atıcı, 2014; Güleryüz, 2009; Turhan, 2007). Parallel to the results of this study, Nurkan and Yazıcı (2020) stated that students with dyscalculia experience loneliness and distraction problems and that dyscalculia has negative effects on social and emotional development as well as academic success.

The mathematics teachers were asked for their opinions about the difficulties experienced in mathematics lessons by the students who were diagnosed with learning disabilities and who they thought might have dyscalculia. In this regard, the results regarding the teachers' experiences were parallel to the results reported in the literature. As it is known, children with dyscalculia have problems in processing numbers and quantities, basic arithmetic operations, creating simple geometric shapes, dealing with visual-spatial concepts, mathematical reasoning, and understanding time and calendar because their number sense is not developed (Haberstroh & Schulte-Körne, 2019; Kaufmann et al., 2003; Mutlu, 2019; Sezer & Akın 2011). In this study, the teachers stated that the children with dyscalculia had problems in performing four operations, counting rhythmically (forward and backward), telling the time, writing numbers, learning multiplication tables, recognizing geometric shapes, dealing with the number line, and finding direction.

The mathematics teachers were asked for their opinions about the appropriate teaching approaches for students who were diagnosed with learning disabilities and who they thought might have dyscalculia. At this point, the results regarding the teachers' experiences were parallel with the results reported in the literature. According to the teachers, the most appropriate teaching approaches for

students with dyscalculia included demonstrating, and teaching how to do, teaching mathematics through games, individualized teaching, associating with daily life, activity-based teaching, technology-supported education, and the use of concrete materials. Williams (2013) states that games are effective in helping children learn and that teaching mathematics through games is especially useful for children with mathematics anxiety. The researcher emphasizes that teaching mathematics through games is effective in hiding the child's learning mathematics, in giving the child a chance to win and in increasing the child's self-efficacy by allowing him or her to have a positive experience. Devisri and Tharani (2021) also recommend making learning fun by using game-playing methods to teach mathematics to children with dyscalculia, benefiting from real life, using modern technology, and establishing a bond between the teacher and the students. In this sense, it could be stated that the teachers who participated in the study adopted appropriate teaching approaches for students with dyscalculia. In addition, one of the important results of this study was that when the teachers taught mathematics by associating it with games, activities or daily life, the mathematics anxiety of the child with dyscalculia could decrease; their negative attitudes towards mathematics could change; and they could approach mathematics more confidently. It was reflected in the teachers' opinions that the students should be given individualized education in a support education room or by creating a mathematics class. The teachers stated that it was difficult to teach these children in crowded classes. Similarly, among the reasons for failure, Sezer and Akın (2011) and Hacısalihoğlu-Karadeniz (2013) also listed crowded classes in which students with dyscalculia studied. Additionally, Hacısalihoğlu-Karadeniz (2013) stated that mathematics could be taught to students with dyscalculia by making them do activities with concrete objects and materials, and one teacher in this study supported this view by stating that audio and visual materials should be used for these children. Williams (2013) recommended that a teacher try many different strategies to find the most effective teaching approach for a child with dyscalculia. It could be stated that the teachers participating in the study also used different strategies and that their approaches to teaching mathematics to students with dyscalculia were consistent with the literature.

The mathematics teachers were asked what support they needed regarding the students they thought might have dyscalculia. It was revealed that the teachers needed family support and expert support on this issue. The teachers emphasized that the family and the teacher should be in communication and that the family should support the child at home, but they did not receive the support they expected from some families. Devisri and Tharani (2021) also stated that children with dyscalculia should be supported not only at school but also at home in order to develop a positive attitude towards mathematics and to learn mathematics.

In addition, the mathematics teachers stated that they did not have much knowledge about dyscalculia, and that they needed to get expert support even if they learned about the situations related to students with dyscalculia through their own efforts. In the literature, most of the studies conducted with teachers on dyscalculia (Hacısalihoğlu-Karadeniz, 2013; Kunwar et al., 2021; Mutlu et al., 2022; Sezer & Akın, 2011) revealed that the teachers were not aware of dyscalculia. In this study, the participants were selected among the teachers who had awareness of dyscalculia and who thought they had students with dyscalculia diagnosed with learning disabilities. It was found that although these teachers were aware of dyscalculia, they stated that they tried to contribute to these children with their own efforts. At this point, it could be stated that it was not enough for the teacher to be just aware of dyscalculia and that these children also needed support in terms of interventions for the development of their mathematical skills. As a matter of fact, it is known that children with dyscalculia can also learn mathematics with appropriate educational interventions. For example, in one study, Nagavalli (2015) revealed that educational interventions improved the mathematical skills of children with dyscalculia and helped reduce the problems faced by these students. In this sense, it is necessary to be clear about what intervention will be made to support students with dyscalculia and about how to ensure the development of these students' mathematical skills. It could be stated that teachers need expert support in order to carry out systematic and evidence-based interventions. In addition, in their studies, researchers could focus on game-based or activity-based models to be used by teachers who want to design games or activities for these children.

This study revealed the experiences of mathematics teachers with dyscalculia awareness regarding students diagnosed with learning disabilities who they thought had dyscalculia. Although it is stated that its general prevalence is between 5% and 7% (Zhou & Cheng, 2015), it appears that there are major problems in our country, as in many countries (Williams, 2013), in recognizing and diagnosing dyscalculia and in providing appropriate education for these individuals. In our country, it is a negative situation that it is not known in which area the students diagnosed with learning disabilities have difficulty; that dyscalculia cannot be diagnosed; and that there are no measurements tools in this regard. However, as with all learning disabilities, early diagnosis and education regarding the child's strengths and weaknesses are the social rights of every child in need of special education. At this point, it should first be determined which learning disability the children diagnosed with learning disabilities have (dyscalculia, dyslexia, dysgraphia, etc.), and the inclusive education practice should be carried out accordingly. Secondly, teachers should be supported with in-service training on dyscalculia, and both elementary school pre-service teachers and mathematics pre-service teachers should be informed about this issue in classes. Because there are studies showing that not only teachers, but also pre-service teachers of mathematics are not aware of dyscalculia and do not have the idea of what processes should be implemented regarding dyscalculia and in what way (Baldemir et al., 2022). In order to support children with dyslexia at home, parents can be encouraged to create an environment which does not harm the child's confidence, and which increases self-esteem. It can be stated that a similar study should be conducted with elementary school teachers who are aware of dyscalculia and who think that there are students with dyscalculia among their students.

Disclosure Statements

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2. No potential conflict of interest was reported by the authors

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