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NEWLY GRADUATED ELEMENTARY MATHEMATICS TEACHERS' VIEWS ON DYSCALCULIA AND THEIR USE OF RESEARCH SKILLS ON THIS SUBJECT[1]

Merve İlayda POLAT[2]

Abstract

The aim of this study is to examine the views of newly graduated elementary mathematics teachers who have not yet started to work and to reveal their awareness of "dyscalculia" (mathematics learning disability) and to investigate to what extent they intend to use their research skills on this subject. Case study, one of the qualitative research approaches, was used in the study. The participants consisted of 14 newly graduated elementary mathematics teachers. In the study, a semi-structured interview form with 10 open-ended questions was used to obtain the opinions of the teachers about dyscalculia and content analysis technique was used to analyze the data obtained. At the end of the study, it was determined that newly graduated elementary mathematics teachers did not have sufficient knowledge about dyscalculia and did not use their research skills sufficiently in terms of dyscalculia and professional competence. Based on the results obtained in this context, it is recommended that elementary mathematics teachers should be given a course called mathematics learning disabilities in their undergraduate education, be subjected to practical training with individuals with dyscalculia, and be given necessary assignments to increase their research skills.

Keywords: Special Learning Disability, Dyscalculia, Awareness, Research Skill

1. Introduction

Present, mathematics has constituted the most important dimension of all kinds of human activities. Mathematics has made its influence felt in many fields such as war, agriculture, religion, and trade, and in turn, the interests of those engaged in mathematics have been determined (Mankiewicz, 2002). Mathematics, which shapes our world of thought, has always played an important role in the development of our civilization (Yenilmez, 2011). Although mathematics is so important in the lives of human beings, unfortunately, some individuals fail in the acquisition of mathematical concepts and skills for many reasons. Dyscalculia (Mathematics Learning Disability) is a difficulty that individuals experience this negative situation (Mutlu, 2016a; Baldemir, 2022).

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[2] Master Student, merveilaydapolat@gmail.com, https://orcid.org/0009-0002-3391-9673

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Dyscalculia is define as a specific learning disability that affects the acquisition of arithmetic skills, the ability to work with numbers, and the understanding of mathematical problems (Geary, 2004; Gillium, 2012). Unexpected low achievement in mathematics in the absence of cultural deprivation, inadequate education, sensory impairment, mental retardation and emotional disorders is also defined as dyscalculia (Büttner & Hasselhorn, 2011). In addition, according to the Ministry of National Education (MoNE), individuals with dyscalculia cannot decide what kind of operation they need to do to solve problems, have problems learning some symbols or confuse them with each other, have difficulty responding directly when trying to solve mathematical problems at a level appropriate for their peers, and have difficulty understanding the concept of number (MEB,2014,s.5). In many studies, the rate of individuals with dyscalculia in the normal population is thought to be 3-6% (GrossTsur et al., 1996; Von Aster, 2000). Based on these rates, considering the total number of students in Turkey, the number of students with dyscalculia is estimated to be 750,000-1,500,000 (Mutlu, 2016b).

It is critical to identify students with dyscalculia early in the mathematics learning and teaching process so that they can benefit from effective instructional activities and be supported academically (Geary, 2011; Passolunghi & Lanfranchi, 2012). The common characteristics or common symptoms of these individuals are as follows:

- Memory difficulties in mathematics (inability to understand and remember general concepts in mathematics)
- Slow and difficult solving of operations involving basic math skills
- High number of mistakes made due to carelessness
- Difficulties with space and spatial organization
- Difficulty in learning involving numbers
- Touch counting (e.g. using ten fingers in operations)
- Difficulty in comparing numbers, inability to select negative and positive numbers
- Difficulty using mathematical language
- Relying on imitation and memorization rather than understanding
- Don't be surprised when giving change
- Difficulty in understanding the problems encountered in daily life and sequencing information and events

- Difficulty in understanding concepts such as days, weeks, months, seasons, etc.
- Difficulty expressing time, finding place and direction
- Lack of skills in strategic planning (e.g. when playing chess)
- Difficulty in understanding daily life problems and sequencing information and events (Hannell, 2005; Akın & Sezer, 2010).

Specific learning disabilities, such as dyscalculia, do not indicate a student's general cognitive ability, and students are likely to show success in different subjects, areas or skills. If individuals with dyscalculia are supported with appropriate educational interventions, their performance in mathematics can significantly improve (Mutlu & Yasul, 2020). Students with dyscalculia are educated as full-time and mainstreamed students in general education classes within the scope of special education. At the same time, these students benefit from support education classroom services and resource room in mathematics lessons (Girli, 2015). When the literature is examined, there are different teaching methods and techniques used in teaching mathematics to individuals with special needs. These are: Direct teaching (Eliçin et al., 2013), concrete-semi-concrete-abstract teaching strategy (CRA) (Aydemir, 2017; Özlü, 2016), errorless teaching methods (Karabulut & Yıkmış, 2010), interaction unit (Yıkmış, 2016), number line technique (Kot et al., 2017), point determination technique (Kot et al., 2016; Terzioğlu & Yıkmış, 2018).

In the literature, it is seen that awareness studies on mathematics learning disabilities are rarely included. Baldemir et al. (2022) examined the awareness and views of pre-service elementary mathematics teachers studying at a state university about the concept of dyscalculia. Chideridou Mandari et al. (2016) in their study, they investigated secondary school mathematics teachers knowledge about dyscalculia.Satybaldy (2022) examined the dyscalculia awareness levels of primary and secondary school mathematics teachers in South Kazakhstan.Dias et al. (2013) In the questionnaire applied to educators, it was determined that 45% of primary school teachers had no knowledge of dyscalculia and 12.9% of teachers knew the symptoms of dyscalculia.Nurkan and Yazıcı (2020) tried to determine the views of two secondary school mathematics teachers about dyscalculia. Hacısalihoğlu Karadeniz (2013) examined the opinions of classroom teachers about dyscalculia. In their review study, Kaçar and Düzkantar (2019) mentioned that the studies they examined were aimed at determining the situation and that they did not come across a study that tried to establish the change in teachers' knowledge or attitude levels after the implementation.

When the literature is examined, it is seen that there are few studies on the awareness of pre-service teachers about dyscalculia, and apart from this, there is no study that examines whether teachers use research skills about dyscalculia, which is one of the types of special learning disabilities, and tries to change the attitude levels of teachers. In addition, the studies were conducted with teachers who had undergraduate education or who had started their profession, so there was a need to conduct a study with newly graduated teachers and to examine their level of readiness before starting their profession as well as their awareness and to determine to what extent they intended to use their research skills. In this study, it was aimed to reveal the views of newly graduated elementary mathematics teachers about individuals with dyscalculia, which is one of the difficulties they may encounter before starting their duties, to raise awareness about dyscalculia, to examine the professional readiness of newly graduated teachers and to investigate how much they intend to use research skills.

2. Method

2.1. Research Model

In this study, case study design, one of the qualitative research approaches, was used since it was aimed to reveal the views of newly graduated elementary mathematics teachers on mathematics learning disabilities and how much they intend to use their research skills on this subject. A case study is a research design that describes and explains the events in a situation or situations and in which the researcher collects detailed information about the situation (Creswell, 2013;Yin, 2011).

2.2. Participants

The participants of the study consisted of 14 newly graduated elementary mathematics teachers who had not yet started their profession.The teachers in the study group were selected from among the newly graduated teachers on a voluntary basis by determined by convenience sampling method.

In the study, the names of the participants were kept confidential, codes (such as P1, P2, ...) were given instead of the names of the participants, and the data were tried to be conveyed as much as possible.

2.3. Data Collection Tools and Data Collection

In the study, a semi-structured interview form with 10 open-ended questions was used to obtain the opinions of newly graduated elementary mathematics teachers about dyscalculia. In order to obtain expert opinion during the preparation of the interview form, the questions were first presented to an academic working at a state university and his/her opinions were obtained. With the questions in the interview form prepared as a data collection tool, it was tried to reach detailed data on special learning disabilities, dyscalculia and the use of research skills on these issues based on the opinions of the teachers.The semi-structured interview form applied to newly graduated elementary mathematics teachers is presented in the Appendix.

Appropriate days and times were decided for the interviews so that the pre-service teachers who participated in the study could participate before the actual interview. The interviews were voluntary and the interviews were conducted online (zoom meeting) and lasted approximately 15-20 minutes. The interviews were recorded with the permission of the pre-service teachers.

For the validity of the study; it was tried to include the participants' answers frequently without changing them (direct quotations). In addition, an expert on the relevant subject working at a university evaluated the data.

For the reliability of the study; all processes at each stage of the study were explained in detail. The researcher received training on qualitative research in order to conduct the research correctly and ensure reliability.

In addition, the data obtained from the interviews were coded separately by two different coders, an expert and a researcher, and the percentage of agreement between the coders was found to be 80%. It is stated that when the percentage of agreement between the coders is 80%, a sufficient reliability value will be provided (Miles & Huberman, 1994). In this respect, it is seen that the agreement obtained is sufficiently reliable.

2.4. Data Analysis

The data obtained from the interviews conducted to determine the views of newly graduated elementary mathematics teachers about dyscalculia were analyzed by content analysis method. The main purpose of content analysis is to explain the data collected and to find connections. The data summarized in descriptive analysis are subjected to detailed processing in content analysis and concepts that are not noticed through the descriptive

approach are discovered. The main process in content analysis is to interpret the data with similarities between them in a way that the reader can understand (Yıldırım & Şimşek, 2006). In this study, the following steps were followed in order to analyze the data. First of all, online interviews were conducted with the pre-service teachers and the interviews were recorded after obtaining permission from the pre-service teachers. After the interviews were over, the recorded interviews were listened to again and the raw data were transcribed in Microsoft Word program. The recorded interviews were listened to again and their accuracy was confirmed with the data in the Word document. The answers given for each interview question were analyzed one by one and themes were formed by first coding and then combining similar codes.

2.5. Research Ethics

Ethics committee permission information

Name of the ethics review board: Atatürk University Social Sciences and Humanities Ethics Committee Educational Sciences Unit Ethics Committee

Date of ethical assessment decision: 31.10.2023

Number of the ethical assessment certificate: Document dated 30.10.2023 and numbered E-30568564850-2300345734-10/61.

3. Findings/Results

In this section, the findings, tables and quotations obtained through the analysis of the data obtained from the interviews with newly graduated elementary mathematics teachers are presented.

3.1. Findings Related to Awareness of Specific Learning Disabilities

As a result of the analysis of the data obtained from the interviews, the themes and codes related to the participants' awareness and definitions of specific learning disabilities are presented in Table 1 and Table 2.

When Table 1 is examined, it is seen that the majority of newly graduated elementary mathematics teachers have heard the concept of specific learning disabilities before. Only 1 participant stated that he had not heard of the concept of specific learning disability before.

Table 1. *Special Learning Disabilities Awareness*

Theme	Code	Participants
Special Learning Disabilities Awareness	**I heard**	P1, P2,P3,P4,P5,P6,P7, P9,P10,P11,P12,P13,P14
	not heard	P8

Some quotations regarding the views of the participants, which can be considered as justification for the theme and code related to awareness of specific learning disabilities, are given below.

"Specific learning disabilities... so I didn't quite hear" (P8).

"Yes, I heard." (P7).

"Yes, I heard." (P12).

3.2. Findings Related to the Concept of Specific Learning Disabilities

Table 2. *Specific Learning Disabilities*

Theme	Code	Participants
Specific Learning Disabilities	Blending letters	P1
	Being behind peers	P2
	Difficulty in learning mathematics	P2,P3
	Late learning	P4,P5
	Difficulty understanding concepts	P4
	Normal learning to stay behind the level of	P6
	Difficulty in learning a particular area	P7

I didn't hear exactly	P8
Late learning	P9
I can't explain	P10
Private tutoring	P11
Mental and psychological characteristics are behind	P13
Do not have difficulty making transactions	P13
Brain disease	P14

When Table 2 is examined, it is seen that newly graduated elementary mathematics teachers associate the concept of specific learning disability mostly with late learning and having difficulty in learning.

Some quotations regarding the views of the participants, which can be considered as justification for the theme and code related to specific learning disabilities, are given below.

"Let me try to explain... I mean, I think I can define it as the difficulties that students have in learning a certain field as I remember right now" (P7).

"Specific learning disability is when some students learn later in a certain area, not in all areas. For example; it can be in math or Turkish, that is, they have particular difficulty in understanding some concepts." (P4)

3.3. Findings on Types of Specific Learning Disabilities

As a result of the analysis of the data obtained from the interviews, the themes and codes related to the types of specific learning disabilities of the participants are presented in Table 3.

When Table 3 is examined, it is seen that newly graduated elementary mathematics teachers associate the types of specific learning disabilities with dyslexia and dyscalculia the most.

Table 3. *Types of Specific Learning Disabilities*

Theme	Code	Participants
Types of Specific Learning Disabilities	Dyscalculia	P6
	Dyslexia-Dyscalculia	P1,P2,P3,P7,P13,P14
	Dyslexia-Dyscalculia-Disgraphia	P5,P12
	Physical, psychological and mental difficulties	P10
	Difficulty with the subject	P10
	Difficulty due to hyperactivity	P7
	I don't know	P4,P8,P9,P11

Some quotations regarding the views of the participants, which can be considered as justification for the theme and code related to the types of specific learning disabilities, are given below.

“For example, dyscalculia, dyslexia, I could not think of any others" (P3).

“mm I don't know" (P4).

“There is dyslexia, there is dyscalculia, which is related to our own field, and there is dysgraphia" (P5).

“I mean, I think I know about dyscalculia, but other than that I don't know" (P6).

3.4. Findings Related to Awareness of Dyscalculia

As a result of the analysis of the data obtained from the interviews, the themes and codes related to the participants' awareness of the concept of dyscalculia are presented in Table 4.

Table 4. *Dyscalculia Awareness*

Theme	Code	Participants
Dyscalculia Awareness	Yes	P1,P2,P3,P4,P5,P6,P7,P8,P9,P10,P11,P12,P13,P14
	No	0

When Table 4 is examined, it is seen that all of the newly graduated elementary mathematics teachers had heard the concept of dyscalculia before.

Some quotations regarding the views of the participants, which can be considered as justification for the theme and code related to dyscalculia awareness, are given below.

“Yes, I have heard" (P9).

“Yes, I heard about it, there was a meeting about it before and I attended it (P13).

3.5. Findings Related to the Concept of Dyscalculia

As a result of the analysis of the data obtained from the interviews, the themes and codes related to the participants' definitions of the concept of dyscalculia are presented in Table 5.

Table 5. *Dyscalculia*

Theme	Code	Participants
Dyscalculia	Math Learning Disabilities	P1,P3,
	Difficulty in learning mathematics	P2,P7,P10
	Writing numbers upside down	P4,P5,P12
	Confusing numbers	P6
	Failure to calculate change	P6
	Making mistakes in addition and subtraction	P6
	Difficulty in understanding mathematics	P9

	Late learning	P10
	Difficulty understanding abstract concepts	P11,P13
	Difficulty in the procedure	P12
	Difficulty reading a watch	P14
	Difficulty understanding numbers	P14
	I don't know	P8

When Table 5 is examined, it is seen that newly graduated primary school mathematics teachers associate the concept of dyscalculia mostly with the difficulty in learning mathematics and writing numbers backwards.

Some quotations regarding the views of the participants, which can be considered as justification for the theme and code related to the concept of dyscalculia, are given below.

“I know it as math learning disability" (P1).

“In mathematics, for example, dyscalculia is understanding some numbers or concepts as they are not, that is, writing numbers upside down, for example, is not a misconception, but attributing different meanings to them" (P4).

“ I think dyscalculia learning disability was like mixing numbers. I know that it is the inability of the student to do the operation that can be done at that level. For example, there was something like this, for example, you go to the grocery store, you give money, the student cannot calculate the change, not even students, but older people. I can't calculate the change, I can't make mistakes in addition, subtraction, I'm not talking about this kind of operation error, it may be a normal operation error, but the student does it unconsciously" (P6).

“ We talked about this in class. Children had difficulty in grasping mathematics. I mean, for example, for example, the number 1, I mean, they have difficulty understanding abstract concepts, I mean, how should I put it, they have problems in learning, I think compared to other children, I think they cannot fully grasp abstract concepts in their minds" (P11).

3.6. Findings on the Status of Being Informed

As a result of the analysis of the data obtained from the interviews, the themes and codes related to the fact that the participants took an informative course about specific learning disabilities in their undergraduate education or participated in an informative activity are presented in Table 6, and the themes and codes related to their contribution to the participants are presented in Table 7.

Table 6. *Information*

Theme	Code	Participants
Information	Mentioned in lectures, did not attend the event	P1,P5,P7,P9,P11,P12
	It was mentioned in the lectures, I participated in the event	P2,P3,P10,P14
	I didn't take a class,I participated in the event	P4,P6,P8,P13

When Table 6 is examined, it is seen that newly graduated elementary mathematics teachers are informed.

Some quotations regarding the views of the participants, which can be considered as justification for the theme and code related to informing, are given below.

“It was mentioned in the lessons, I did not participate in the activity, it was explained in the lessons" (P1).

“In the university I graduated from, yes, I took a course under the name of special education, yes, I participated in it, a club was opened in our school, I was involved in that club, and in the work of the club, since it was the time of distance education, they held webinars and invited some of our professors and held interviews on zoom, one of these topics was dyscalculia, and I participated in an interview on this" (P2).

“I did not participate in the activities, but these learning difficulties were included in the education courses we took" (P9).

Table 7. *Contribution*

Theme	Code	Participants
Contribution	Yes	P1,P2,P3,P4,P5,P6,P7,P8,P9,P10,P11,P12,P13,P14

When Table 7 is examined, it is seen that newly graduated elementary mathematics teachers think that the courses they take or the activities they participate in contribute to them.

Some quotations regarding the views of the participants, which can be considered as justification for the theme and code related to making a contribution, are given below.

“Of course, if I come across such students in my professional life, I have learned how to distinguish them from other students, how to recognize them first, and how to contact the guidance counselor first in the next teaching phase, how to approach the parents and so on, and how to organize the subsequent education process" (P5).

“I definitely think it was better when my knowledge was fresh, but let me put it this way, even if we forget the information at that time, I think that lesson is good in terms of our awareness, so I think that I can at least notice and at least suspect the student in general, even if it is a rough draft." (P7).

“I think because even though I cannot explain it fully now, at least I have knowledge about the symptoms of dyscalculia, dysgraphia or such students. I think this will help me to recognize and diagnose students in my future teaching life” (P12).

3.7. Findings on the Use of Research Skills

As a result of the analysis of the data obtained from the interviews, the themes and codes related to the participants' use of research skills after the information (lessons or activities) are presented in Table 8.

Table 8. *Using Research Skills about Specific Learning Disabilities*

Theme	Code	Participants
Special Learning Disabilities Research Skills	Yes	P3,P4,P5,P7,P9,P10,P14
	No	P1,P2,P6,P8,P11,P12,P13

When Table 8 is examined, we can say that newly graduated elementary mathematics teachers used research skills half of the time after they were informed, based on the number of participants.

Some quotations regarding the views of the participants, which can be considered as justification for the theme and code related to research skills, are given below.

“No, I did not" (P1).

“Yes, I especially went to the Instagram pages of the seminar providers and looked at what they were doing, what kind of work they were doing. I also did some research for myself to see what kind of things I could do when I became a teacher” (P4).

“I can say that I only attended the seminar” (P6).

3.9. Findings Related to Vocational Readiness

As a result of the analysis of the data obtained from the interviews, the themes and codes related to the participants' professional readiness are presented in Table 9 and the themes and codes related to the frequency of researching the concept of learning disability are presented in Table 10.

Table 9. *Readiness for the Profession*

Theme	Code	Participants
Profession readiness research skills	I did research	P1,P3,P4,P5,P9,P12,P14
	I did not do research	P2,P6,P7,P8,P10,P11,P13

When Table 9 is examined, we can say that newly graduated elementary mathematics teachers use the skills of using research skills related to professional readiness half and half based on the number of participants.

Some quotations regarding the views of the participants, which can be considered as justification for the theme and code related to research skills, are given below.

“I thought a lot about the difficulties I would experience in the profession, I mean, I didn't do any research specifically, but I thought about it, or if there were experienced people around me, I asked them questions in this way, or we went on internship in the last year, for example, in both semesters, I observed the school, the class, the teachers, the students a lot, and

I can say that I thought the most during these periods, I observed the difficulties related to the profession, but I didn't do any research" (P2).

“So yes, I think the subject I did the most research on for my profession was about classroom management. When I started my internship, I was already doing a lot of research on classroom management, and at the same time, as I said, whether it was hearing-impaired students or students with learning difficulties, there were already a lot of hearing-impaired students in Turgut Özal in the first internship I went to, there was one student with mental retardation, or rather learning difficulties, and there were many such mainstreaming students. Especially in classroom management, I did more research on how to approach these children, how to teach them in the classroom."(P9).

“I didn't do research, but the way I did research on this subject was like this, I mean, I didn't open it on the internet or I don't know, on the computer, but of course I asked questions from people who are teachers to share their experiences. But I definitely didn't do a long research" (P11).

Table 10. *Specific Learning Disabilities Research Frequency*

Theme		**Code**	**Participants**
Specific Learning Disabilities Research Frequency		Yes	P5,P9,P12,P14
		No	P1,P2,P3,P4,P6,P7,P8,P10,P11,P13

When Table 10 is examined, we can say that newly graduated elementary mathematics teachers do not include specific learning disabilities in their research.

Some quotations regarding the views of the participants, which can be considered as justification for the theme and code related to the frequency of research on specific learning disabilities, are given below.

“I worked more for misconceptions rather than specific learning disabilities" (P4).

“I thought about it and what I can do, yes, I researched it. I came across it, yes" (P12).

“I mean, it is actually a subject that interests me because our lessons are always about this, I mean, each subject has misconceptions in its own way, I have always wondered about

the way children perceive it, but unfortunately, I have not done a detailed research yet. But I think I will work on it. No, unfortunately, because I have not done a detailed research." (P13).

“Yes, yes, I mean, when I became a teacher, when I started to work, I did a research on myself about what I would do if I had such a student in my class, what kind of reaction I should give, how I should communicate with the parents, how I should approach the student" (P14).

3.10. Findings Related to Previous Encounters with Individuals with Dyscalculia

As a result of the analysis of the data obtained from the interviews, the themes and codes related to the participants' encounters with individuals with dyscalculia in the internship are presented in Table 11.

Table 11. *Encountering a Dyscalculic Individual in Internship*

Theme	Code	Participants
Encountering individuals with dyscalculia in internship	Encountered	P4,P7,P14
	I have not encountered	P1,P2,P5,P6,P8,P9,P10,P11,P12,P13

When Table 11 is examined, we can say that newly graduated elementary mathematics teachers mostly did not encounter individuals with dyscalculia during their internship.

Some quotations regarding the views of the participants, which can be considered as justification for the theme and code related to encountering individuals with dyscalculia in internship, are given below.

“Let me put it this way, I encountered a student with special learning difficulties, but I don't know whether he had dyscalculia or not, I think his teacher didn't know either, but the child had epilepsy and was quite behind his peers both physically and intellectually." (P2).

“Yes, I met once" (P7).

“In the internship, I couldn't really sense whether it was dyscalculia or not, but I feel like I haven't encountered it, let me put it that way. I mean, because I was a little uninformed, even though I knew what dyscalculia was, I didn't know the content of it, our teacher explained whether a person had dyscalculia or not, but unfortunately, it was erased from my mind" (P8)

3.11. Findings on the Use of Research Skills for the Education of Individuals with Dyscalculia

As a result of the analysis of the data obtained from the interviews, the themes and codes related to the participants' use of research skills for the education of dyscalculic individuals are presented in Table 12.

Table 12. *The Use of Research Skills for the Education of Dyscalculic Individuals*

Theme	**Code**	**Participants**
Research skills for education	I would research	P1,P3,P5,P8,P9,P10,P11,P12,P13
	I have not researched	P2,P4,P6,P7
	Researched	P14

When Table 12 is examined, we can say that newly graduated elementary mathematics teachers would mostly use research skills for the education of individuals with dyscalculia if they had encountered these individuals, but at the same time, teachers who encountered individuals with dyscalculia or any learning disabilities did not use this skill.

Some quotations regarding the views of the participants, which can be considered as justification for the theme and code related to the use of research skills related to the education of individuals with dyscalculia, are given below.

“Yes, I thought about it, I mean, I already examined the teacher's approach to him, his behavior, I thought about it. For example, I decided that I should not put him in the mathematics exam that all students take the same, I thought that a special exam should be prepared for him. No, I did not do research" (P2).

“As I said, I talked to his teacher rather than researching it myself, to see where he was having difficulties and how he was progressing. I think his learning disability was a little advanced, they were able to learn only numbers in about a year. He said that I make him repeat it all the time, I print it all the time, the family is very important in this regard, he said that it is very important to meet with the family, but the child was unlucky with the family, unfortunately, the family was not interested at all, and they could only progress so much with the teacher's interest. He says that when I don't repeat it often, he gets confused very quickly. He says we constantly repeat from the beginning. When the family did not support, the teacher had a lot of burden on her and she was talking a lot about her difficulties" (P7).

"Yes, if I had encountered it, I would have researched it" (P10).

"Yes, yes, I realized how I could explain it better" (P14).

3.12. Findings Related to Symptoms of Dyscalculia

As a result of the analysis of the data obtained from the interviews, the themes and codes related to the symptoms of dyscalculia are presented in Table 13.

Table 13. *Symptoms of an Individual with Dyscalculia*

Theme	Code	Participants
Symptoms of Dyscalculia	Difficulty in class	P2
	Negative attitude towards mathematics	P2,P13
	Difficulty understanding numbers	P3
	Failure to understand problems	P3
	Writing numbers upside down	P4,P5,P12
	Late understanding	P5
	Asocialization	P6
	Difficulty in reading the number	P7
	Using fingers while processing	P9
	Difficulty in mental processing	P9
	Ledger layouts	P10
	Difficulty with geometric shapes	P10
	Hyperactivity	P12,P14
	Wrong writing layout	P12

	Easily distracted	P14
	Difficulty with four operations	P14
	Difficulty reading the wall clock	P14
	Don't be stagnant	P14
	Not staying on the board	P14
	I couldn't define	P1,P8,P11

When Table 13 is examined, we can say that newly graduated elementary mathematics teachers associate the symptoms of dyscalculia with the difficulties in numbers the most.

Some quotations regarding the views of the participants, which can be considered as justification for the theme and code related to the symptoms of the individual with dyscalculia, are given below.

“I would have difficulty because I don't have complete knowledge at the moment, I would not be able to define it" (P1).

“Having difficulty in making sense of numbers, not understanding problems, these kinds of things" (P3).

“ As I said, first of all, the thing is noticed. They understand the subjects I explain later than normal students, and what I know especially clearly is that they write the numbers upside down. These are the 2 diagnoses that I can think of right now that can distinguish them directly" (P5).

“Yes, I think I can define it. I mean, the first symptoms are long immersion, you know, not being at the moment of the lesson, that is, when you lecture, his interest is not there, he thinks of different things in his own world, his attention is very quickly distracted, either hyperactivity or on the contrary, excessive stagnation, apart from that, he has difficulty in four operations, which we call the grocery store operation, he has difficulty in reading the wall clock, so it is thought that digital clock teaching is more accurate for them, apart from that, he pulls himself back, he does not want to stay at the blackboard" (P14).

3.13. Findings Regarding the Education of Individuals with Dyscalculia

As a result of the analysis of the data obtained from the interviews, the themes and codes related to the education of the individual with dyscalculia are presented in Table 14.

Table 14. *Teaching for Individuals with Dyscalculia*

Theme	Code	Participants
Teaching for the individual with dyscalculia	Preparing a separate exam	P2
	Preparing separate activities	P2,P14
	Ensuring participation in the lesson	P5
	Individual program creation	P10,P12
	Progress at a simple level	P13
	Reduction to level	P14
	Using Web 2.0 tools	P14
	I don't know	P1,P3,P4,P6,P7,P8,P9,P11

When Table 14 is examined, we can say that newly graduated elementary mathematics teachers mostly do not know how to teach individuals with dyscalculia.

Some quotations regarding the views of the participants, which can be considered as justification for the theme and code related to the teaching of individuals with dyscalculia, are given below.

“No, I don't know" (P1).

“Instead of ignoring, I try to actively involve the student in the lesson and approach him/her in a different and more positive way" (P5).

“I mean, I don't know because I haven't encountered it at the moment. But of course, it would be better to know without encountering it, but I don't have it at the moment" (P6).

“For example, I am explaining natural numbers and I see that the student does not know that he/she has problems with numbers, let's say I have designed a high-level activity about natural numbers, if I see that he/she has problems with numbers, I can design another activity

for him/her in a way that he/she can understand more easily, whether from geography, web 2.0 tools, or I can establish a special bond with him/her and teach him/her that way" (P14).

3.14. Findings on the Need for Research on Dyscalculia

As a result of the analysis of the data obtained from the interviews, the themes and codes related to the need to research dyscalculia after the answers given by the participants are presented in Table 15.

Table 15. *The Need to Research Dyscalculia*

Theme	Code	Participants
Research Need	I felt	P1,P2,P3,P4,P5,P6,P7,P8,P9,P10,P11,P12
	I didn't feel	P13,P14

When Table 15 is analyzed, we can say that most of the newly graduated elementary mathematics teachers felt the need to research dyscalculia after their answers.

Some quotations regarding the views of the participants, which can be considered as justification for the theme and code related to the need to research dyscalculia, are given below.

“Yes, I definitely felt it" (P1).

“So yes, I definitely feel that I am lacking now. I mean, when I make a diagnosis or when I am suspicious, I think that I should take into account which of their movements or attitudes I should take into account the most, you know, I think that I should investigate them a little more or even more. So I felt that I was lacking" (P6).

“Yes, I realized some of my shortcomings, there were some points I forgot. I think I should do some research to remember this again" (P12).

“I mean, I think research should always be done because we need to have clear information. I mean, I cannot say that I felt it because I did not encounter such a student, but it is a subject that should always be researched" (P13).

3.15. Findings Related to Recommendations

As a result of the analysis of the data obtained from the interviews, the themes and codes related to the suggestions of the participants are presented in Table 16.

When Table 16 is examined, we can say that newly graduated elementary mathematics teachers made various suggestions to ensure awareness.

Table 16. *Recommendations*

Theme	Code	Participants
Recommendations	Training should be provided	P1,P2
	Conducting research	P2,P3,P9,P13
	Seminar	P3
	Watch a movie	P4
	In-service training	P5
	Mandatory participation in projects	P6
	Information in internship	P7
	Asking in midterm and final	P8
	Reading	P9
	Undergraduate homework	P9
	Practical training with individuals with dyscalculia	P10
	Elective course	P11
	Raising awareness among families	P12
	Participating in an interview	P13
	Seminar for parents	P14
	Organizing events	P14

Some quotations regarding the views of the participants, which can be considered as justification for the theme and code related to the suggestions given, are given below.

“I can say that yes, we saw it at the university, but as I said, I saw the details of this concept thanks to a club's work, but I mean, I did not receive this training as a normal education, I think this can be taught in universities, I mean, we took a course on special education, but we did not learn much detail about dyscalculia, for example, so it can be thought about a little more" (P2).

“I think we pre-service teachers or teachers who have started their profession are very inadequate in this regard. If a student does not like mathematics or has a bad relationship with mathematics, we only attribute this to academic achievement, but we do not know whether that child has a learning disability or not and we do not feel the need to research this. I think that such surveys and seminars can inform teachers and prospective teachers" (P3).

“Let me think about it, of course I think that a math teacher should improve himself/herself about this subject. I thought of attending a seminar for this. I couldn't attend because the seminar was overdue, but I will attend again in the future. In other words, I think that when we see that students' mistakes, which we think are simple, can lead to big things, we should focus a little more on this. Teacher candidates should listen to the students a little bit. More examples should be shown on this subject or it can be effective to watch movies made on this subject. Because it may be difficult to be sensitive if such students are not encountered, but I think they will be more sensitive when they see an example" (P4).

“For example, since I took this course in the 2nd grade, I realize that I don't remember much now, normally 2-3 years have passed, but for example, I came across it during the internship, I asked and tried to get information, but if I hadn't asked, for example, I think information about it can be provided during the internship, especially about dyscalculia."(P7).

“In other words, the things I can recommend for our friends who are teaching both in the undergraduate period and for our friends who have just started teaching, they should not stay only with that thing given by the undergraduate education, they should not stay in the lessons given, that is, they should do a lot of research on such things as dyscalculia or other specific learning disabilities. I mean, at least now I really feel incomplete in this regard, you know, no matter how much I follow the pages about dyscalculia, no matter how much I read, I see that I am incomplete, I have not internalized this issue very much, what I can suggest to them is to do a lot of reading. I mean, during the undergraduate period, this can be done by

academics with homework assignments, but these are now mature people who have reached a certain age, so they receive undergraduate education in a certain field and I think they should specialize in this field, so it is not compulsory for them to read, but they should read it themselves" (P9).

4. Discussion and Conclusion

It was observed that most of the participants had heard of the concept of specific learning disability and defined specific learning disability mostly in terms of academic achievement such as late learning and difficulty in learning. Fırat and Koçak (2018) reached similar results in their study and stated that teachers defined learning disabilities based on academic achievement, cognitive behaviors and some environmental factors.

Most of the participants were aware of dyslexia and dyscalculia among the types of specific learning disabilities, while very few of them were aware of dyslexia, dyscalculia and dysgraphia and had no idea about other types of specific learning disabilities. In their study, Yangın et al. (2016) reached similar results and stated that in their study, along with the classroom teacher candidates, the lecturers were not aware of the types of specific learning disabilities, and a few of them were only aware of concepts such as dyscalculia and dyslexia.

It is seen that the majority of the participants were informed about specific learning disabilities, attended a course or an informative activity, and that the courses they took contributed to them, that it was better when the information was fresh, but in the suggestions asked to them, they stated that the courses they took should be covered in more detail for dyscalculia, which falls within the scope of their field. Similarly, Çoğaltay and Çetin (2020) concluded that teachers generally did not receive pre-service training on specific learning disabilities and that the training they received from the university was superficial, theoretical and not permanent for teachers. In their study, Altun and Uzuner (2016) concluded that most of the teachers received a training on specific learning disabilities at the university, but this training given to them was not sufficient and the remaining participants did not receive any training on specific learning disabilities at the university.

It was observed that the participants had heard the term dyscalculia before and defined dyscalculia as a difficulty in learning mathematics, but most of them could not fully express it. Baldemir et al. (2022) concluded in their study that the majority of pre-service elementary mathematics teachers studying at a state university had never heard of the concept of dyscalculia before and that the pre-service teachers who had heard of dyscalculia before did not know

exactly what dyscalculia meant. In their study, Nurkan and Yazıcı (2020) concluded that the teacher who had a student diagnosed with special learning difficulties had knowledge about the concept of dyscalculia and the other teacher who participated in the study did not have sufficient knowledge.

Participants mostly stated that they had not encountered an individual with dyscalculia, but if they had, they would not be able to distinguish whether the individual they encountered would have dyscalculia or not, and that they mostly encountered individuals with special learning difficulties. It was seen that if they had encountered these individuals, they would mostly research how to provide education for these individuals and most of the individuals who encountered them did not. It was seen that the participants mostly thought that they could solve the problems by asking questions to experienced colleagues and by their own methods. Similarly, Altun and Uzuner (2016) concluded in their study that teachers would get help from the internet, an experienced colleague or books if they encounter a student with specific learning disabilities in their classrooms.

For the symptoms of dyscalculia, the participants mostly mentioned difficulties with numbers, but also gave answers such as using fingers while doing operations, not being able to perform mental operations, not being able to understand problems, having difficulty in reading the wall clock, not standing up at the blackboard, and it was observed that most of the participants did not have any information about the other symptoms other than these. Sezer and Akın (2011) found that teachers expressed the symptoms of dyscalculia in terms such as not understanding the problem, having difficulty in four operations, confusing which operation to apply in the problem, having problems with visual, spatial and temporal functioning, and being surprised when giving change.

It was observed that the participants mostly did not know how to carry out the education of an individual with dyscalculia. It was observed that only a few participants gave answers such as creating a program for the individual and using web 2.0 tools. Sezer and Akın (2011) reached different conclusions in their study and concluded that teachers would use concrete tools in learning environments for students with mathematics learning disorders and carry out activity-based instruction.

In the use of research skills related to the participants' readiness for the profession, it was observed that the participants used their research skills about the difficulties they may experience in the profession half and half. We can say that most of the participants who conducted research did not include specific learning disabilities in their research. In their study,

Korkut et al. (2016) stated that teachers need to gain new competencies in terms of their approaches and behaviors to students who need different special learning support as well as being able to use information and communication technologies effectively for educational purposes and that teachers should use research skills.

After the answers given by the participants, it was seen that almost all of the participants felt the need for research on individuals with dyscalculia in order to increase their awareness for individuals with dyscalculia, and it was seen that teachers tried to change their level of knowledge. In their review study, Kaçar and Düzkantar (2019) mentioned that the studies they examined were aimed at determining the situation and that they did not come across such a study that tried to establish the change in teachers' knowledge or attitude levels after the implementation, and this shows that the finding reached is intended to fill this gap in the literature.

In the suggestions section of the participants, it was seen that the majority of the participants mentioned research on this subject, and the other participants made suggestions such as the need for participation in interviews, the need for in-service training, the need to watch movies on the subject, the need to give homework, and the need to provide trainings. It can be said that the reason why pre-service teachers made these suggestions was that they could not give satisfactory answers to the questions in the semi-structured interview form. In their study, Baldemir et al. (2022) mentioned that the course on specific learning disabilities should be given at the university, digitalization in mathematics education should be in the curriculum, and information about dyscalculia should be given in TV series, movies and books to raise awareness about dyscalculia.

According to the results of the research, recommendations can be made for practice. Based on the findings;

1. It is foreseen that the newly graduated elementary mathematics teachers who participated in the research do not have enough information about dyscalculia, and even if they take a course on special education in their undergraduate education, this course does not provide detailed information about the learning disability (dyscalculia) in their field, so it is foreseen that a course called field-based mathematics learning disability should be given in undergraduate education. Because in terms of professional readiness, teachers should have knowledge about dyscalculia and after they start to work, according to the results of the literature

review, it can be said that the number of dyscalculic students is high and the probability of encountering these students in their professional lives is high.

2. Pre-service teachers may encounter individuals with dyscalculia in their internship practice, but they do not have the necessary knowledge and they do not know how to teach these individuals because they cannot identify that the students they encounter are individuals with dyscalculia, so pre-service teachers should be given practical training with individuals with dyscalculia.

3. In order to increase awareness about individuals with dyscalculia, teacher candidates should be given assignments to use research skills in their undergraduate education. Because prospective teachers should learn to use research skills in undergraduate education, make it a habit and continue to use these skills when they start working.

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APPENDIX: Semi-structured Interview Form

INTERVIEW QUESTIONS

1) Have you heard of the concept of specific learning disabilities?
- Can you explain if you have heard of it?

2) Do you know about the types of learning disabilities?
- Can you explain?

3) Have you heard of dyscalculia (math learning disability)?
- If yes, define.

4) Did you take a course on specific learning disabilities at the university you graduated from?
- Or have you participated in an informative event such as a talk, etc.?
- If you participated, do you think it added something to you?
- If you participated, did you also wonder and did you do any research to find out more information?

5) Have you ever thought about the difficulties you may experience in your profession (during your undergraduate education) and have you done any research on this subject?
- If you did, did you come across a specific learning disability?

6) Have you encountered an individual with special learning difficulties (dyscalculia) during your internship practice in your undergraduate education?
- If you have encountered or would have encountered, have you thought and researched what kind of training you would provide for this individual / Would you have researched?

7) If you had a dyscalculic individual in your class when you started your profession, could you identify the symptoms of a dyscalculic individual?
- If yes, what are the symptoms of dyscalculic individuals?

8) Do you know how to teach an individual with dyscalculia in your class?
- Explain.

9) After your answers, did you feel the need for a research on individuals with dyscalculia?

10) Do you have any suggestions or thoughts to add?