



Exploring Number Sense in Students with Dyslexia, Dyscalculia, and Dysgraphia

Original research article

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Abstract

This study examines number sense in students formally diagnosed with dyslexia, dyscalculia, and dysgraphia - specific learning difficulties that do not impact intelligence but affect reading, writing, and calculation. Five students completed a test of 33 tasks divided into six components that measure different aspects of number sense. The lowest performance was recorded in understanding the size and meaning of numbers (7%), while the best results were achieved in evaluating and comparing expressions without calculation (40%). Students were more successful when solving tasks set in an everyday context that allowed for assessment and logical reasoning, and did not require the technical execution of algorithms. The interviews further confirmed the importance of individual attention and support from teachers. These findings highlight the importance of functional, visually supported mathematics instruction, as well as systemic support for students with difficulties, in enabling them to learn mathematics in a more effective, meaningful, and motivating way.

Keywords: *dyscalculia, dysgraphia, dyslexia, learning difficulties, number sense*

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The concepts of number and counting have a special place in mathematical knowledge. Counting is one of the basic mathematical skills, which include: sorting,

comparing, sequencing, following a series of instructions, spatial orientation, visualization, visual grouping, pattern recognition, estimation, deductive thinking, and inductive thinking (Sharma, 2001). According to Vlahovic-Stetic et al. (2006), children

with typical development begin counting from the age of two and put the numbers in order - one, two, three, four... - thereby learning the sequence. Children who do not adopt these activities show signs of risk for difficulties in mathematics or the risk of dyscalculia. By the time they start school, children will adopt the above principles and mathematical knowledge through a series of informal procedures. Children with typical mathematical pre-skills will be able to associate numbers up to 10 with objects/quantities, and then connect with the appropriate symbols (Sinclair & Sinclair, 1986). Signs of deviation can be noticed through a series of tasks that are commonly used to assess counting when children come for a school enrollment examination (Jordan et al., 2006).

In any educational environment, it is easy to recognize that not all students learn at the same speed and do not have the same learning capacities. Students come to school with different skills and abilities that are shaped by a number of different factors. That is why the school system and teachers must adapt the teaching and approach to the needs of each child, because the right to education does not only mean attending school, but also the possibility for each child to learn in the way that suits them best.

The goal of this study is to examine number sense, as one of the basic mathematical skills, in children with single or combined learning difficulties (dyslexia, dyscalculia, dysgraphia), and to learn about their previous experiences with learning mathematics.

Difficulties in Learning Mathematics

Chinn and Ashcroft (2017) state that the causes of difficulties in mathematics are visual and spatial perception. Mathematical skills and knowledge acquired during the early years of schooling depend largely on attention and memory, and require a variety of strategies and ways of understanding problems (Krasa et al., 2022). Difficulty in acquiring counting is one of the first signs of mathematical difficulties (Geary, 2003).

Each learning disability has different characteristics and features, and manifests itself differently. The difficulties occur individually or in combination with other difficulties. Children with these learning disabilities have normal intelligence and,

with appropriate support, can make progress. Each learning disability is characterized by different symptoms that are different for each student. The symptoms of the disability can be mild, moderate, or severe, but students are generally able to learn and absorb information (Stepanovic & Ilic, 2025).

According to Lyon et al. (2003), dyslexia is a specific learning disability of neurobiological origin. It is characterized by difficulties with accurate word recognition, along with poor spelling and decoding skills. Students diagnosed with dyslexia demonstrate deficits in phonological processing that affect their reading, spelling, and writing skills. Although mathematics is a subject that involves numbers and symbols, students are required to read and understand mathematical instructions and textual tasks to complete mathematical problems. Therefore, students with dyslexia experience significant difficulties in mathematics due to poor reading and decoding skills.

Children with dyslexia often have messy and illegible handwriting, which can be seen in their work. They replace letters and syllables, and have difficulty expressing themselves in writing. They often cannot follow the years and events that happen, and it all depends on the level of dyslexia. They need more time to read than children without difficulties. Very often, while reading, they do not understand what they have read. All this affects the learning of mathematics. According to Chia (1998), the problems faced by students diagnosed with dyslexia are as follows:

1. Problems with auditory processing:
 - difficulty understanding or remembering learned information,
 - difficulty in correctly following multi-step directions or instructions (e.g., calculating sums in 2 or 3 steps),
2. Problems with visual processing:
 - difficulty remembering things they have recently seen (e.g., steps shown or models and diagrams used in class),
 - difficulty copying from the board (e.g., mathematical symbols and numbers),
 - difficulties in solving word-based mathematical problems, as well as specific topics, such as geometry and algebra,
3. Poor organizational skills:
 - inability to systematically organize materials,

- poor time management, resulting in tasks not being completed,
- tendency to messy writing and poor spatial skills,
- problems with reading comprehension and mathematics (e.g., word problems).

Dyscalculia is a broad term for severe difficulties in mathematics. Dyscalculia is also known as “number blindness”. It is defined as a cognitive disorder that manifests itself in impaired arithmetic abilities.

About 5% of primary school students have dyscalculia (Kaufmann & von Aster, 2012).

Children with dyscalculia stand out among children who consider mathematics a difficult subject. They differ from others in that they make many specific errors in the areas of comparing numbers, counting beyond ten, changing numbers, memorizing the multiplication table, changing the direction of solving problems, changing symbols, skipping steps in solving problems, poor memory, and many other computational actions. A student with dyscalculia can progress in understanding mathematical content, but significantly slower than his peers (Sharma, 2001).

Students with dyscalculia can become good experts in certain areas of science if the disorder is recognized and treated in time, but not in the area of mathematics. Early detection is the responsibility of parents, teachers, and professional associates. Learning can be made easier for students by increasing the space between letters and lines when writing, by marking important parts in the textbook, by ordering tasks from simpler to more complex, and by praising each effort and progress. Understanding students and good support from experts are crucial for the success and further development of the child.

The act of writing implies the knowledge, art, and skill of proper graphic design of letters. A disorder in the ability to write is denoted by the term dysgraphia. The main symptoms of dysgraphia are poorly formed letters, illegible handwriting, uneven font size, unfinished words, omitted words, and broken lines. In younger school-age students, the environment has a significant influence on the development of dysgraphia. Children with dysgraphia have messy handwriting, trouble learning to spell, difficulty expressing thoughts on paper, organizing and storing ideas, among many other writing challenges (Berninger & Wolf,

2009).

Bojanin (1985) defines dysgraphia as a child’s inability to master the skill of writing according to the spelling rules of a particular language. Posokhova (2007) defines dysgraphia as impaired or incomplete handwriting. According to Smits-Engelsman & Van-Galen (1997), students with dysgraphia do not progress in mastering the fine motor skills of writing even though they have sufficient education and practice.

The earlier the intervention for any form of learning disability begins, the better the results will be and the easier it is for the child to become independent. The parent is the main and key support for further action. Good results are expected with the involvement of a team of experts in providing help and support (Stepanovic & Ilic, 2025).

Number Sense

Number sense is difficult to define because it is not a single entity and has many dimensions. Number sense refers to a general understanding of numbers and operations with numbers, with the ability to develop useful, flexible, and effective strategies for solving numerical problems (Yang, 2003). According to Nickerson and Whitacre (2010), number sense can be described as a good intuition about numbers and their relationships. According to Yang et al. (2009), number sense becomes meaningful and valuable for students when teachers believe that developing number sense is more important than mastering the rules of written calculation.

Developed number sense has many advantages, both in learning mathematics in formal education and in everyday activities, like handling money, various measurements, estimations, etc. Attention from all parties, especially teachers, is essential to continue practicing and developing number sense by implementing effective constructivist-based learning approaches, so that the acquired concept becomes more meaningful (Yuniawatika, 2018).

In this study, a framework for analyzing number sense by McIntosh et al. (1997) was used. Their framework has three main components: numbers, operations, and computational settings, and every component is divided into two number sense strands. So, in total, there are six strands (smaller, more

specific components).

Component 1 is understanding the meaning and magnitude of numbers (number concepts). This component includes understanding the number system, place value, and comparing numbers to a standard or personal benchmark. Tasks to measure this component are, for example, *using each of the digits 2, 6, 3, 5, and 1 exactly once, form a 5-digit number closest to 30000*.

Component 2 is understanding and using equivalent forms and representations of numbers (multiple representations). This includes recognition that numbers can have different representations (fraction as decimal, number on number line, etc.), the ability to identify and reformulate numbers to produce an equivalent form, and the ability to decompose and recompose numbers for easier calculation. An example of a task to measure this component is: *Which of the following numbers is equivalent to $\sqrt{8}$: A. $\sqrt{4} \times 2$, B. $2\sqrt{2}$, C. $\sqrt{16}$, or D. $\sqrt{2} \times 4$.*

Component 3 is understanding the meaning and effect of operations (effect of operations). This component covers understanding the effect an operation has on numbers and judging the reasonableness of a result. Example of a task for measuring this component is: *When a positive four-digit number is added to another positive four-digit number, the result is: A. always a 4-digit number, B. always a 5-digit number, C. it can be a 3-digit or a 4-digit number, D. it can be a 4-digit or a 5-digit number, or, E. it can be a 4-digit, a 5-digit or a 6-digit number.*

Component 4 is understanding and using equivalent expressions (equivalent expressions). It implies translation of an expression to its equivalent form to evaluate or process computation more efficiently. An example of a task to measure this component is: *If 87×134 equals 11658, use this to find a result of 87×135 .*

Component 5 is calculation and counting strategies, which means applying different number sense components in the formulation and implementation of a solution process. An example of a task for this component is, *Number $\sqrt{2} \times 1.9$ is: A. less than 3, B. greater than 3, or C. it cannot be told without a calculator.*

Component 6 is measurement benchmarks, which includes applying different, previously mentioned number sense components in the formulation and

implementation of a solution process to a measuring situation. An example of a task is, *What is 0.4975×9428.8 equal to: A. 46.90828, B. 469.0828, C. 4690.828, or D. 46908.28.*

Methods

This study investigated number sense in students with learning disabilities, namely students diagnosed with dyslexia, dysgraphia, and dyscalculia, in the form of a multiple case study. The research aimed to examine number sense in students with an official diagnosis of dyslexia, dyscalculia, and/or dysgraphia, to determine the achievements in number sense in students with one or more associated diagnoses, and to survey students' satisfaction with the educational system and methods.

Participants

The research was conducted in the Sarajevo Canton, and five students in the final grades of primary and secondary schools participated. Out of five participants, there were two boys and three girls. Three participants had a diagnosis of dyslexia, one participant had a diagnosis with elements of dyslexia and dysgraphia, and one participant had a combined diagnosis of dyslexia, dysgraphia, and dyscalculia. Before testing and interviewing the respondents, permission to conduct the research was obtained from the competent Ministry of Education, along with written consent from the parents of the participants. The participants completed the number sense test in which the font Arial size 16 was used, which is recommended for students with such diagnoses (Khan et al., 2019). The time for completing the test was adjusted for each student in accordance with their abilities in reading speed, comprehension, understanding of tasks, etc. After the testing, an interview was conducted to determine the students' way of thinking, their approach to each task, and their motivation to possibly solve the task differently. The test results and the interviews served to provide certain recommendations for future work with students who have some of these learning difficulties.

Test Instrument

The test was developed for the purpose of a larger, cross-sectional study

on the development of number sense in primary and secondary school students. To begin with, a pilot test was developed that consisted of 42 tasks divided into the aforementioned components. It is important to mention that these tasks covered primary school mathematical content, i.e., they were appropriate for use at the end of primary school.

The tasks were reviewed in detail by a panel of experts consisting of five university professors in the field of education and/or number theory. The experts made suggestions in the form of replacing certain tasks and changing the text for clarity in others.

A revised version of the pilot test was administered to a sample of 58 high school graduates from one high school in Sarajevo. After reviewing and analyzing the tests, the item difficulties, item indices of discrimination, item-total correlation coefficients, and reliability coefficients were calculated. After eliminating items with poor values of the aforementioned coefficients and correcting items with borderline coefficient values, a new test of 33 items was obtained. The number of items per component is given in Table 1.

Table 1.
Components and Number of Tasks per Component in the Test

Components	Component name	Number of tasks
Component 1	Understanding the meaning and magnitude of numbers (number concepts)	6 tasks
Component 2	Understanding and using equivalent forms and representations of numbers (multiple representations)	7 tasks
Component 3	Understanding the meaning and effect of operations (effect of operations)	5 tasks
Component 4	Understanding and using equivalent expressions (equivalent expressions)	5 tasks
Component 5	Calculation and counting strategies	6 tasks
Component 6	Measurement benchmarks	4 tasks

In this research, the test was used to examine number sense in primary and secondary school students diagnosed with dyslexia, dyscalculia, and/or dysgraphia.

Interviews

After the test, an interview was conducted with each student. The duration of the interview depended on the student, i.e., from 15 minutes to 90 minutes. The students showed great interest in the conversation, probably because the test was interesting for them. The interview consisted of the following questions:

- How did you come to this solution?

- Can you explain your answer?
- How did you think about the task, and why did you approach it that way?
 - Could you do the task differently?
 - Is this how you solve tasks in class?
 - Have you done these types of tasks in class?
 - How did your teachers explain it to you?
 - How satisfied are you in general with the way your teachers explain and approach you?
 - Would you like a different approach?
 - Did you like the test and why?
 - Would you like to do this test again?

Results and Discussion

Test Results and Discussion

Performance results in percentages by component are shown in Table 2.

Table 2.

Percentage of Success by Components

Components	Component name	Percentage of correctly solved tasks
Component 1	Understanding the meaning and magnitude of numbers	7%
Component 2	Understanding and using equivalent forms and representations of numbers	12%
Component 3	Understanding the meaning and effect of operations	12%
Component 4	Understanding and using equivalent expressions	40%
Component 5	Calculation and counting strategies	26%
Component 6	Measurement benchmarks	20%

The results of the research on the first component showed that students with the aforementioned diagnoses had the greatest difficulty in understanding basic numerical concepts, which is evident from the low performance in the first component, 7%. Considering that this component tests the understanding of numbers and the sense of their order, magnitude, and relationships, it can be concluded that students generally

perform very poorly at estimating approximate numerical values, have a poor understanding of the place of digits in the decimal system, and have a poorly developed sense of the magnitude of numbers and their range.

Out of the five participants who did 6 tasks from this component, only two of them completed the task presented in Figure 1.

Figure 1.

Solution of one Task from Component 1 of one Student

Zadatak 1:

Imamo 5 cifara: 2, 6, 3, 5, 1. Koristeći svaku cifru tačno jednom, formirajte petocifren broj tako da bude što bliži broju 30 000.	<u>37256</u>
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Translation: The 5 digits are given: 2, 6, 3, 5, 1. Using each of the digits exactly once, form a 5-digit number closest to 30000.

This task required knowledge of multiple processes. Students had to understand what it means for a number to be close to 30000. They needed to understand that the first digit of a number has the greatest impact on its overall magnitude and to know how to arrange the digits so that the final number is as close as possible to the given value. Students with dyslexia, dyscalculia, and dysgraphia have difficulty estimating and

understanding the place of digits in a number. They do not have a developed strategy for the approximate value of numbers, and that is why this task was complicated for them. Students with dyslexia and dysgraphia generally do not have a developed sense for the visual organization of numbers, and this is one of the reasons for such poor results. In Component 2, which focused on multiple representations (understanding and using


equivalent forms and representations of numbers), students achieved a success rate of 12%, which was slightly higher than in

Component 1. Out of five students, three students correctly solved the task presented in Figure 2.

Figure 2.

Solution of one Task from Component 2 of one Student

Zadatak 11:

<p>Zaokružite decimalni broj koji najbolje predstavlja zasjenjeni dio pravougaonika.</p> 	<p>A. 0.018 <input checked="" type="radio"/> B. 0.15 C. 0.4 D. 0.801 E. 0.51</p>
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Translation: Circle a decimal number that represents the shaded part of the rectangle.

This task required students to identify the shaded part, which was approximately 15% (or 0.15 in decimal form), so these estimates gave them the opportunity to use visual intuition and logic. Most students used the principle of eliminating wrong answers. The option 0.018 was too small, 0.801 was too large, 0.4 was close to half, 0.51 was

slightly greater than half, and finally 0.15 was the closest to the shaded part of the rectangle, which was also the correct answer. In Component 3, effect of operations (understanding the meaning and effect of operations), students had the same success rate as in the second Component, i.e., 12%.

Figure 3.

Solution of one Task from Component 3 of one Student

Zadatak 14:

<p>Kada se pozitivan četverocifren broj sabere sa pozitivnim četverocifrenim brojem rezultat je:</p>	<p>A. Uvijek četverocifren broj B. Uvijek petocifren broj C. Može biti trocifren ili četverocifren broj <input checked="" type="radio"/> D. Može biti četverocifren ili petocifren broj E. Može biti četverocifren, petocifren ili šestocifren broj</p>
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Translation: When a positive four-digit number is added to another positive four-digit number, the result is: A. always a 4-digit number, B. always a 5-digit number, C. it can be a 3-digit or a 4-digit number, D. it can be a 4-digit or a 5-digit number, E. it can be a 4-digit, a 5-digit, or a 6-digit number

The solution of task 14 (Figure 3) showed that students with learning disabilities can demonstrate an understanding of mathematical relationships if the tasks are set conceptually clear. Two students solved this task correctly. Students who gave incorrect answers relied on the mechanical rule that a four-digit number plus a four-digit number must be a four-digit number without thinking about the limits of numbers. In the fourth component, equivalent expressions (understanding and using equivalent expressions), students demonstrated solid performance on certain tasks.

The overall achievement in this component was 40%, which is a good result compared to the other components. In the following task (Figure 4), all students answered correctly, prompting an inquiry into how they achieved such success and what strategies they applied. From the interview conducted with these students, it was concluded that some relied on the strategy of visual comparison and estimation, while others used calculation to get their answers. Only one student demonstrated the usage of number sense by noticing that the arithmetic mean of the numbers 134, 136, 138 and 140 is 137, and that their sum is equivalent to 137×4 .

Figure 4.

Solution of one Task from Component 4 of one Student

Zadatak 19:

Bez računanja zaokružite izraz koji predstavlja najveći rezultat.	A. $135 \cdot 4$ <input checked="" type="radio"/> B. $134 + 136 + 138 + 140$ C. $136 \cdot 4$
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Translation: Without calculating, circle the expression with the greatest result.

This result showed that students with learning disabilities can be very successful in tasks that are clearly formulated and require understanding rather than technical performance.

In Component 5, calculation and counting strategies (application of basic and alternative strategies), students had better results than in the first three components, but worse than in the fourth component, i.e., they had a 26% success rate. The task solved by four out of

Figure 5.

Solution of one Task from Component 5 of one Student

Zadatak 27:

Boca vode od 600 ml košta 0.70 KM, a boca vode od 1500 ml košta 1.50 KM.	Voda od 1500 ml
Koje pakiranje vode je isplativije (tj. nudi vodu po boljoj cijeni)?	

Translation: A 600 ml bottle of water costs 0.70 KM, while a 1500 ml bottle of water costs 1.50 KM. Which packaging of water is more cost-effective (i.e., offers water at a better price)?

five students is presented in Figure 5.

Students encountered similar situations in everyday life when buying water, juice, snacks, and they could conclude, without mathematical analysis, that a larger package was more cost-effective in this case. Without formal calculations, students arrived at the correct answer. In Component 5, students achieved a relatively good result, probably because the tasks were designed to describe specific life situations, enabling assessment, comparison, and the application of functional knowledge.

In Component 6, measurement

benchmarks (knowledge of basic units of measurement and relationships between them), five students worked on four tasks, and the total of four tasks was completed correctly. This represents a 20% success rate for this component (4 tasks completed correctly out of a total of 20 tasks completed). The tasks in this component encouraged estimation rather than precise calculation, and students used the strategy of rounding and estimation. The task presented in Figure 6, which was completed correctly by two students, was as follows:

Figure 6.

Solution of one Task from Component 6 of one Student

Zadatak 31:

Čemu je jednako $0.4975 \cdot 9428.8$:	A. 46.90828 B. 469.0828 C. 4690.828 D. 46908.28
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Translation: What is 0.4975×9428.8 equal to:

Interviews with students showed that one student randomly circled the answer under C, and another student recognized that 0.4975 represented approximately one-half. Measurement tasks often involved difficulties due to the need to know units and the relationships between them (kilograms, liters, meters). Very few students diagnosed with dyslexia, dyscalculia, and dysgraphia can recognize this type of estimation.

Results and Discussion

After testing, students were interviewed, providing valuable insight into their personal experiences, perception of mathematics, and the educational approaches that helped them the most.

When asked about their previous school and educational experience, most students emphasized how much it meant to them when teachers paid attention to them individually and when they had the opportunity to work in a small group or one-on-one. This approach contributed to the feeling of understanding, security, and motivated them to learn.

However, the issue of the teacher's workload and the possibility that other children in the class may not receive sufficient attention also arose. In this sense, students with learning difficulties were often dependent on the availability of teachers and their willingness to adapt teaching. These results are consistent with the research of Stepanovic and Ilic (2025), who report on the insecurity and the lack of external support felt by students with learning difficulties. This indicated a systemic need for the inclusion of assistants in the teaching process. The presence of an assistant would enable a balance between individual support and monitoring the needs of the whole class, and potentially improve the results of students with difficulties.

When asked about their general attitude towards mathematics, most participants disliked mathematics and did not feel competent to follow the lessons, which further reduced engagement and self-confidence. A significant statement was made by one student who stated that she "cannot visualize things in mathematics", which was a clear indicator of specific cognitive barriers. This inability to mentally visualize and abstractly represent numbers

and operations affected the understanding of mathematical concepts and led to the avoidance of mathematics as a subject.

The attitude towards the number sense test was interesting: students expressed interest in the test they took, stating that it was interesting and that they would like more similar tasks. This showed that tasks that were adapted to their abilities and presented in a less formal context could increase their involvement and positively affect their attitude towards mathematics.

During the interview process, students showed great motivation and interest in the conversation, which could be linked to the fact that the test was unusual for them, potentially more interesting than standard school tests, and that they were able to express their opinions more freely in a safe and relaxed environment. Students were willing to actively participate in interviews and demonstrate their abilities.

Regarding the differences between participants from primary and secondary school, no significant difference was observed, which may indicate the stability of difficulties, but also a lack of continuous support in later education. However, it was observed that students who reported having significant support at home and at school, and who were in a more attentive and supportive environment, achieved better results. This indicates the importance of a systemic approach, where the school, family, and local community work together in providing support to students with learning difficulties.

The students' responses showed a certain amount of self-confidence, especially when they completed the task. In some cases, they expressed dissatisfaction with teaching approaches that did not sufficiently take into account their difficulties. In terms of test comprehension, students generally had a positive attitude, especially when the tasks did not require intensive language processing.

Students showed significant difficulties in solving mathematical tasks. Their answers to questions such as "How did you arrive at the solution?" were often uncertain, disconnected, or intuitive. They showed significant anxiety when discussing mathematical content, as well as difficulties in recognizing strategies that would allow them to approach the problem differently. Students' experiences with teachers'

explanations were often negative, especially in situations where they were not provided with additional explanations or concrete visual support. Although some students showed interest in re-taking the tests, the general impression was that they needed more intensive support in mastering the basic concepts.

When asked about their previous experience with such tasks, most students stated that similar tasks rarely appeared in class and that they did not fully understand them. When talking about teachers and their approach, the responses varied: while some students emphasized support and understanding, others stated that they felt pressured, misunderstood, or that their difficulties were often ignored.

The interview as a method proved to be extremely useful in revealing the real levels of understanding and insight of students, and confirmed the importance of a constructive and inclusive approach in education. Further work with these students should include more creative forms of teaching, greater appreciation of different forms of learning, and greater openness to innovative and more modern ways of assessing knowledge.

Conclusion

This study on number sense in students with diagnoses of dyslexia, dyscalculia, and dysgraphia shows that they have significant difficulties in mastering basic mathematical concepts, especially those that require abstract thinking, symbolic understanding, and precise arithmetic operations. The difficulties are particularly reflected in poor performance in components that required precise numerical processing (Components 1, 2, and 3). On the other hand, the best results were achieved in components where tasks allow assessment, logical thinking, and application in everyday contexts (Components 4 and 5), indicating the importance of functional mathematics and the need to design tasks that emphasize understanding rather than relying exclusively on formal algorithms. Students demonstrate the ability to use elimination, estimation, and comparison strategies, especially when tasks are clearly formulated and related to real-life situations. The analysis also reveals that students often misinterpret decimal numbers

and orders of magnitude, which affects their answers even when they recognize the basic logic of the task.

From the students' interviews, it is clear that an individual approach, emotional support, and a good relationship with teachers play a key role in shaping their attitude towards mathematics. Although the students express low self-confidence and mostly a negative attitude towards mathematics, they also show interest in interactive and accessible approaches to learning. The inclusion of teaching assistants, strengthening cooperation between the school and the family, as well as developing methods that combine visual, practical, and real-life examples, can be of crucial importance for their progress. The interviews confirm that, alongside cognitive factors, the emotional climate, instructional methods, and learning environment significantly impact the success of students with dyslexia, dyscalculia, and dysgraphia - highlighting a direction in which the school system should intensify its efforts. All of this highlights the need to allocate more time in teaching to developing number sense through visual, practical, and contextual tasks, to enable students with learning difficulties to experience mathematics as understandable, usable, and achievable.

The findings of this study provide a foundation for future research on number sense in students diagnosed with dyslexia, dyscalculia, and dysgraphia. Both test outcomes and interview results highlight the importance of visual representation and real-life contextualization, suggesting that these elements should serve as a basis for the development of new intervention strategies and instructional programs. During interviews, students were more relaxed and expressed clear issues with the written forms of examination. This indicates a need for further investigation into the differences in student performance and achievement across written and oral modes of assessment.

The results also demonstrate that a negative attitude toward mathematics does not have to be an insurmountable obstacle if the instruction is adapted both emotionally and methodically. Recommendations emerging from this study include increased teacher support, the involvement of classroom assistants, small-group or individualized instruction,

supplementary explanations, the use of visual representations, the incorporation of tasks situated in real-life contexts, and the application of oral examination.

The study highlights that not all components of number sense are equally challenging for students with dyslexia, dyscalculia, and dysgraphia. This suggests the need for the development of more targeted and component-specific tests to identify the precise areas in which students experience challenges. A deeper understanding of the specific number sense difficulties encountered by students with learning difficulties could inform the design of more effective and evidence-based intervention programs.

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