Prisma Sains: Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram
https://e-journal.undikma.ac.id/index.php/prismasains/index
e-mail: prismasains.pkpsm@gmail.com

July 2024. Vol. 12, No. 3
p-ISSN: 2338-4530
e-ISSN: 2540-7899
pp. 489-499

Mathematical Identity of Students with Dyscalculia Tendency

*** Resminati Dinda Salisa, Meiliasari, Anny Sovia**
Master of Mathematics Education, Faculty of Mathematics and Natural Sciences, Jakarta State University. Jl. Rawamangun Muka Raya, Rawamangun, East Jakarta 13220, Indonesia

*Corresponding Author e-mail: resmidinda@gmail.com

Received: June 2024; Revised: June 2024; Published: July 2024

Abstract

This study aimed to investigate the factors that contribute to the formation of mathematical identity in students with a tendency towards dyscalculia. By understanding the mathematical identity of these students, we can gain insights into their interest in mathematics and identify appropriate interventions to meet their learning needs. This research followed a case study design and employed Creswell's model, which consists of six stages, for data analysis. The participants in this study were six junior high school students who displayed a tendency towards dyscalculia, as determined by the Dyscalculia Checklist. Of these students, three had a high tendency, two had a medium tendency, and one had a low tendency towards dyscalculia. A questionnaire was used to measure the participants' mathematical identity, which was categorized into three groups: three students had a positive mathematical identity, two students had a neutral identity, and one student had a negative identity. Six distinct components, namely the importance of mathematics, motivation, strategy, opportunity, obstacles, and the ability to perform, all played a unique role in shaping the students' mathematical identity. While these components, as well as the students' level of dyscalculia tendency, could influence their mathematical identity, it is crucial to acknowledge that the students' environment, both at school and at home, also contributed significantly to the development of their mathematical identity.

Keywords: Dyscalculia; Mathematical Identity

How to Cite: Salisa, R., Meilliasari, M., & Sovia, A. (2024). Mathematical Identity of Students with Dyscalculia Tendency. *Prisma Sains : Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram, 12*(3), 489-499. doi:https://doi.org/10.33394/j-ps.v12i3.11870

https://doi.org/10.33394/j-ps.v12i3.11870

Copyright© 2024, Salisa et al.
This is an open-access article under the CC-BY License.

INTRODUCTION

Mathematicsplays a crucial role in human existence, both in its pure form and in its applications to other fields. It holds a unique position in education because it is taught to students of all ages and grade levels (Ernest, 2018). The advancements in mathematical knowledge, particularly in the realms of science, technology, and engineering, have contributed to longer, healthier, and better-educated lives for a larger portion of the population (Ernest, 2018). This trend has become increasingly prominent over the past two centuries. Moreover, since mathematics is utilized in everyday life, the mathematical concepts that students learn in school can have a profound impact on their lives (Aprinastuti et al., 2020; Ernest, 2018; Kißler et al., 2021; Kunwar, 2021; Lazo-Amado et al., 2022; Liu et al., 2022; Ziadat, 2022). Therefore, it is essential for students to understand and master fundamental mathematical principles in order to lead more comfortable lives. Unfortunately, a substantial proportion of students, ranging from 6% to 8%, experience difficulties in learning mathematics, which can hinder their understanding of basic mathematical concepts (Fauzan et al., 2022; Lazo-Amado et al., 2022; Patricia & Zamzam, 2021).

Dyscalculia, commonly referred to as mathematical learning disability, specifically affects the comprehension and manipulation of numerical concepts (Salisa & Meiliasari, 2023). Students with dyscalculia typically exhibit below-average mathematical abilities, as evidenced

by their struggles with basic arithmetic operations, leading to difficulties in comprehending and applying various mathematical concepts (Firmasari et al., 2021; Gut et al., 2021; Onyishi & Sefotho, 2021). This disability can have a significant impact on various aspects of students' lives. For instance, their limited understanding of numerical values can hinder their ability to comprehend the monetary worth of the currency they use on a daily basis. Additionally, poor academic performance can negatively affect their motivation, self-confidence, and perception of mathematics (Kunwar, 2021; Lewis et al., 2022; Noordin et al., 2020; Vigna et al., 2022). Consequently, these factors can influence the mathematical identity of students with dyscalculia.The concept of identity is a significant connection between the educational environment and cultural context. Previous research has used mathematical identity as a tool to investigate individuals' relationships with mathematics (Kaspersen & Ytterhaug, 2020), which can influence their future choices based on these relationships (Cass et al., 2011). Mathematical identity refers to an individual's self-understanding and how others build upon it in the context of mathematics. This can be evaluated through interviews (Hima et al., 2019; Martin, 2000) and questionnaires (Kaspersen et al., 2017; Kaspersen & Ytterhaug, 2020). Mathematical identity is developed alongside school learning and provides an overview of the interaction between students and mathematics (Hima et al., 2019). Understanding the mathematical identity of students with dyscalculia can offer insights into their interest in mathematics (Astuti et al., 2022) and aid in identifying interventions that can meet their learning needs (Hima et al., 2019).

A study by Hima et al. (2019) demonstrated that educational interventions aimed at enhancing students' motivation to learn can alter their mathematical identity. Furthermore, another study found that the mathematical identity of students with dyscalculia may influence their perceptions of mathematics (Astuti et al., 2022). Although previous studies have explored methods to improve mathematical identity and its impact on individuals' perspectives on mathematics, this study intends to examine the components that contribute to the development of mathematical identity in students with a tendency towards dyscalculia. The study will adopt Martin's components of mathematical identity, which encompass (Martin, 2000): (1) the importance of mathematics, (2) motivation, (3) strategy, (4) opportunity, (5) obstacle, and (6) capacity to do. Additionally, this study will investigate how the mathematical identity of these students is formed.

METHOD

The research method employed in this study was qualitative research, specifically a case study approach. The study utilized Creswell's research design, which prioritizes the research question and its practicality. Figure 1 was overview the study's methodological framework. This study focused on analyzing the case of students displaying tendencies of dyscalculia. The selection of participants was based on their final semester exam scores and daily test scores. Specifically, students who scored in the lowest 8th percentile were chosen, and their performance was assessed to determine if they consistently achieved low scores based on two consecutive daily test scores. Participants were selected based on the prevalence rate of dyscalculia, which is 8% (Ardila & Rosselli, 2002; Shalev, 2004), and the defining characteristic of dyscalculia, which is a persistent struggle with mathematics throughout the school year rather than limited to a specific mathematical concept (Lewis et al., 2022; Vigna et al., 2022). The study was conducted at a private junior high school in Bogor with 192 seventh-grade students, out of which 16 students fell into the lowest eight percentile. Based on two consecutive daily test scores, six students were selected as participants.

The study was carried out over a one-month research period. Three research instruments were utilized: the Dyscalculia Checklist, the mathematical identity questionnaire, and interview guidelines. The Dyscalculia Checklist consisted of 19 modified items adapted from the original questionnaire developed by Chinn (2020). Chinn's Dyscalculia Checklist initially comprised 31 items, which were modified considering the circumstances of students in Indonesia. The

validity of the Dyscalculia Checklist was assessed by experts in psychology, mathematics, and Bahasa Indonesia, while its readability and reliability were evaluated by four junior high school math teachers, confirming its appropriateness for research purposes. The researcher filled out this questionnaire based on information gathered from the six selected participants to determine their level of dyscalculia tendency.

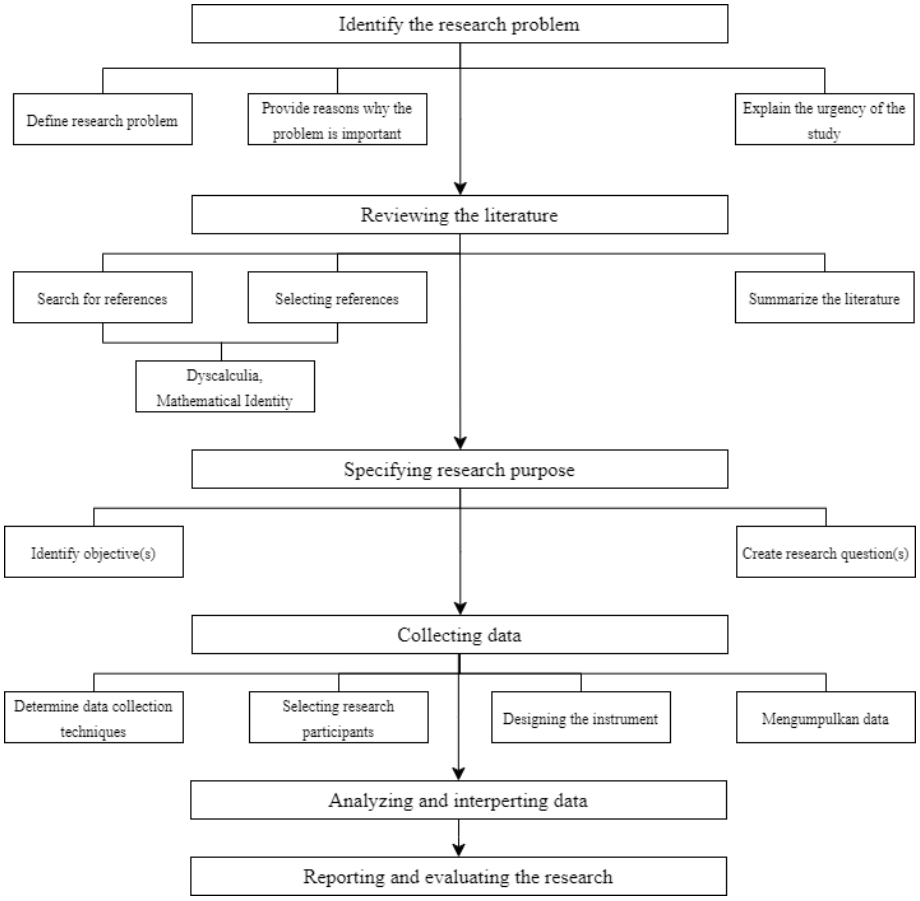

Figure 1. Research Framework

The Dyscalculia Checklist utilized a Likert interval scale of 1-4, with a rating of one indicating "never," two indicating "sometimes," three indicating "often," and four indicating "always." Scores obtained from the questionnaire were then totaled and categorized into three severity levels based on guidelines provided by the American Psychiatric Association (2013), which were adjusted to suit the needs of this study. The subsequent section outlines the interpretation of the categorization for students displaying tendencies of dyscalculia (Table 1). The mathematical identity questionnaire was administered to assess the mathematical identity of the participants in this study.

Table 1. Dyscalculia Tendency Categories

Category	Score
High tendency	$57 \leq a$
Medium tendency	$38 \leq a < 57$
Low tendency	$a < 38$

The questionnaire consisted of 20 items and was adapted from two previous questionnaires: one by Kaspersen and Ytterhaug (2020) and another by Ikram and Rosidah (2023). According to Martin (2000), the mathematical identity questionnaire used in this study measures six components. The following Table 2 provides a description of these components, as well as the questionnaire items utilized to measure participants' mathematical identity.

Table 2. Mathematical Identity Questionnaire Items

Mathematical Identity Components	Description	Questionnaire Items
The importance of mathematics	About significance of mathematics for students	I think math is very important to learn I like math lessons I can use math in my daily life I only learn math at school*
Motivation	About one's reason to engage in mathematical activity	I enjoy studying math at home I like to discuss math problems given by the teacher with my friends at school I always try to do the problems given by the teacher even though my answers are wrong
Strategy	About the strategies and preferred approaches for solving mathematical tasks	When the teacher explains how to solve a problem and I have difficulty with that method, I try to find another way to solve it When I learn a new way of solving a problem and I have a difficulty understanding it, I try to study it until I understand I am not afraid to discuss with my friends if I have difficulties I prefer if the teacher tells me how to solve the problem when solving math problems*
Opportunity	About the chance to engage in the context of mathematics	My parents encourage me to study at home I have enough time to study math at home The teacher gives me the opportunity to ask question if I do not understand the material
Obstacles	About the challenges encountered while engaging in the context of mathematics	I often struggle when it comes to solving math problems* If I can't solve a given problem, I ask a friend or teacher I always have a doubt whenever I have to solve math problems*
Capacity to do	About the ability to capitalize on learning opportunities	I can explain the solution to a problem I have solved I find math difficult* I have enough mathematical knowledge to be used in everyday life

A Likert scale interval of 1-4 was employed as the measurement scale for the mathematical identity questionnaire. The questionnaire comprises two types of statements: positive and negative. Positive statements carry a weight of one for strongly disagree, two for disagree, three for agree, and four for strongly agree. Meanwhile, negative statements carry a weight of one for strongly agree, two for agree, three for disagree, and four for strongly disagree. The scores obtained from the questionnaire were then summed up and used to categorize the students into three distinct classifications, with reference to the classification system developed by Ikram and Rosidah (2023). For further details about the categorization of students' mathematical identity, please refer to Table 3. Additionally, Figure 2 presents a graphical representation guide of students' mathematical identity.

Table 3. Mathematical Identity Categories

Category	Score
Positive	$60 \leq a$
Neutral	$40 \leq a < 60$
Negative	$a < 40$

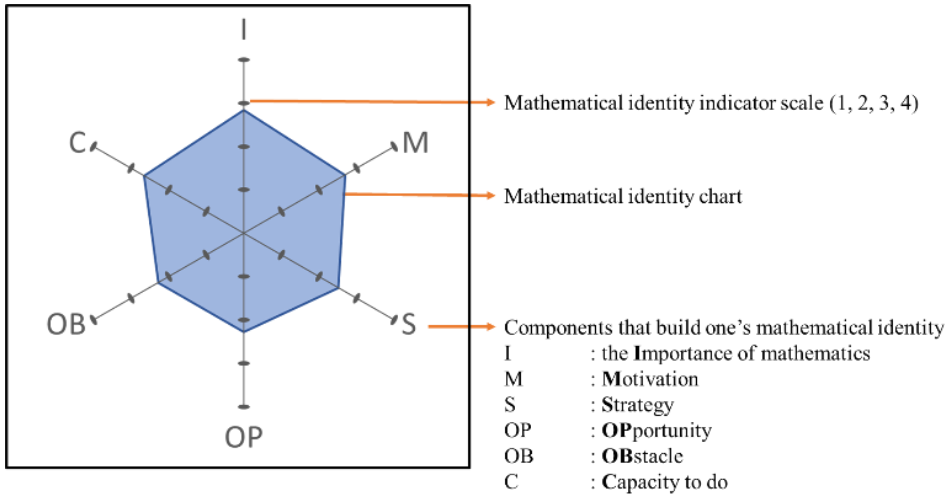

Figure 2. Mathematical Identity Representation Graph

To validate the participants' responses, interviews were conducted. The data analysis process in this study followed the Creswell model, which comprises six stages: (1) organizing and preparing the data for analysis, involving sorting and preparing the raw data; (2) reading through all the data to assess credibility; (3) conducting a detailed analysis through coding, whereby participants' responses were analyzed and coded based on their dyscalculia tendency and mathematical identity; (4) generating descriptions based on the coding process, resulting in descriptions of each participant's mathematical identity; (5) enhancing the representation of descriptions and topics through qualitative narrative; and (6) interpreting each participant's mathematical identity based on the preceding stages.

RESULTS AND DISCUSSION

Based on the completed Dyscalculia Checklist, three participants exhibited a high tendency towards dyscalculia, two participants showed a medium tendency, while one participant had a low tendency. Table 4 presents the dyscalculia tendencies for the nine participants.

Table 4. Participants' Dyscalculia Tendency Level

Participant Code	Score	Dyscalculia Tendency Level
S1	69	High
S2	41	Low
S3	63	High
S4	56	Medium
S5	54	Medium
S6	58	High

Based on the participants' responses to the mathematical identity questionnaire, it was found that three participants had a positive mathematical identity, two had a neutral mathematical identity, and one had a negative mathematical identity. The mathematical identities of the participants, along with their corresponding graphical representation, are presented in Table 5.

Table 5. Participants' Mathematical Identity

Participant Code	Score	Mathematical Identity Category
S1	44	Negative
S2	60	Positive
S3	58	Neutral
S4	48	Neutral
S5	60	Positive
S6	58	Positive

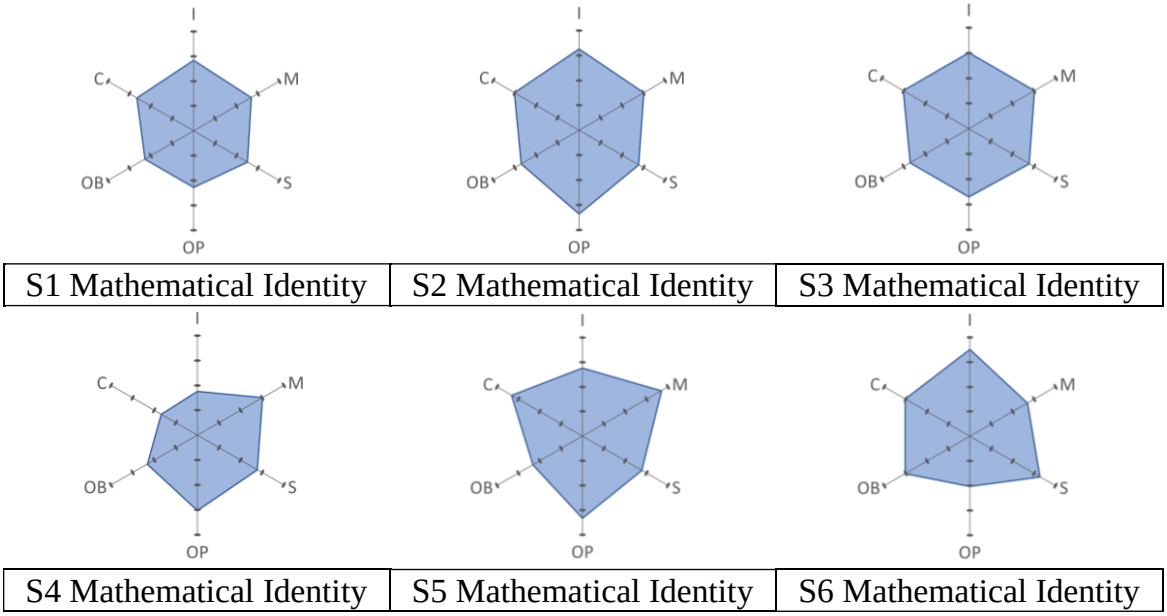

Figure 3. Participants' Mathematical Identity Representation Graph

In Figure 3, it is evident that as the graph area increases, the participant's mathematical identity tends to lean towards positive values. Conversely, as the graph area decreases, the participant's mathematical identity tends to incline towards negative values. For instance, the S1 graph exhibits the smallest area, indicating a negative mathematical identity, whereas the S2 graph demonstrates one of the largest areas, indicating a positive mathematical identity.

S1 Mathematical Identity

Based on the results obtained from the Dyscalculia Checklist and mathematical identity questionnaire, it was determined that S1 exhibited a significant inclination towards dyscalculia and possessed a negative mathematical identity. Notably, S1 obtained a below-average score in all aspects of mathematical identity, with the dimension of the perceived importance of mathematics receiving the lowest average score. This pattern may suggest that S1 views mathematics as lacking significance, deeming it only useful within the confines of an educational setting. These findings were further substantiated through interviews conducted with S1 (Table 6).

Table 6. Interview Snippet with S1

Q	:	Do you think it is important to learn math at school?
S1	:	Not really.
Q	:	Then, can you learn it outside of school?
S1	:	I do not think so.
Q	:	Do you think math can be used in everyday life?
S1	:	Yes, but I don't think there are many things that involve math in everyday life.

Since S1 did not consider math to be important, this may have contributed to their lack of motivation and belief in their ability to learn and apply math effectively. Consequently, they tended to give up easily when faced with challenging math problems. Despite feeling that the teacher had provided opportunities for better comprehension of math, S1 still found their parents' assistance to be inadequate. The challenges S1 encountered in their math journey could explain their negative mathematical identity, particularly due to the perceived lack of support from the environment in promoting a deeper understanding and engagement with mathematics.

S2 Mathematical Identity

Based on the results obtained from both the Dyscalculia Checklist and the mathematical identity questionnaire, it can be concluded that S2 exhibits a low propensity for dyscalculia and possesses a favorable mathematical identity. This can be attributed to the significantly elevated average scores obtained for each component. Moreover, it is evident from the interviews conducted with S2 (refer to Table 7) that they possess a firm grasp of the significance of mathematics and are provided with ample opportunities to acquire and employ mathematical skills.

Table 7. Interview Snippet with S2

Q	:	Do you think it is important to learn math at school?
S2	:	Yes, I do think it is important to learn math at school because we need it in our everyday lives, like when I buy something at the store.
Q	:	Is the math you learn at school and the math you use in your daily life different?
S2	:	Maybe, but the math I use in my daily life is much easier, just addition, subtraction, and multiplication, it is not difficult like what we are taught at school.

S2 faced numerous challenges during their journey of learning mathematics. However, they displayed a commendable willingness to seek assistance from their peers or teachers whenever needed. Unfortunately, they were prone to giving up easily when encountering particularly difficult mathematical concepts. Nevertheless, their perseverance in seeking help and support from their immediate environment to actively participate in mathematics, coupled with their recognition of the significance of mathematics in everyday life, likely contributed to the development of their positive mathematical identity.

S3 Mathematical Identity

Based on the findings obtained from the Dyscalculia Checklist and the questionnaire assessing mathematical identity, it can be concluded that S3 exhibits a strong inclination towards dyscalculia and maintains a neutral stance towards mathematics. S3 perceives mathematics as an indispensable component of life, albeit primarily as a subject to be pursued within an academic setting. In their approach to mathematics, S3 demonstrates confidence by effectively solving problems posed by teachers and seeking assistance from peers when required. The participant's perspectives are substantiated through interviews, as depicted in Table 8.

Table 8. Interview Snippet with S3

Q	:	Do you think it is important to learn math at school?
S3	:	Yes, because we can use it in our daily life, but I do think it is too difficult to learn.
Q	:	If you think it is difficult, is it hard for you to learn it?
S3	:	Yes, it is, but I can just ask my friends to help me solve the problems from the teacher.
Q	:	Did you also ask your teacher if you cannot solve the problem?
S3	:	I did not, I am more comfortable to ask my friends.

S3's difficulty in learning and understanding mathematics can be attributed to the perception of this subject as complex and challenging. Despite S3's clear presence of

dyscalculia, the environment surrounding her may have diminished her perception of mathematics as excessively intimidating.

S4 Mathematical Identity

Based on the findings derived from the Dyscalculia Checklist and mathematical identity questionnaire, it was determined that S4 exhibited a moderate inclination towards dyscalculia, while their mathematical identity remained neutral. S4 displayed a satisfactory level of motivation to actively participate in mathematics within the educational context and received adequate support from their immediate environment to facilitate their mathematical learning. However, S4 maintained the standpoint that mathematics is primarily relevant within the confines of the classroom and does not bear practical significance in their daily life. This assertion is substantiated by the insights obtained from the interview conducted with S4, as evidenced in Table 9.

Table 9. Interview Snippet with S4

Q	:	Do you think it is important to learn math at school?
S4	:	Maybe, because we have to learn it from the time we were in elementary school.
Q	:	Then, do you think you can learn it outside of school?
S4	:	Math is hard, why do we have to learn it again outside of school?
Q	:	Do you think math can be used in everyday life?
S4	:	I do not know

S4 acknowledged the potential of seeking assistance from friends or teachers in order to understand mathematics and persisted in their efforts to comprehend it. However, they consistently perceived mathematics as a challenging subject and lacked confidence in their own mathematical abilities. As a result, these factors may have contributed to S4's mathematical identity being categorized as neutral.

S5 Mathematical Identity

Based on the results of the Dyscalculia Checklist and the mathematical identity questionnaire, it was determined that S5 exhibited a moderate tendency towards dyscalculia and possessed a positive mathematical identity (Table 10). Among all the participants, S5 displayed the highest level of motivation and demonstrated a strong desire to excel in mathematics. While they still perceive mathematics as a subject primarily taught in school, they do acknowledge its application in their daily lives.

Table 10. Interview Snippet with S5

Q	:	Do you think it is important to learn math at school?
S5	:	Maybe.
Q	:	Do you think you can learn it outside of school?
S5	:	I do not think so.
Q	:	Do you think math can be used in everyday life? If so, where can we use it?
S5	:	I think that math can be used in everyday life, for example when we buy food in the canteen.

S5 exhibited a limited enthusiasm towards engaging with difficult mathematical concepts. Nonetheless, they were receptive to seeking assistance from their peers in order to enhance their comprehension of such concepts. S5 expressed a belief that the teacher did not offer sufficient opportunities for them to ask questions, which explains their preference for seeking help from their friends. The development of a positive mathematical identity in S5 can be attributed to the synergy between their strong motivation and a supportive learning environment for mathematics.

S6 Mathematical Identity

Based on the results of the Dyscalculia Checklist and the mathematical identity questionnaire, it can be concluded that S6 shows a high tendency towards dyscalculia, while also having a positive mathematical identity. S6 demonstrates a profound comprehension of the significance of mathematics and possesses the ability to actively pursue further understanding when necessary. Although they recognize that their current level of comprehension may not align with the mathematical concepts typically taught in school, they express a strong willingness to seek assistance until they have a comprehensive grasp of the subject matter. This assertion is supported by the findings from the interview conducted with S4, as illustrated in Table 11.

Table 11. Interview Snippet with S6

Q	:	Do you think it is important to learn math at school?
S6	:	Yes
Q	:	Why do you think it is important to learn?
S6	:	Because it can help me in my everyday life
Q	:	Can you describe how math can help you in your daily life?
S6	:	For example, when I assist my parents in serving customers at the store, I must be able to accurately calculate the change for each customer.
Q	:	Is the math you learn at school and the math you use in your daily life different?
S6	:	Yes, the mathematics I learn at school is harder. I often do not understand what the teacher was explaining.

S6 students express a lack of sufficient opportunities to develop a deep understanding of mathematics, particularly in their home environment. This may contribute to their relatively low motivation to engage with the subject. However, despite their high tendency towards dyscalculia, S6 students still possess a positive mathematical identity, likely driven by their recognition of the importance of mathematics in their daily lives and their need to acquire basic proficiency in the subject.

The mathematical identity of each participant is influenced by various factors, including their perception of mathematics and their level of dyscalculia tendency. Dyscalculia can impact students' experiences with mathematics, potentially shaping their mathematical identity. However, it is important to note that a high dyscalculia tendency does not always result in a negative mathematical identity. For instance, participants S1 and S6 both exhibit a high dyscalculia tendency but have contrasting mathematical identities. Their perception of the significance of mathematics greatly influences their mathematical identity. Furthermore, the surrounding environment plays a significant role in shaping participants' perspectives on the importance of mathematics. While not a direct component of mathematical identity, the environment exerts a strong influence on participants' mathematical identity. This aligns with Martin's perspective, which suggests that an individual's mathematical identity is not solely constructed by themselves but is also influenced by the individuals in their social circle (Martin, 2000).

CONCLUSION

While an individual's propensity for dyscalculia and each aspect of their mathematical identity can influence their overall mathematical identity, it is imperative to underscore the significant role played by the environment in shaping this identity.

RECOMMENDATION

The scope of this study was restricted to the examination of the mathematical identity of students displaying a tendency towards dyscalculia. Future research is expected to explore the connection between mathematical identity and dyscalculia tendency, as well as their subsequent influence on students' mathematical aptitude.

REFERENCES

American Psychiatric Association (Ed.). (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (5th ed). American Psychiatric Association.

Aprinastuti, C., Anggadewi, B. E. T., Suharno, R., & Wiyantari, W. (2020). Development of mathematics manipulative for slow learner and dyscalculia student in elementary school by using Montessori's characteristic. *Journal of Physics: Conference Series*, *1663*(1), 012065. https://doi.org/10.1088/1742-6596/1663/1/012065

Ardila, A., & Rosselli, M. (2002). Acalculia and dyscalculia. *Neuropsychology Review*, *12*(4), 179–231. https://doi.org/10.1023/A:1021343508573

Astuti, R. N., Subanji, S., & Rahardi, R. (2022). Identitas matematis: Studi kasus pada siswa dyscalculia. *Jurnal Kajian Pembelajaran Matematika*, *6*(1), Article 1. https://doi.org/10.17977/um076v6i12022p11-21

Cass, C. A. P., Hazari, Z., Cribbs, J., Sadler, P. M., & Sonnert, G. (2011). Examining the impact of mathematics identity on the choice of engineering careers for male and female students. *2011 Frontiers in Education Conference (FIE)*, F2H-1-F2H-5. https://doi.org/10.1109/FIE.2011.6142881

Chinn, S. J. (2020). *More trouble with maths: A complete manual to identifying and diagnosing mathematical difficulties* (Third edition). Routledge.

Ernest, P. (2018). *The Ethics of Mathematics: Is Mathematics Harmful?* (pp. 187–216). https://doi.org/10.1007/978-3-319-77760-3_12

Fauzan, A., Andita, C. D., Rada, G., Zafirah, A., & Abdullah, A. H. B. (2022). Developing RME-based learning trajectory for teaching addition to a dyscalculia student in elementary school. *Jurnal Didaktik Matematika*, *9*(1), 39–58. https://doi.org/10.24815/jdm.v9i1.25340

Firmasari, S., Herman, T., & Kusuma Dewi, I. L. (2021). Dyscalculia: Mathematical difficulties in the concept of multiplication using word problems. *Jurnal Inspirasi Pendidikan*, *11*(2), 113–121. https://doi.org/10.21067/jip.v11i2.5852

Gut, M., Goraczewski, Ł., Finc, K., Matulewski, J., Walerzak-Więckowska, A., & Duch, W. (2021). Number line estimation strategies used by children with dyscalculia and typically developing controls. *Przegląd Psychologiczny*, *64*(3). https://doi.org/10.31648/pp.7330

Hima, L. R., Nusantara, T., Hidayanto, E., & Rahardjo, S. (2019). Changing in mathematical identity of elementary school students through group learning activities. *Lnternational Electronic Journal of Elementary Education*, *11*(5), 461–469. https://doi.org/10.26822/iejee.2019553342

Ikram, F. Z., & Rosidah, R. (2023). Identitas matematis: Studi kasus pada mahasiswa akuntansi. *SIGMA: JURNAL PENDIDIKAN MATEMATIKA*, *15*(1), Article 1. https://doi.org/10.26618/sigma.v15i1.10928

Kaspersen, E., Pepin, B., & Sikko, S. A. (2017). Measuring STEM students' mathematical identities. *Educational Studies in Mathematics*, *95*(2), 163–179. https://doi.org/10.1007/s10649-016-9742-3

Kaspersen, E., & Ytterhaug, B. O. (2020). Measuring mathematical identity in lower secondary school. *International Journal of Educational Research*, *103*, 101620. https://doi.org/10.1016/j.ijer.2020.101620

Kißler, C., Schwenk, C., & Kuhn, J.-T. (2021). Two Dyscalculia Subtypes With Similar, Low Comorbidity Profiles: A Mixture Model Analysis. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.589506

Kunwar, R. (2021). Impacts of dyscalculia in learning mathematics: Some considerations for content delivery and support. In *Learning Disabilities—Neurobiology, Assessment, Clinical Features and Treatments*. IntechOpen. https://doi.org/10.5772/intechopen.99038

Lazo-Amado, M., Cueva-Ruiz, L., & Andrade-Arenas, L. (2022). Prototyping a mobile application for children with dyscalculia in primary education using augmented reality.

International Journal of Advanced Computer Science and Applications, *13*(10). https://doi.org/10.14569/IJACSA.2022.0131085

Lewis, K. E., Sweeney, G., Thompson, G. M., Adler, R. M., & Alhamad, K. (2022). Dyscalculia in algebra: A case study. *Insights into Learning Disabilities*, *19*(1), 3–36.

Liu, S., Cheng, C., Wu, P., Zhang, L., Wang, Z., Wei, W., Chen, Y., & Zhao, J. (2022). Phonological Processing, Visuospatial Skills, and Pattern Understanding in Chinese Developmental Dyscalculia. *Journal of Learning Disabilities*, *55*(6), 499–512. https://doi.org/10.1177/00222194211063650

Martin, D. B. (2000). *Mathematics success and failure among African-American youth: The roles of sociohistorical context, community forces, school influence, and individual agency* (1st ed.). Routledge. https://doi.org/10.4324/9781410604866

Noordin, M., Bahrin, U., Hamzah, S., & ... (2020). Mathematics courseware for dyscalculia students (MCDYs). *E-Academia …*, *Query date: 2023-05-23 11:36:00*. https://myjms.mohe.gov.my/index.php/JeA/article/view/11519

Onyishi, C., & Sefotho, M. (2021). Differentiating instruction for learners' mathematics self-efficacy in inclusive classrooms: Can learners with dyscalculia also benefit? *South African Journal of Education*, *41*(4), 1–15. https://doi.org/10.15700/saje.v41n4a1938

Patricia, F. A., & Zamzam, K. F. (2021). Development of scientific approach-based interactive multimedia for elementary school dyscalculia children. *Jurnal Prima Edukasia*, *9*(1). https://doi.org/10.21831/jpe.v9i1.33853

Salisa, R. D., & Meiliasari, M. (2023). A literature review on dyscalculia: What dyscalculia is, its characteristics, and difficulties students face in mathematics class. *Alifmatika: Jurnal Pendidikan Dan Pembelajaran Matematika*, *5*(1), Article 1. https://doi.org/10.35316/alifmatika.2023.v5i1.82-94

Shalev, R. S. (2004). Developmental dyscalculia. *Journal of Child Neurology*, *19*(10), 765–771. https://doi.org/10.1177/08830738040190100601

Vigna, G., Ghidoni, E., Burgio, F., Danesin, L., Angelini, D., Benavides-Varela, S., & Semenza, C. (2022). Dyscalculia in early adulthood: Implications for numerical activities of daily living. *Brain Sciences*, *12*(3), 373. https://doi.org/10.3390/brainsci12030373

Ziadat, A. H. (2022). Sketchnote and working memory to improve mathematical word problem solving among children with dyscalculia. *International Journal of Instruction*, *15*(1), 509–526. https://doi.org/10.29333/iji.2022.15129a