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Challenges in Numeracy: The Role of Mathematics Anxiety in Shaping Eleventh-Grade Students' Problem-Solving Abilities

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ABSTRACT

This study investigates the learning barriers experienced by eleventh-grade high school students in solving mathematics problems related to numeracy literacy, with particular attention to their levels of mathematics anxiety. Numeracy literacy is essential for students to apply mathematical concepts in real-life contexts; however, many struggle due to cognitive and emotional challenges. Using a qualitative research design, data were collected through classroom observations, semi-structured interviews, and analysis of student work. Participants were selected purposively from a public high school, ensuring variation in performance and reported anxiety levels. The findings reveal that students commonly face difficulties in understanding foundational mathematical concepts, such as fractions, algebraic operations, and data interpretation from tables or graphs. Many also demonstrate limited ability to connect mathematical problems with real-world applications, such as calculating percentages in discounts or interpreting statistical information. Moreover, students struggle to identify relevant information and apply appropriate problem-solving strategies. These barriers are strongly linked to mathematics anxiety, which is evident through behaviors such as hesitation, avoidance, and reduced confidence during numeracy tasks. High-anxiety students often experience deeper conceptual misunderstandings and exhibit less persistence in solving problems. The results suggest that effective instructional approaches should not only address conceptual gaps but also incorporate emotional support to reduce anxiety and improve engagement. Future research is recommended to develop and test targeted interventions aimed at overcoming both cognitive and affective barriers in mathematics learning.

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1. INTRODUCTION

Education is a structured process of teaching and learning that aims to develop individuals' knowledge, skills, attitudes, and values (Maharani et al., 2019). Through education, individuals are equipped not only with academic knowledge but also with social competencies and moral integrity

essential for meaningful participation in society (Abdullah & Abbas, 2022; Manfreda Kolar & Hodnik, 2021). This process occurs within formal institutions such as schools and universities, involving systematic interactions between teachers and students (Ashcraft & Kirk, 2001). Meaningful education emphasizes not only cognitive development but also affective and psychomotor domains, fostering learners' overall personal and intellectual growth (Masfingatin et al., 2020; Romandoni et al., 2024).Within this context, each subject, including mathematics, plays a strategic role in shaping well-rounded individuals prepared for present and future challenges.

Mathematics is a core subject in education due to its capacity to cultivate logical reasoning, analytical thinking, and problem-solving skills. Broadly defined, mathematics is the study of patterns, quantities, structures, and relationships that are applicable in both abstract reasoning and real-life contexts (Barroso et al., 2021). Rather than treating these definitions separately, mathematics can be holistically understood as an interconnected discipline involving numbers, space, magnitude, and logical relations (Beilock & Willingham, 2014). The utility of mathematics extends far beyond academic settings—it is embedded in daily decision-making, financial planning, and technological engagement. Thus, mastering mathematical concepts is not only intellectually valuable but also practically essential in navigating modern life.

Despite its importance, many students encounter significant learning barriers in mathematics, particularly when tasks require integration of literacy and numeracy skills. These barriers are often cited as critical factors contributing to poor mathematical performance. In classroom settings, students frequently exhibit confusion when solving problems, relying heavily on rote memorization of procedures without comprehending underlying concepts (Kholid et al., 2022). Such surface-level learning reflects weak conceptual understanding and limited critical thinking ability (Fitrianna & Novtiar, 2020). As a result, students struggle to retain knowledge over time and face difficulties in applying mathematical concepts to unfamiliar contexts, emphasizing the need for more targeted instructional interventions.

One of the more complex challenges arises when students face mathematics problems that are grounded in numeracy literacy. Numeracy literacy refers to the ability to interpret, analyze, and apply mathematical information in real-world situations. Many students, for instance, find it difficult to make sense of contextual problems, fail to identify key information, and are unsure of which operations to use in problem-solving (Gunderson et al., 2018). These limitations highlight a disconnect between mathematical knowledge and its practical application. Given that numeracy skills are critical for academic achievement and career readiness, the development of numeracy literacy must be considered a foundational educational objective (Nurmeidina et al., 2025). Without this, students are at a disadvantage both academically and in everyday life.

A specific illustration of this issue can be observed at SMAN 1 Jiwan, where students often struggle with mathematics problems that demand high levels of numeracy literacy. These types of tasks require not only abstract comprehension but also critical reasoning and the ability to apply concepts in novel contexts (Genc & Erbas, 2020). However, due to the school's relatively small student body and low levels of academic competition, students tend to exhibit diminished motivation and are less inclined to engage in cognitively demanding tasks. As a result, only a small number of students demonstrate the confidence and ability to solve such problems effectively, while the majority continue to face persistent learning difficulties. This lack of motivation and confidence significantly impacts overall mathematics achievement.

In addition to cognitive and motivational issues, emotional factors—particularly mathematics anxiety—play a crucial role in shaping students' learning experiences. Mathematics anxiety is a psychological condition characterized by feelings of fear, nervousness, or tension that interfere with performance on mathematical tasks (Luttenberger et al., 2018). At SMAN 1 Jiwan, many students show observable signs of anxiety during mathematics lessons, especially when required to solve contextual problems under time pressure (Ramirez et al., 2018). Such emotional responses can hinder cognitive processing, reduce working memory capacity, and ultimately impair mathematical performance (Caviola et al., 2017; Ramirez et al., 2018). Consequently, addressing mathematics anxiety must be a key component in efforts to overcome learning barriers in mathematics.

Although the literature on mathematics learning difficulties and mathematics anxiety is extensive, most studies have treated these issues in isolation (Barroso et al., 2021; Wardani et al., 2024). Research tends to focus either on cognitive aspects—such as low numeracy skills and misconceptions—or on the emotional effects of anxiety on test performance, without exploring how anxiety may amplify or interact with specific learning obstacles (Anggara et al., 2018; Ashcraft & Kirk, 2001). This reveals a significant research gap in understanding how mathematics anxiety contributes to various types of learning barriers, such as ontogenic (internal factors), didactic (teaching-related factors), and epistemological (knowledge-related factors) challenges. The present study aims to address this gap by investigating how anxiety affects students' ability to solve mathematics problems that require numeracy literacy.

The novelty of this study lies in its integrative approach, examining both emotional and structural factors within the context of mathematics learning. By focusing on students at SMAN 1 Jiwan—who are characterized by low academic competitiveness and low self-confidence—the study offers context-specific insights into how mathematics anxiety exacerbates particular learning difficulties. This dual focus expands the current understanding of mathematics education, which often privileges either cognitive or emotional perspectives. Additionally, the study contributes practical implications by proposing classroom strategies that address not only conceptual misunderstandings but also affective needs of students.

Building upon this rationale, the objective of the present study is to analyze the relationship between students' levels of mathematics anxiety and the types of learning obstacles they encounter when solving numeracy-based mathematics problems. This objective is grounded in the belief that academic performance in mathematics is influenced not only by content mastery but also by students' emotional readiness and mental resilience. The study focuses on three primary types of learning obstacles—ontogenic, didactic, and epistemological—with the aim of identifying which type is most strongly associated with anxiety. Such insights are crucial for developing learning approaches that are emotionally responsive and pedagogically appropriate (Myers et al., 2022; Rayhan & Juandi, 2023).

Based on this objective, the research question addressed in this study is as follows: *"How does mathematics anxiety influence the learning obstacles experienced by high school students in solving numeracy-based mathematics problems at SMAN 1 Jiwan?"*. This question seeks to explore how anxiety contributes to specific learning difficulties and to identify which types of obstacles are most affected. The findings are expected to inform teachers, counselors, and education policymakers in designing instructional strategies that balance academic rigor with emotional support—particularly in increasingly complex mathematics learning environments driven by literacy and numeracy demands.

2. METHODS

This research is a qualitative study that aims to explore students' learning obstacles in solving mathematics problems related to numeracy literacy, particularly from the perspective of mathematics anxiety. Qualitative research is a method that focuses on understanding phenomena in natural settings through descriptive data in the form of words—both written and spoken—as well as observable behavior. It seeks to interpret meaning from participants' perspectives and emphasizes depth over breadth. The qualitative approach used in this study involves interactive data collection and in-depth analysis to capture students' experiences authentically and contextually.

The research was conducted during the 2023/2024 academic year, starting in September 2023, and proceeded in several stages until completion. The location of the study was SMAN 1 Jiwan, selected based on the rationale that this school had not previously been examined in the context of numeracy literacy and mathematics anxiety. The participants of this research were students from class XI, specifically selected based on the results of a mathematics anxiety questionnaire. Six participants were chosen through purposive sampling, with consideration for data richness and representation of different anxiety levels: two students with high anxiety, two with moderate anxiety, and two with low anxiety. Selection was also based on the willingness of participants and recommendations from the

mathematics teacher regarding students who frequently encountered difficulties in problem-solving tasks.

Data were obtained through three primary techniques: observation, semi-structured interviews, and questionnaires. The observation instrument was a checklist and field notes used to document student behavior during mathematics lessons, particularly when solving numeracy-based problems. The interview guide contained open-ended questions designed to explore students' thoughts, feelings, and strategies when encountering mathematical tasks. The mathematics anxiety questionnaire, adapted from existing validated instruments, was used not only to classify participants but also to gain initial insight into their emotional responses to mathematics. Each instrument was developed with guidance from relevant literature and validated by education experts to ensure content accuracy.

To ensure data credibility, this research applied source triangulation, where information from different data collection methods (observation, interview, and questionnaire) was cross-checked for consistency. Beyond triangulation, the researcher also conducted member checking by confirming findings with the participants to validate the interpretations. Peer debriefing with fellow researchers and supervisors was carried out to reduce researcher bias and enhance analytical rigor. Dependability and confirmability were addressed by maintaining detailed documentation of the research process, including reflexive notes and audit trails.

For data analysis, the researcher employed thematic analysis using an inductive approach. After transcription of interview and observation data, the researcher performed open coding to identify meaningful units. These codes were then categorized and interpreted into broader themes related to types of learning obstacles, emotional responses, and problem-solving behaviors. Manual coding was supported with microsoft excel to organize and retrieve codes systematically. Patterns and relationships were continuously reviewed and refined throughout the analysis to construct a comprehensive understanding of how mathematics anxiety affects students' numeracy literacy performance.

3. FINDINGS AND DISCUSSION

3.1 Indicators of Learning Obstacles

This study identified four key indicators that signify the presence of learning obstacles in mathematics among students. These indicators reflect cognitive, behavioral, and affective dimensions that can hinder students' academic progress in the subject:

3.1.1 Inability to Master Lesson Material Within the Allocated Time

This indicator is evident when students struggle to understand and internalize mathematical concepts within the time allotted for instruction. It suggests a mismatch between the pace of teaching and the learner's cognitive processing speed. Students in this category may require additional time, scaffolding, or alternative instructional strategies to fully grasp abstract or procedural mathematical content. This issue is particularly pronounced when introducing new or complex topics that require higher-order thinking skills.

3.1.2 Delayed Completion of Learning Tasks

Students showing this indicator typically need more time than their peers to complete mathematics-related tasks, such as problem-solving activities, worksheets, or homework. This delay may stem from cognitive overload, lack of procedural fluency, poor time management, or anxiety related to mathematics. The inability to complete tasks efficiently can impact both learning outcomes and students' motivation, as they may feel overwhelmed or discouraged when they fall behind.

3.1.3 Consistently Low Academic Performance Compared to Peers

This indicator reflects persistent underachievement in mathematics assessments and class-based evaluations. Students exhibiting this pattern often score below the class average and demonstrate limited progress despite regular instruction. Their low performance may be linked to foundational knowledge gaps, limited conceptual understanding, or difficulties applying learned concepts to new problems. This consistent underperformance signals the need for targeted intervention and differentiated instruction.

3.1.5 Behavioral Indicators of Learning Difficulties

Students who face learning obstacles often exhibit specific behavioral signs, such as avoidance of mathematical tasks, frequent expressions of frustration, reduced engagement in classroom discussions, or reluctance to participate in mathematical activities. These behaviors may be rooted in low self-efficacy, math anxiety, or prior negative learning experiences. When left unaddressed, such behavioral patterns can reinforce a cycle of academic disengagement and further hinder mathematical development.

These indicators, while distinct, are often interrelated and may co-occur in students experiencing significant learning barriers. Recognizing and responding to these indicators early allows educators to design more responsive pedagogical approaches, implement individualized support mechanisms, and create inclusive learning environments that accommodate diverse mathematical learning needs.

3.2 Types of Learning Obstacles

This study adopts a well-established theoretical framework that categorizes learning obstacles into three distinct types: ontogenic, didactical, and epistemological obstacles. These categories help to systematically identify the root causes of students' difficulties in learning mathematics. Each type represents a different source of learning barrier—ranging from internal cognitive limitations to external instructional shortcomings—thereby offering a comprehensive lens for analyzing learning challenges in the classroom.

Ontogenic obstacles refer to learning difficulties that originate from the students themselves, particularly from their cognitive development and mental readiness. These obstacles emerge when students are not yet developmentally prepared to grasp certain mathematical concepts due to limitations in abstract reasoning, working memory, or logical thinking abilities. For example, a student may struggle with understanding algebraic expressions not because of poor instruction, but because their cognitive structure has not yet matured to the point of handling symbolic representation. These intrinsic challenges require teachers to apply differentiated instruction, scaffolding strategies, or concrete learning experiences to support the student's gradual conceptual growth.

Didactical and epistemological obstacles, on the other hand, stem from external factors. Didactical obstacles arise when instructional methods, teaching sequences, or classroom practices do not align with students' learning needs. A common example is the use of abstract problem-solving tasks without adequate visual or contextual support, which may confuse students who require more concrete examples. Meanwhile, epistemological obstacles occur when students attempt to apply existing knowledge to new mathematical contexts, but their prior understanding is incomplete or based on misconceptions. This often results in flawed reasoning or incorrect generalizations. These two types of obstacles highlight the importance of responsive pedagogy—teachers must critically reflect on how content is delivered and how students' prior knowledge is activated or challenged during instruction.

3.3 Mathematics Anxiety Questionnaire Results

To assess the levels of mathematics anxiety among students, a mathematics anxiety questionnaire was administered to 26 students in Class XI A at SMAN 1 Jiwan. The questionnaire categorized student responses into three anxiety levels: high, moderate, and low. The distribution of the results is presented in Table 1.

Table 1. Distribution of Mathematics Anxiety Levels Among Class XI A Students

No.	Mathematics Anxiety Category	Number of Students
1.	High	4
2.	Moderate	20
3.	Low	2

Out of the 26 students, 4 students (15.4%) were categorized as having high mathematics anxiety, 20 students (76.9%) were identified with moderate mathematics anxiety, and 2 students (7.7%) were classified as having low mathematics anxiety.Based on this distribution, six students were selected as research subjects: two students from each anxiety category (high, moderate, and low). These students were then given a set of validated mathematics problems to work on individually.

The students' written responses were collected and analyzed. Students in the high-anxiety category showed specific characteristics in their work, including task omission and difficulty following multi-step procedures. Students in the moderate-anxiety category exhibited occasional inaccuracies and incomplete solutions. In contrast, students with low mathematics anxiety generally demonstrated consistent completion of tasks with fewer errors. These observations provided the basis for identifying patterns of learning obstacles associated with each level of mathematics anxiety, which are discussed in detail in the subsequent chapter.

3.4 Analysis of Student Work by Anxiety Level

3.4.1 High Mathematics Anxiety Students

Students with high mathematics anxiety demonstrated significant learning obstacles when attempting to solve mathematical problems. When presented with questions, these students were frequently unable to complete the assigned tasks.

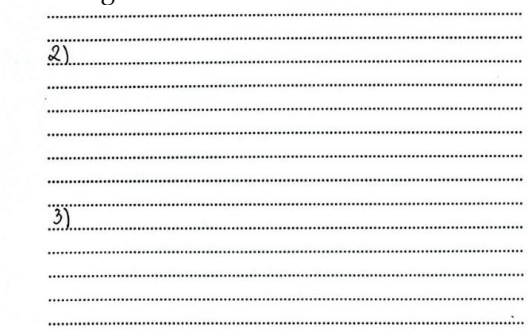

Figure 1. Answer sheet of a student with high mathematics anxiety

As evident in Figure 1, the student with high mathematics anxiety exhibited clear learning obstacles, being unable to analyze the problem and leaving the answer sheet entirely blank. This inability to engage with the mathematical task suggests substantial cognitive barriers. The interview results with high-anxiety subjects (Table 2) further illuminate their learning obstacles.

Table 2. Interview excerpts with high-anxiety subjects

P	:	"Then, when you start working, what do you do after reading question number one?"
S_1	:	"I will analyze the question first , sis, find out what is known in the question"
S_2	:	"For me, no I don't know what to do, because when I do math, I'm used to browsing."

These subjects demonstrated limited understanding of mathematical concepts and struggled to master the material presented during class instruction. Additionally, their academic achievement was notably below the class average, as evidenced by their class rankings (Table 3).

Table 3. Class rankings of high-anxiety subjects

P	:	" Okay lastly , do you know what class ranking you are in ?"
S_1	:	" I'm 20"
S_2	:	" Embarrassed Sis , I'm ranked last"

The combination of work samples and interview data strongly indicates that students with high mathematics anxiety predominantly experience ontogenic obstacles. These students display limitations in cognitive readiness that impede their ability to comprehend mathematical concepts or material presented by instructors.

3.4.2 Moderate Mathematics Anxiety Students

Students with moderate mathematics anxiety exhibited less severe but still notable learning obstacles when solving mathematical problems. These students demonstrated partial understanding but encountered difficulties in completing the assigned tasks correctly.

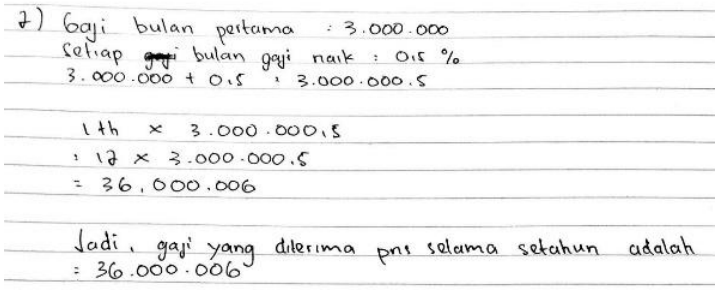

Figure 2. Answer sheet for the student with the criteria for math anxiety

The answer sheet in Figure 2 reveals conceptual misunderstandings. The problem stated that the monthly salary increases by 0.5% of the initial wage, but the student incorrectly added the initial wage to the 0.5% increase rather than calculating the incremental amount properly. This error suggests incomplete conceptual understanding despite having foundational knowledge. The academic achievement of moderately anxious students (Table 4) provides additional context for their learning obstacles.

Table 4. Class rankings of moderate-anxiety subjects

P	:	"Then, if I may ask, what rank are you in your class?"
LWA	:	"8 sis"
DA	:	"18 sis"

The mid-range class rankings indicate that these students can generally master instructional material but struggle with concept application and extension. Their difficulties appear to stem from insufficient practice and conceptual development, characteristics of epistemological obstacles. These students possess basic knowledge frameworks but encounter barriers when extending these frameworks to novel mathematical contexts.

3.4.3 Low Mathematics Anxiety Students

Students with low mathematics anxiety demonstrated minimal learning obstacles when solving mathematical problems. These students were generally able to analyze and solve assigned problems with confidence and accuracy.

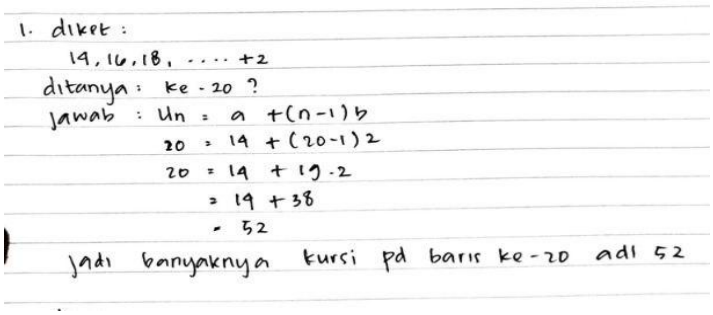

Figure 3. Answer sheet of a student with low mathematics anxiety

As shown in Figure 3, students with low mathematics anxiety were able to analyze and solve the given problems with relative ease and correctness. Their work demonstrates stronger conceptual understanding and procedural fluency compared to their more anxious peers. The academic achievement of low-anxiety students further confirms their stronger mathematical capabilities (Table 5).

Table 5. Class rankings of low-anxiety subjects

P	:	" Previously I Want to Ask , what class rank are you in ?"
KM	:	"Ranking 3 sis "
MDP	:	"Rank 6 sis "

Despite their generally strong performance, even students with low mathematics anxiety occasionally experienced learning obstacles. These primarily manifested as didactical obstacles, where students understood core concepts but encountered difficulties when instruction involved conceptual leaps or insufficient scaffolding by teachers.

3.5 Relationship Between Mathematics Anxiety and Learning Obstacles

Our findings reveal a significant relationship between mathematics anxiety levels and the types of learning obstacles experienced by students. This relationship aligns with previous research by Ashcraft & Kirk (2001), who demonstrated that mathematics anxiety consumes cognitive resources that would otherwise be available for mathematical problem-solving. Students with high mathematics anxiety predominantly experienced ontogenic obstacles, suggesting that anxiety interferes with their cognitive readiness to engage with mathematical concepts. This finding is consistent with Ramirez et al. (2018), who found that highly anxious students often exhibit avoidance behaviors that prevent them from fully processing mathematical instruction.

In addition, studies by Young et al. (2012) found that individuals with high math anxiety show increased emotional reactivity in brain regions associated with threat perception, further explaining their difficulty in initiating and sustaining engagement with math tasks. Moreover, Ashcraft & Krause (2007) emphasized that mathematics anxiety alters the functioning of the working memory system, a core component required for mathematical reasoning and problem-solving. These insights support the interpretation that ontogenic obstacles in highly anxious students stem from deep-seated neurocognitive and emotional responses.

Students with moderate mathematics anxiety primarily encountered epistemological obstacles, suggesting partial conceptual understanding but difficulties extending knowledge to new contexts. This pattern aligns with Maloney & Beilock (2012)'s work demonstrating how mathematics anxiety can impede the integration of mathematical knowledge across contexts. The concept of epistemological obstacles, as introduced by Zahroh et al. (2023) refers to limitations in students' internalized conceptions of knowledge, which may be stable but insufficient or in conflict with formal mathematics. Moderately anxious students may hold fragmented or misconceived understandings, which, although not debilitating, impede their progression through more abstract mathematical reasoning.

Students with low mathematics anxiety experienced minimal learning obstacles, primarily limited to didactical barriers resulting from instructional sequencing or pacing. This finding corresponds with research by Beilock & Willingham (2014) showing that even mathematically confident students can struggle when instructional approaches do not match their learning needs. Such students may encounter difficulties due to misalignment between their zone of proximal development and the design of classroom activities, leading to temporary disengagement or confusion. Hendriyanto et al. (2024) also point out that didactical obstacles may stem from the implicit rules embedded within classroom norms, which can challenge even advanced students when expectations are not made explicit.

These findings have several important implications for mathematics instruction. Instructional approaches should be tailored to address the specific types of learning obstacles associated with different anxiety levels. Students with high anxiety may benefit from interventions focused on building mathematical self-efficacy and reducing cognitive load, which can help overcome ontogenic obstacles by enhancing their readiness to engage with mathematical concepts. For moderately anxious students, instruction should emphasize epistemological scaffolding through explicit connections between existing knowledge and new concepts, providing bridges across mathematical contexts that help students extend their understanding to novel situations. Even for low-anxiety students, teachers should implement didactical refinements that ensure instructional sequencing minimizes conceptual leaps and provides appropriate scaffolding for complex topics, preventing the formation of didactical obstacles.

Additionally, the use of socio-emotional learning strategies in the classroom may help mitigate the emotional burden of math anxiety across all levels. Collaborative learning environments, math journaling, and mindfulness techniques have been identified as effective tools in reducing anxiety while promoting metacognitive awareness (Boaler, 2020). Evaluation approaches should consider how mathematics anxiety might influence performance and incorporate varied assessment formats that minimize anxiety triggers, allowing for more accurate measurement of students' mathematical knowledge independent of their anxiety levels. For instance, incorporating oral assessments, low-stakes quizzes, and process-focused rubrics may provide more inclusive representations of student understanding.

This study was limited by its small sample size and focus on a single grade level at one school. Future research should expand to include diverse student populations across multiple educational settings to enhance generalizability. Additionally, longitudinal studies tracking the relationship between mathematics anxiety and learning obstacles over time would provide valuable insights into how this relationship evolves throughout students' educational trajectories. Such studies could explore developmental patterns in cognitive resilience and adaptive strategies used by students to manage their anxiety while navigating mathematical concepts. Moreover, mixed-methods research incorporating neuroimaging, classroom observations, and self-report measures could provide a holistic understanding of how anxiety manifests and disrupts learning at the cognitive, behavioral, and affective levels. Intervention studies targeting specific types of learning obstacles based on anxiety levels would also contribute significantly to developing effective instructional approaches. Ultimately, a more nuanced and empathetic understanding of the interplay between mathematics anxiety and learning obstacles can lead to more inclusive and responsive mathematics education for all learners.

4. CONCLUSION

The results of this study indicate that students encounter various learning obstacles when solving mathematics problems based on numeracy literacy. These barriers include a lack of understanding of basic mathematical concepts, difficulties in relating and applying mathematical concepts to everyday life, and limitations in using effective problem-solving strategies. In more detail, this obstacle is reflected in several indicators, including students' inability to master the learning material within the specified time, their slowness in completing learning tasks, lower learning outcomes compared to their classmates, and low motivation and confidence among students when facing math problems. These

findings underscore the importance of developing learning approaches that are not only conceptual but also contextual and adaptive to students' psychological conditions, including math anxiety, which plays a major role in inhibiting learning performance. Therefore, education policy needs to consider interventions that focus on empowering learning strategies that can reduce students' emotional distress towards mathematics. For further research, it is suggested that the focus be directed to more in-depth identification of specific types of learning barriers, both conceptual, procedural, and affective, so that more targeted and effective solutions can be formulated. In addition, follow-up studies can also develop and test intervention strategies that aim to reduce mathematics anxiety and improve students' numeracy literacy at various levels of education in a sustainable manner.

REFERENCES

Abdullah, N. A., & Abbas, N. H. (2022). Teachers' exploration using graphic organizer for problem solving in primary mathematics. *Hiroshima Journal of Mathematics Education*, *15*(1), 19–33.

Anggara, B., Priatna, N., & Juandi, D. (2018). *Learning difficulties of senior high school students based on probability understanding levels*. *1013*(1), 012116.

Ashcraft, M. H., & Kirk, E. P. (2001). The relationships among working memory, math anxiety, and performance. *Journal of Experimental Psychology: General*, *130*(2), 224.

Ashcraft, M. H., & Krause, J. A. (2007). Working memory, math performance, and math anxiety. *Psychonomic Bulletin & Review*, *14*(2), 243–248. https://doi.org/10.3758/BF03194059

Barroso, C., Ganley, C. M., McGraw, A. L., Geer, E. A., Hart, S. A., & Daucourt, M. C. (2021). A meta-analysis of the relation between math anxiety and math achievement. *Psychological Bulletin*, *147*(2), 134–168. https://doi.org/10.1037/bul0000307

Beilock, S. L., & Willingham, D. T. (2014). Math anxiety: Can teachers help students reduce it? Ask the cognitive scientist. *American Educator*, *38*(2), 28.

Boaler, J. (2020). Ability Grouping in Mathematics Classrooms. In *Encyclopedia of Mathematics Education* (pub.1125081654; pp. 1–5). https://doi.org/10.1007/978-3-030-15789-0_145

Caviola, S., Carey, E., Mammarella, I. C., & Szucs, D. (2017). Stress, time pressure, strategy selection and math anxiety in mathematics: A review of the literature. *Frontiers in Psychology*, *8*, 1488.

Fitrianna, A., & Novtiar, C. (2020). *The role of education, values, culture and character in online learning for learning mathematical outcomes of prospective teachers*. *1657*(1), 012008.

Genc, M., & Erbas, A. K. (2020). Exploring secondary mathematics teachers' conceptions of the barriers to mathematical literacy development. *International Journal for Mathematics Teaching and Learning*, *21*(2), 143–173.

Gunderson, E. A., Park, D., Maloney, E. A., Beilock, S. L., & Levine, S. C. (2018). Reciprocal relations among motivational frameworks, math anxiety, and math achievement in early elementary school. *Journal of Cognition and Development*, *19*(1), 21–46.

Hendriyanto, A., Suryadi, D., Juandi, D., Dahlan, J. A., Hidayat, R., Wardat, Y., Sahara, S., & Muhaimin, L. H. (2024). The Didactic Phenomenon: Deciphering Students' Learning Obstacles in Set Theory. *Journal on Mathematics Education*, *15*(2), 517–544.

Kholid, M. N., Rofi'ah, F., Ishartono, N., Waluyo, M., Maharani, S., Swastika, A., Faiziyah, N., & Sari, C. K. (2022). What Are Students' Difficulties in Implementing Mathematical Literacy Skills for Solving PISA-Like Problem? *Journal of Higher Education Theory and Practice*, *22*(2), 181–200.

Luttenberger, S., Wimmer, S., & Paechter, M. (2018). Spotlight on math anxiety. *Psychology Research and Behavior Management*, 311–322.

Maharani, S., Kholid, M. N., Pradana, L. N., & Nusantara, T. (2019). PROBLEM SOLVING IN THE CONTEXT OF COMPUTATIONAL THINKING. *Infinity Journal*, *8*(2), 109–116. https://doi.org/10.22460/infinity.v8i2.p109-116

Maloney, E. A., & Beilock, S. L. (2012). Math anxiety: Who has it, why it develops, and how to guard against it. *Trends in Cognitive Sciences*, *16*(8), 404–406.

Manfreda Kolar, V., & Hodnik, T. (2021). Mathematical literacy from the perspective of solving contextual problems. *European Journal of Educational Research*, *10*(1), 467–483.

Masfingatin, T., Murtafiah, W., & Maharani, S. (2020). Exploration of Creative Mathematical Reasoning in Solving Geometric Problems. *Jurnal Pendidikan Matematika*, *14*(2), 155–168. https://doi.org/10.22342/jpm.14.2.7654.155-168

Myers, J. A., Witzel, B. S., Powell, S. R., Li, H., Pigott, T. D., Xin, Y. P., & Hughes, E. M. (2022). A Meta-Analysis of Mathematics Word-Problem Solving Interventions for Elementary Students Who Evidence Mathematics Difficulties. *Review of Educational Research*, *92*(5), 695–742. https://doi.org/10.3102/00346543211070049

Nurmeidina, R., Zaqiyah, N. N., Nugroho, A. G., Andini, A., Faiziyah, N., Adnan, M. B., & Syar'i, A. (2025). Analysis of students' problem-solving abilities in solving contextual problems of Linear Equations with Three Variables in terms of Habits of Mind. *Indonesian Journal on Learning and Advanced Education (IJOLAE)*, 117–135.

Ramirez, G., Shaw, S. T., & Maloney, E. A. (2018). Math anxiety: Past research, promising interventions, and a new interpretation framework. *Educational Psychologist*, *53*(3), 145–164.

Rayhan, N. C., & Juandi, D. (2023). Students Learning Obstacles Related to Mathematical Literacy Problem: A Systematic Literature Review. *Mathline: Jurnal Matematika Dan Pendidikan Matematika*, *8*(2), 457–472.

Romandoni, H. R., Maharani, S., & Suprapto, E. (2024). Development of ethnofun to improve computational thinking of junior high school students grade VII. *Al-Jabar: Jurnal Pendidikan Matematika*, *15*(2). https://ejournal.radenintan.ac.id/index.php/al-jabar/article/view/22204

Wardani, A. K., Prabawanto, S., & Jupri, A. (2024). How Students' Obstacle in Solving Ratio and Proportion Problem? Focusing on Mathematical Literacy Process. *Mosharafa: Jurnal Pendidikan Matematika*, *13*(2), 415–430.

Young, C. B., Wu, S. S., & Menon, V. (2012). The Neurodevelopmental Basis of Math Anxiety. *Psychological Science*, *23*(5), 492–501. https://doi.org/10.1177/0956797611429134

Zahroh, U., Rachmawati, N. I., & Darmayanti, R. (2023). Significance of Collaborative Learning Guidelines in 21st Century Education on Functional Limits Material in Madrasah Tsanawiyah. *Assyfa Journal of Islamic Studies*, *1*(2), 155–161. https://doi.org/10.61650/ajis.v1i2.239