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OBSTACLES IN MATHEMATICS LEARNING AND MATHEMATICS TEACHING STRATEGIES: A QUALITATIVE STUDY ON THE EXPERIENCES OF PROSPECTIVE TEACHERS

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Abstract

This study was conducted with the primary aim of identifying the main barriers in mathematics learning and determining effective teaching strategies to overcome them. Employing a qualitative research approach, data were collected from twenty respondents comprising educators and stakeholders in the field of education. To ensure a rigorous interpretation of these perspectives, the data underwent thematic analysis, allowing for the systematic categorization of participant responses into core pedagogical themes. The findings indicate that the most prominent barriers are low student motivation and lack of parental support, with 90% of participants identifying these as critical challenges affecting student learning outcomes. These factors contribute significantly to disengagement and reduced academic performance in mathematics. On the other hand, the study also reveals encouraging trends. All respondents (100%) expressed a positive attitude toward collaborative lesson planning, emphasizing that working together in designing learning activities enhances both teacher creativity and instructional effectiveness. A substantial majority (86.67%) also acknowledged the potential of technology integration in making mathematics more accessible and engaging. Furthermore, there was unanimous agreement on the importance of ongoing professional development (100%) as a vital component for teacher growth and improved pedagogy.

This research offers a novel contribution by bridging the gap between stakeholder-identified barriers and specific collaborative interventions, providing a localized framework for teacher-led reform. Taken together, these findings highlight the need for comprehensive educational interventions that include strengthening teacher capacities, fostering home-school collaboration, integrating digital tools in classrooms, and promoting continuous teacher training. Such efforts are essential to improve students' understanding, interest, and achievements in mathematics.

Keywords: *Mathematics Learning, Teaching Strategies, Learning Barriers, Thematic Analysis, Collaborative Pedagogy*

INTRODUCTION

Barriers to mathematics learning originate from a complex interplay of internal psychological factors and external instructional voids. Current research (SOTA) emphasizes that students often perceive mathematics as an abstract, uninspiring hurdle, leading to chronic disengagement (Rachmawati et al., 2023). While Tisnawati and Mujahid (2024) identify a lack of instructional variety as a primary culprit, the current academic landscape

suggests that the difficulty lies not just in the content, but in the failure of traditional media to bridge the gap between abstract concepts and student experience. Despite these insights, a significant gap remains: most studies focus on identifying problems without providing a scalable, integrated framework that addresses both the cognitive and emotional dimensions of learning mathematics.

The urgency of this issue is underscored by the direct correlation between conceptual frustration and decreased participation (Amanda et al., 2024). When students view tasks as insurmountable, self-doubt replaces curiosity, necessitating a shift toward problem-solving strategies that foster self-efficacy (Febriani & Elfrianto, 2023). However, the existing literature often overlooks the role of peer dynamics and environmental factors in this transition. This research addresses that gap by moving beyond individual cognitive strategies to explore how collaborative lesson planning can mitigate these psychological barriers.

Effective strategies are no longer optional but essential for modern mathematics education. Recent findings suggest that peer collaboration and interactive methods significantly reduce "math anxiety," a leading cause of academic stagnation (Erbay, 2024; Serin, 2023). Building on this, the current SOTA points toward a "techno-pedagogical" shift. Moldoisaeva (2024) and Charles (2024) argue that integrating cutting-edge technology and creative environments can boost attention and performance. Yet, the missing link in current research is how these digital tools can be practically managed by teachers who are themselves struggling with traditional lesson planning.

This study bridges the aforementioned gaps by offering a dual-lens approach: identifying specific barriers while simultaneously empowering future educators with technical and collaborative skills. Unlike previous studies that treat teacher training and student engagement as separate entities, the novelty of this research lies in its focus on "Lesson Study" programs. By demonstrating how university-school collaborations can reduce initial teaching challenges by as much as 62.5% (Fitriati et al., 2023), this study provides a concrete roadmap for integrating graphing software, programming, and structured lesson planning. This holistic focus on teacher readiness as the primary engine for student success constitutes the study's unique contribution to the field.

METHOD

This study utilizes a qualitative descriptive approach to explore the multifaceted barriers in mathematics education and the subsequent strategies adopted by educators. In the context of mathematics education, qualitative research is indispensable for uncovering the "why" behind pedagogical friction and student disengagement (Sharma, 2023).

The novelty of this methodological choice lies in its focus on the lived experience of prospective teachers in transition, bridging the gap between theoretical pedagogical training and the practical realities of the classroom. By

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prioritizing depth over breadth, this design captures the nuances of "math anxiety" and "instructional adaptation" that quantitative metrics often overlook.

The study was conducted between April 16 and May 11, 2025, involving educational institutions in Banten. The participants (n=20) were selected through purposive sampling, a non-probability sampling technique used to ensure that the respondents possessed specific expertise or experience relevant to the research objectives. The cohort included:

- Active Mathematics Teachers: Providing insights into long-term systemic barriers and established strategies.
- Prospective Teachers: Offering fresh perspectives on the integration of modern technology and innovative lesson planning.

The primary data collection instrument was an open-ended questionnaire distributed via Google Forms. Unlike Likert-scale surveys, open-ended questions were chosen to facilitate narrative richness, allowing respondents to describe specific classroom incidents, parental interactions, and the iterative process of lesson planning.
To ensure the trustworthiness of the instrument:

1. Validation: The questionnaire underwent expert review to align prompts with the research variables (barriers vs. strategies).
2. Pilot Testing: A preliminary trial was conducted to ensure that the technical terminology was accessible to both student teachers and veterans.

The data were analyzed using Thematic Analysis, a systematic method for identifying, analyzing, and reporting patterns (themes) within qualitative data. The analytical process followed a rigorous four-step trajectory:

1. Data Familiarization: Transcribing and reading the narrative responses multiple times to achieve immersion.
2. Coding and Categorization: Segmenting text into meaningful units. For instance, responses mentioning "lack of interest" and "fear of failure" were coded under the sub-theme of Psychological Resistance.
3. Theme Synthesis: Merging sub-themes into overarching thematic categories, such as *Instructional Void* or *Collaborative Synergy*.
4. Narrative Integration: Correlating these themes with the State of the Art (SOTA) to identify how the findings confirm or challenge existing literature (e.g., the 62.5% improvement rate in lesson study programs noted by Fitriati et al., 2023).

To maintain research integrity, all participants provided informed consent. Data were anonymized to encourage candid responses regarding institutional challenges and teacher growth, ensuring that the qualitative findings reflect a genuine "grassroots" perspective of the Banten educational landscape.

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RESULT AND DISCUSSION

Result

This study identifies the multifaceted obstacles experienced by teachers and prospective teachers in mathematics learning. Based on the open-ended questionnaire results and thematic synthesis, the findings are categorized into three core dimensions: learning barriers, effective strategies, and professional readiness.

The primary aim was to identify factors hindering student progress. As summarized in Table 1, while technical and curriculum factors are significant, the socio-psychological environment remains the most daunting challenge.

Table 1. Results of the Teacher and Prospective Teacher Questionnaire: Obstacles in Learning Mathematics

Statement	Average score (1-5)	Percentage
1. The difficulties prospective teachers face in adapting teaching strategies/methods and learning assessments to students' styles and thinking abilities, as well as the teachers' self-confidence factors (Mangwende & Maharaj, 2020).	3,00	60.00%
2. Curriculum and memorization methods that hinder innovative learning (Sir Adrian Smith, 2023).	3,50	70.00%
3. Administrative factors and resource limitations hinder effective learning and technology (Siti Mistima Maat & Zakaria, 2023).	3.50	70.00%
4. There is a lack of Student motivation and minimal parental support (Noel Pearson, 2023).	4.50	90.00%

The results from Table 1 indicate that the average scores and percentages reflect the responses of teachers and pre-service teachers regarding learning obstacles, the methods and strategies used, and their readiness to teach mathematics. The data is connected to and analyzed alongside the ideas of experts to strengthen the research findings. Teachers and prospective teachers face challenges adapting learning strategies, methods, and assessments to students' learning styles and thinking abilities. In addition, teacher confidence in managing learning is also an inhibiting factor. This indicates a need to strengthen teacher pedagogical competence and self-confidence in implementing approaches appropriate to students' needs. This statement obtained an average score of 3.00 and a percentage of 60.00%.
The rigid curriculum and the dominance of learning methods that focus on memorization hinder the creation of innovative learning. This shows that the

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learning system lacks space for exploration, creativity, and contextual problem-solving. This statement received an average score of 3.50 and a percentage of 70.00%.

Teachers and prospective teachers also stated that complex administrative factors and resource limitations in terms of facilities, infrastructure, and technology were significant obstacles to creating effective learning. This condition hampers the use of technology in mathematics learning and limits teachers' room to develop varied learning strategies. This statement received an average score of 3.50 and a percentage of 70.00%.
The most dominant factors identified as obstacles to learning mathematics are low student motivation and a lack of support from parents. These factors dramatically affect student involvement in learning and their success in understanding mathematical concepts. This statement obtained the highest average score of 4.50, with a percentage of 90.00%.

In addition to identifying obstacles, this study explored strategies considered effective for enhancing learning outcomes. The data in Table 2 emphasizes a shift toward interactive and collaborative models.

Table 2. Results of the Teacher and Prospective Teacher Questionnaire: Effective Teaching Strategies in Mathematics

Statement	Average score (1-5)	Percentage
1. Critical thinking using a contextual approach in mathematics teaching (Sir Adrian Smith, 2023).	4.00	80.00%
2. Evaluation of alternatives and the role of technology helps students' understanding to enhance the effectiveness of mathematics learning (Siti Mistima Maat & Zakaria, 2023).	4,33	86,67%
3. Interactive question-and-answer, direct instruction, and discussion methods (Noel Pearson, 2023).	4.00	80.00%
4. Teacher collaboration in developing learning strategies (Mangwende & Maharaj, 2020).	5.00	100.00%

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Based on Table 2, Teacher Collaboration received a perfect score of 100%. Working together allows teachers to share ideas and best practices, effectively mitigating individual confidence issues. Furthermore, technology integration (86.67%) is recognized for its ability to make abstract concepts visual and interactive.

- *On Technology:* "Using software like GeoGebra makes abstract concepts visual instantly. It's the only way to keep modern students from checking out mentally." (Preservice Teacher).
- *On Collaboration:* "Collaboration is our lifeline. When we plan lessons together, we share the burden of failure and the joy of a strategy that actually works." (Experienced Teacher).

Table 3 reflects how educators prepare themselves to provide effective teaching. Readiness is viewed as a combination of mental, emotional, and professional competence.

Table 3. Results of the Teacher and Prospective Teacher Questionnaire: Readiness and Perception towards Mathematics Teaching

Statement	Average score (1-5)	Percentage
1. The readiness and complete control of the teacher in teaching (Noel Pearson, 2023).	4,00	80.00%
2. The importance of teacher reflection on teaching (Mangwende & Maharaj, 2020).	4,00	80.00%
3. Professional training for teachers (Sir Adrian Smith, 2023).	5,00	100,00%
4. Development of pedagogical skills (Siti Mistima Maat & Zakaria, 2023).	4.00	80.00%

Based on Table 3 above, the first statement highlights the importance of the Mental, emotional, and professional readiness of teachers in facing learning situations in the classroom. Teachers with high readiness and complete control over the teaching process can create a conducive and effective learning environment. This includes the teacher's ability to manage time and the class and deliver material systematically. From the questionnaire results, this aspect obtained an average score of 4.00 on a scale of 1-5, with a percentage of agreement reaching 80.00%. This finding shows that most teachers and prospective teachers know the importance of personal and professional readiness in the success of mathematics learning.

The second statement emphasizes that reflection on teaching practice is integral to a teacher's professional development. By reflecting, teachers can evaluate the methods' effectiveness, identify weaknesses, and design new strategies more appropriate to students' needs. The results of the responses show that this indicator also received an average score of 4.00, with the same

percentage of 80.00%. This indicates that respondents are highly aware of the importance of introspection in teaching and learning.

Professional training for teachers received the highest attention in the results of this questionnaire. Teachers need continuous competency updates through training, workshops, or other professional development programs. This training improves the understanding of mathematics content, pedagogical skills, educational technology, and classroom management. Respondents scored 5.00 on the maximum scale, which is accompanied by a whole agreement level of 100.00%. This finding shows that all participants agree that professional training is a key element in improving the quality of mathematics teaching. The consistency of this perfect score reflects the urgent need to provide relevant and continuous training programs for teachers at all levels.
The last statement discusses the need to develop pedagogical skills as a foundation for teaching. These skills include designing lesson plans, choosing methods appropriate to student characteristics, and conducting practical assessments. Strong mastery of pedagogy allows teachers to deliver mathematics material in a more interesting, adaptive, and meaningful way. This indicator obtained an average score of 4.00, which means that teachers and prospective teachers consider this aspect important.

Discussion

The data reveals a systemic friction between curriculum demands and classroom reality. As indicated in Table 1, the high score for administrative factors and resource limitations (70%) creates a direct "bottleneck" effect.

- Cause-and-Effect: Heavy administrative burdens and facility deficits (cause) lead to a reduction in the time and energy teachers can dedicate to diversifying their instructional methods (effect). This results in a retreat toward rigid, memorization-heavy instruction (70%), as teachers lack the structural support to experiment with innovative pedagogy.
- Academic Link: These findings mirror Mangwende and Maharaj (2020), who noted that institutional constraints and resource scarcity in secondary education effectively "freeze" pedagogical innovation, forcing teachers into a survivalist mode of rote instruction. Furthermore, Pearson (2023) suggests in *Radical Hope* that these structural inequalities must be dismantled to empower students in resource-constrained environments like Indonesia.

Despite structural hurdles, there is a significant shift toward Collaborative Lesson Planning (100%) and Contextual Approaches (80%).

- Cause-and-Effect: The recognition of low student motivation (90%) (cause) has driven teachers to seek interactive and problem-solving strategies (effect) to reclaim student engagement. This awareness marks a transition from "Teacher-Centered" to "Student-Centered" paradigms, prioritizing Higher-Order Thinking Skills (HOTS).
- Academic Link: This strategic shift aligns with Suanto, Maat, and Zakaria (2023), whose KARA module demonstrates that moving from abstract

conceptualization to active experimentation significantly boosts motivation. Similarly, Pearson (2023) in *Mission* argues that pedagogies promoting critical thinking over memorization are essential for intellectual empowerment.

A striking paradox exists in the data: while teachers express high confidence in using technology like GeoGebra (86.67%), they unanimously agree (100%) on the need for more Professional Training.

- Cause-and-Effect: The rapid evolution of digital tools (cause) has outpaced formal institutional training, creating a "readiness gap." This gap causes teachers to feel capable in theory but technically unsupported in practice, leading to the "neutral" responses regarding current reflective habits.
- Academic Link: Smith (2023) emphasizes that long-term investment in technology-focused training is the only way to maximize educational innovation. As Pearson (2023) asserts in *A Rightful Place*, individual empowerment—such as teacher growth—can only be realized when the system provides the inclusive training necessary for high-quality instruction.

The survey results indicate a profound readiness gap. While teachers across various educational levels demonstrate a strong willingness to implement effective strategies, they encounter a "Pedagogical Ceiling." This ceiling is created by the interplay of diverse learning styles and the lack of a strong habit of reflective practice. A critical observation is the prevalence of neutral responses regarding reflection. This suggests that reflection is currently viewed as a luxury rather than a standard professional habit. Without a habit of reflection, teachers cannot effectively adjust their "Confidence" into "Competence." On the student side, the continued weakness in solving mathematical problems confirms that contextual approaches are not yet being applied successfully at the grassroots level. To bridge this gap, the transition from "Teacher-led" to "Collaborative-led" planning is not just a strategy—it is a necessity. As the data suggests, 100% of teachers are ready for professional development; the onus is now on the educational system to provide the infrastructure and training that matches this readiness.

Tabel 4. Comparative Summary: Subject Perspectives

Theme	Preservice Teachers	Experienced Teachers
Barriers	Internal: Fear of failing to adapt to styles.	External: Administrative and facility limits.
Strategies	Heavy reliance on technology/applications.	Focus on group discussion and Q&A.
Readiness	Need for classroom management training.	Need for continuous technology updates.

CONCLUSION

A survey of teachers at various levels of education (elementary, junior high, and senior high schools) showed that 70% experienced difficulties in implementing effective and innovative mathematics learning strategies. Some of the main obstacles faced include difficulties in adapting teaching methods to students' diverse learning styles (60%), limited school resources (70%), high administrative workload (70%), and minimal professional training in the field of pedagogy and educational technology (100%).

Despite these challenges, most teachers (86.67%) showed a positive attitude and readiness to implement problem-solving-based learning approaches, integrate technology such as GeoGebra, and utilize interactive methods such as group discussions and questioning techniques (80%). Training and professional development were also shown to impact their competence in teaching positively.

Overall, these findings indicate an urgent need to enhance teachers' pedagogical skills, strengthen support from educational institutions, and provide ongoing training. These efforts are essential to helping teachers create more effective, contextual, and engaging mathematics learning for students.

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