



Mathematics teachers' perception in using mathematical problem-solving as a teaching method for form 1 of secondary school

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Abstract

This study explores teachers' perceptions and practices regarding problem-solving in Form 1 Mathematics classrooms. Problem-solving is widely recognized as a fundamental component of mathematics education, yet its effective implementation remains a significant challenge. Employing a qualitative research approach, this study utilized semi-structured interviews with two mathematics teachers and thematic analysis to examine how teachers perceive, interpret, and apply problem-solving approaches in their instruction. The findings reveal that although teachers hold positive attitudes toward problem-solving and acknowledge its importance in developing Higher-Order Thinking Skills (HOTS), their self-reported classroom practices rarely reflect the systematic use of established frameworks such as Polya's Model. Key barriers identified include insufficient professional training, curriculum time constraints, and students' weak foundational mathematical skills. This perception-practice gap indicates a significant disconnect between teachers' beliefs and their instructional reality. The study concludes that structured professional development programs, curriculum flexibility, and targeted support systems are essential to bridge this gap and enhance the quality of problem-solving instruction in mathematics education.

Keywords: problem-solving; teacher perceptions; instructional practices; Polya's model; higher-order thinking skills

Abstrak

Penelitian ini mengeksplorasi persepsi dan praktik guru terhadap penyelesaian masalah dalam pembelajaran Matematika kelas 7 (Tingkatan 1). Penyelesaian masalah diakui secara luas sebagai komponen fundamental dalam pendidikan matematika, namun implementasinya yang efektif masih menjadi tantangan yang signifikan. Dengan menggunakan pendekatan penelitian kualitatif, penelitian ini menggunakan wawancara semi-terstruktur bersama dua guru matematika dan analisis tematik untuk mengkaji bagaimana guru memahami, menafsirkan, dan melaporkan praktik pengajaran mereka terkait pendekatan penyelesaian masalah. Hasil penelitian menunjukkan bahwa meskipun guru memiliki sikap positif terhadap penyelesaian masalah dan mengakui pentingnya dalam mengembangkan Kemampuan Berpikir Tingkat Tinggi (HOTS), praktik mereka di kelas jarang mencerminkan penggunaan kerangka kerja yang sistematis seperti Model Polya. Hambatan utama yang teridentifikasi meliputi kurangnya pelatihan profesional, keterbatasan waktu kurikulum, dan lemahnya kemampuan dasar matematika siswa. Kesenjangan antara persepsi dan praktik ini menunjukkan ketidakselarasan yang signifikan antara keyakinan guru dan realitas pengajaran mereka. Penelitian ini menyimpulkan bahwa program pengembangan profesional yang terstruktur, fleksibilitas kurikulum, dan sistem dukungan yang terarah sangat diperlukan untuk menjembatani

kesenjangan ini dan meningkatkan kualitas pengajaran penyelesaian masalah dalam pendidikan matematika.

Kata Kunci: penyelesaian masalah; persepsi guru; praktik pengajaran; model Polya; kemampuan berpikir tingkat tinggi

Introduction

Mathematics has been positioned as a problem-solving endeavour in curriculum materials around the world, especially in Indonesia, for many years (Muhammad et al., 2023; Siregar et al., 2025). Problem-solving has been fundamental to the development of mathematical knowledge since the dawn of humanity (Liljedahl et al., 2016; Santos-Trigo, 2024; Schoenfeld, 2009). It is used to teach and learn mathematics, fostering the growth of learners' conceptual and deep understanding, and is viewed as an effective means of accommodating diversity (Bailey, 2022; Olivares et al., 2020). Although the significance and difficulty of mathematical problem-solving in the classroom are uncontested, promoting and facilitating problem-solving remains a contentious endeavour (Lit et al., 2026). Despite this long-standing emphasis, problem-solving has not yet received adequate attention in educational practice. Many classroom practices continue to prioritize numerical and procedural skills over problem-solving and mathematical reasoning, limiting opportunities for students to engage in meaningful problem-solving experiences (English, 2023; Nurlaily et al., 2019; Özreçberoğlu & Çağanağa, 2018). According to research, even experienced mathematics teachers encounter a variety of barriers when fostering students' problem-solving skills (Baste, 2025).

Teachers play a central role in shaping how mathematical problem solving is understood and implemented in the classroom. Their beliefs and attitudes towards mathematics and mathematics teaching influence the tasks they select, the questions they ask, and the learning opportunities they provide for students (Ernest, 1989; Handal, 2015). Examining teachers' beliefs and perceptions is therefore important because this influence their classroom experiences and instructional decisions (Acevedo & Pino-Fan, 2024). In this study, teachers' views are particularly relevant because the problem-solving approach depends not only on curriculum expectations, but also on how teachers interpret and apply the approach in their lessons.

Mathematical problem solving involves more than applying a familiar rule or procedure. A task becomes a problem when students do not immediately know how to solve it and need to make sense of the situation, choose or develop a strategy, and justify their reasoning (Schoenfeld, 2009; Bailey, 2022; Mamona-Downs & Downs 2013). Through problem-solving activities, students can develop conceptual understanding, mathematical reasoning, and the ability to apply mathematical knowledge in meaningful situations rather than simply memorising procedures (Dinglasan et al., 2023; Fererde et al., 2024; Guerrero et al., 2025; Nilimaa, 2023). Polya's model, which includes understanding the problem, devising a plan, carrying out the plan, and looking back, remains a widely used

framework for supporting students' problem-solving processes (Fauziyah & Rahma, 2025; Hidayah & Murti, 2025; Shah & Ayaz, 2025)

In this study, problem solving is understood as a teaching approach through which students learn mathematics by engaging with tasks for which a solution method is not immediately apparent. In teaching through problem solving, students develop mathematical ideas through exploring problems, discussing possible strategies, and explaining their reasoning, rather than receiving a procedure before they begin the task (Bailey, 2022; Wilkie, 2025).

However, implementing problem-solving instruction can be challenging. Teachers may value problem solving but still emphasise routine exercises, direct procedures, and teacher-led explanations due to limited time, curriculum demands, concerns about students' ability, or limited knowledge of how to design and facilitate non-routine tasks (Siswono et al., 2016; Harisman et al., 2019). Teachers' beliefs about students' abilities may also influence the extent to which they provide opportunities for challenging problem-solving activities, particularly for students perceived as low achieving (Meier, 1989; Siswono et al., 2016; Stipek et al., 2001). Therefore, understanding teachers' perspectives is essential for identifying how problem solving is interpreted and used in mathematics instruction.

Previous studies in Indonesia and other Southeast Asian contexts have examined teachers' beliefs, knowledge, and practices related to mathematical problem solving. These studies indicate that teachers' beliefs can shape their instructional decisions, but they may not always be consistent with reported or enacted classroom practice (Harisman et al. 2018; Siswono et al. 2016; Siswono, Kohar, et al. 2019). However, much of this research has focused on teachers' beliefs in general, students' problem-solving performance, or curriculum implementation. Less attention has been given to how secondary mathematics teachers explain their understanding of problem solving as a teaching approach, the specific types of tasks and questions they report using, and the challenges that shape their implementation in a local classroom context.

To address this gap, the present study examines the perspectives of Form 1 mathematics teachers in East Lombok. By focusing on teachers' accounts from two secondary schools in East Lombok, the study provides context-specific insight into how problem-solving instruction is understood and negotiated in Form 1 mathematics lessons.

Specifically, the study addresses the following research questions:

1. How do teachers understand and interpret the problem-solving approach in Form 1 mathematics classrooms?
2. What types of problem-solving tasks and questions do teachers use in Form 1 mathematics lessons?

3. What challenges do teachers encounter when implementing a problem-solving approach in Form 1 mathematics classrooms?

The findings may support teachers in reflecting on their approaches to problem-solving instruction and inform professional development efforts that address task design, questioning strategies, and challenges in implementing problem solving in mathematics classrooms.

2. Research Methodology

Research methodology refers to the systematic techniques and procedures employed to locate, collect, process, and analyse data pertaining to a particular research problem (D. J. , Creswell & Creswell, 2018). This section is organised into four subsections: Research Design, Participants, Data Collection, and Data Analysis.

2.1 Research Design

This study employed a generic qualitative research design to explore how Form 1 mathematics teachers understood and interpreted a problem-solving approach, the tasks and questions they reported using, and the challenges they experienced in implementing the approach. A generic qualitative design was considered appropriate because the study aimed to obtain an in-depth understanding of teachers' perspectives and experiences without applying a specific qualitative tradition, such as phenomenology or grounded theory (Ellis & Hart, 2023).

Two secondary-school mathematics teachers from East Lombok participated in the study. Data were collected through semi-structured interviews to obtain detailed accounts of the participants' views, reported practices, and perceived challenges related to problem-solving instruction. This design was appropriate because it enabled the researchers to describe and interpret the participants' experiences in relation to the research questions.

2.2 Participants

The participants in this study were two Form 1 mathematics teachers from two secondary schools in East Lombok. They were selected using criterion-based purposive sampling because the study aimed to obtain in-depth and contextualised accounts of teachers' understandings, self-reported practices, and challenges related to the implementation of a problem-solving approach in Form 1 mathematics classrooms. Purposive sampling is a non-probability sampling strategy that intentionally selects information-rich cases that are likely to provide relevant and meaningful data in relation to the research aims (Campbell et al., 2020)

Participants were selected based on four criteria: (a) in-service secondary mathematics teachers, (b) experience teaching Form 1 mathematics, (c) experience or interest in using problem-solving tasks, and (d) voluntary participation. These criteria ensured relevant insights into their understandings, reported task usage, and implementation challenges.

Although limited to two teachers from different secondary schools in East Lombok, this sample size suits the qualitative, exploratory focus aimed at in-depth understanding rather than statistical generalization. Their varying teaching experience added professional background diversity for cross-case comparison. Both served as information-rich cases capable of providing detailed accounts across all three research questions. The details of the participants are presented in Table 1.

Table 1. Details of the Informants

Respondents	Education Background	Years of Teaching
Teacher A	Bachelor of Mathematics Education	4 years
Teacher B	Bachelor of Mathematics Education	7 years

Both participants held a Bachelor's degree in Mathematics Education and taught Form 1 mathematics in two secondary schools. Their differing teaching experience enabled cross-case comparison, supporting the study's aim of providing rich, context-specific insights into their understandings and self-reported implementation of a problem-solving approach.

2.3 Data Collection

Data were collected through semi-structured interviews via Google Meet at mutually agreed times, audio-recorded with informed consent, and transcribed verbatim. This method allowed for in-depth exploration of participant experiences through core open-ended questions, follow-up probing, and detailed elaboration. The interview protocol addressed the three research questions by exploring: (a) teachers' understanding and interpretation of the problem-solving approach in Form 1 mathematics; (b) the reported types of problem-solving tasks and questions used; and (c) the challenges encountered during implementation. Because the study relied on interview data, the findings reflect the participants' reported understandings, reported practices, and perceived challenges rather than direct classroom observations.

2.4 Data Analysis

The interview transcripts were analysed using thematic analysis, following the six-phase framework proposed by Braun & Clarke (2006). Thematic analysis was selected for its systematic yet flexible approach to identifying, organising, and interpreting patterns of meaning within qualitative data. The six phases are outlined in Table 2.

To enhance study trustworthiness, member checking was employed by returning transcripts to participants to confirm data accuracy and alignment with their experiences (Birt et al., 2016; Koelsch, 2013). This strategy strengthens credibility and confirmability while minimizing researcher bias (Ahmed, 2024; Candela, 2019).

Table 2. Phases of Thematic Analysis (Braun & Clarke, 2006)

No	Phase	Description
1	Familiarisation with the data	Replayed audio recordings, transcribed data, and read transcripts repeatedly for thorough understanding.
2	Generating initial codes	Systematically coded the dataset to highlight features relevant to the research questions.
3	Searching for themes	Grouped initial codes and relevant data extracts into potential themes.
4	Reviewing themes	Checked candidate themes against coded extracts and the entire dataset, refining or merging them as needed.
5	Defining and naming themes	Defined core meanings and assigned concise names to each theme and sub-theme.
6	Producing the report	Compiled the final analytical narrative addressing the research questions.

3. Findings

This section presents the findings from semi-structured interviews conducted with two Form 1 Mathematics teachers. The data were analysed thematically, and three main themes emerged (1) teachers' understanding and interpretation of the problem-solving approach, (2) the types of problem-solving tasks and questions teachers reported using, and (3) the challenges teachers reported encountering when implementing the approach.

3.1 Teachers' understanding and interpretation of the problem-solving approach

Both participants expressed a strong belief that problem-solving is a fundamental component of Mathematics education. They viewed it as essential for developing students' critical thinking and for connecting mathematical concepts to real-life situations.

Teacher A stated:

"Problem-solving is very important because it helps students to think, not just memorise formulas. When they solve problems, they actually understand why the formula works."

Similarly, Teacher B emphasized:

"I always tell my students that Mathematics is not just about getting the right answer. It is about the process how you think and how you approach the problem."

Despite these positive perceptions, neither teacher made explicit reference to any structured problem-solving framework such as Polya's four-step model. When asked about their approach, both described an intuitive, experience-based method rather than a systematic strategy.

Teacher A explained

"I usually ask student to read the question carefully and then try to find what is given and asked,"

which loosely corresponds to Polya's first step of understanding the problem, but without conscious application of the model.

Teacher B acknowledged a lack of formal training in problem-solving pedagogy:

"To be honest, I was never trained specifically on how to teach problem-solving. I just use my own experience and what I think works for my students."

Overall, while teachers valued problem-solving for developing thinking skills, their reported practice relied on practical experience rather than formal models, adapting their approaches to suit student needs and classroom contexts.

3.2 Types of problem-solving tasks and questions

The analysis revealed that both teachers employed two main categories of questions in their problem-solving activities: challenging questions and context-rich (real-life) questions.

Challenging questions were described as problems that require students to apply multiple steps or combine different mathematical concepts. Teacher A provided an example:

"I give them questions that are not straightforward for example, questions that combine fractions and decimals in one problem, so they have to think about which operation to use first."

Context-rich questions involved situating mathematical problems within real-world scenarios to enhance student engagement and relevance. Teacher B noted:

"I like to use questions about things they know like calculating discounts when shopping or measuring areas of their classroom. It makes them more interested."

Both teachers reported that they adjusted the level of difficulty of questions according to students' perceived ability. In particular, they explained that questions were simplified when students experienced difficulty with basic mathematical operations. Teacher A stated:

"Sometimes I want to give harder questions, but when I see that they still struggle with basic operations, I have to simplify."

These accounts indicate that teachers attempted to use both challenging and context-rich questions, while adjusting the complexity of the tasks in response to students' perceived readiness.

3.3 Challenges in implementing a problem-solving approach

Both participants identified several interconnected obstacles that hinder the effective implementation of problem-solving in their Form 1 Mathematics classrooms.

3.3.1. Weak Student Foundation

The most prominent obstacle cited by both teachers was students' inadequate mastery of basic mathematical skills. Teacher B explained:

"Many of my Form 1 students still cannot do basic multiplication or division confidently. How can I give them problem-solving questions when they do not even have the foundation?"

This finding indicates that the transition from primary to secondary school presents a significant gap in mathematical preparedness, which directly limits the type and difficulty of problem-solving activities that teachers can implement.

3.3.2 Lack of Student Motivation and Confidence

The teachers also observed that students frequently display low motivation and a fear of failure when confronted with non-routine problems. Teacher A shared:

"When they see a long question, they immediately say 'I don't know' without even trying. They are afraid of making mistakes."

This avoidance behaviour suggests that students have not been adequately exposed to a classroom culture that normalises struggle and values the problem-solving process over the final answer.

3.3.3 Time Constraints and Curricular Pressure

Both teachers reported that the pressure to complete the syllabus within a fixed timeframe severely limits the time available for meaningful problem-solving activities. Teacher B stated:

"I know problem-solving is important, but I also have to finish the syllabus. If I spend too much time on one topic, I will fall behind."

This tension between curriculum coverage and depth of learning represents a systemic barrier that individual teachers cannot resolve without institutional support.

3.3.4 Insufficient Professional Training

Neither teacher reported receiving specific training related to problem-solving pedagogy during pre-service teacher education or through in-service professional development. They explained that their training had focused more on mathematical content and general teaching methods. Teacher A noted:

"In my teacher training, we learned about content, how to teach fractions, algebra, and so on. But nobody taught us how to specifically teach problem-solving as a skill."

3.4 Summary of Findings

The findings show that both teachers held positive views of problem solving and regarded it as important for helping students think and understand mathematical concepts.

However, they reported relying mainly on their own teaching experience rather than a formal problem-solving framework. The teachers described using challenging and context-rich questions, although they often adjusted task difficulty when students struggled with basic skills. They also identified four main challenges: weak foundational skills, low motivation and confidence, time and curriculum pressure, and limited professional training.

4. Discussion and Conclusion

4.1 Discussion of Findings

This study explored how Form 1 mathematics teachers understood a problem-solving approach, the tasks and questions they reported using, and the challenges they experienced in implementing the approach. The findings show that both teachers valued problem solving, but their reported use of the approach was influenced by students' basic skills, motivation, time pressure, and limited professional training.

4.1.1 Teachers' understanding of problem solving

Both teachers viewed problem solving as important because it helps students think and understand mathematical concepts rather than simply memorise formulas. This is related to (Siswono, Kohar, et al. 2019), who showed that teachers' beliefs were connected to their approaches to mathematical problem solving. In both studies, teachers' views of mathematics appeared to influence how they approached problem-solving instruction.

However, there is a difference between the two studies Siswono, Kohar, et al. (2019) focused on teachers with instrumentalist beliefs and examined their problem-solving practices. In the present study, the teachers were not classified according to a particular belief category, and the study relied on interview data rather than classroom observation. The teachers in this study valued problem solving, but they did not mention using a formal framework such as Polya's model. Instead, they described relying on their own teaching experience and their understanding of students' needs.

4.1.2 Tasks and questions used

Teachers reported using challenging and context-rich questions (e.g., combining fractions and decimals, calculating discounts, and measuring classrooms) to foster thinking and real-world connection. However, both teachers frequently simplified tasks when students struggled with basic operations. Markle and McGarvey (2025) Teachers reported using challenging and context-rich questions (e.g., combining fractions and decimals, calculating discounts, and measuring classrooms) to foster thinking and real-world connection. However, both teachers frequently simplified tasks when students struggled with basic operations.

4.1.3 Challenges in implementation

The teachers reported four related challenges: weak student foundations, lack of students' motivation and confidence, time constraints and curriculum pressure, and insufficient professional training. These findings are similar to Nasir, Mumtaz, and Abaidullah (2015), who reported that teachers experienced difficulties when using problem-solving methods because such lessons required additional preparation and were affected by classroom conditions.

The present study provides a more specific explanation of how these challenges were connected. The teachers explained that they needed to review basic skills before giving more challenging questions. This required additional time and made it difficult to complete the syllabus. They also reported that some students were afraid of making mistakes and were reluctant to try unfamiliar questions. As a result, teachers sometimes simplified questions or gave more direct support.

insufficient professional training may have made these difficulties harder to manage. Siswono, Kohar, et al. (2019) explain that teachers' beliefs, knowledge, and teaching practices are related. Similarly, the teachers in this study valued problem solving but reported limited preparation for teaching it. This suggests that professional development should not only introduce teachers to problem-solving steps or models. It should also provide practical examples of tasks, questioning strategies, and ways to support students with different levels of mathematical readiness.

4.2 Implications and Limitation

The findings indicate that teachers need adequate support to implement problem solving in a way that challenges students while remaining manageable and accessible to them. Schools can support teachers by providing relevant professional development, sufficient time for lesson planning, and opportunities to exchange problem-solving tasks and teaching strategies with other teachers.

However, this study involved only two teachers and relied on semi-structured interviews. As a result, the findings cannot be generalised to all Form 1 mathematics teachers in East Lombok. The study also focused on teachers' reported practices and experiences rather than their actual classroom practices, which were not directly observed. Future studies could include a larger number of teachers and combine interviews with classroom observations. It would also be useful to examine examples of problem-solving tasks used during mathematics lessons to better understand how the approach is implemented in practice.

4.3 Conclusion

Overall, this study demonstrates that for the two participating Form 1 mathematics teachers, positive perceptions of problem solving were constrained by systemic challenges, including weak student foundations, curriculum time pressure, and a lack of specialized

training. These factors led teachers to rely on intuitive practices and frequent task simplification rather than structured problem-solving frameworks. Rather than reflecting mathematics teachers in general, these findings highlight the specific need for context-tailored professional support and instructional flexibility within these schools to help teachers effectively bridge the gap between their educational beliefs and self-reported classroom practices.

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