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Teachers' Perspectives on Problem Posing Assessment: A Needs Analysis for Evaluating Conceptual Understanding in Mathematics

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ABSTRACT
This study aims to address gaps in understanding how mathematics teachers perceive and use problem-posing assessment. It is part of a larger Research and Development (R&D) framework aimed at designing an effective problem-posing assessment model for mathematics teachers. Specifically, this paper reports on the preliminary phase, focusing on needs assessment. A mixed-methods strategy was adopted, integrating quantitative data from questionnaires and qualitative insights from open-ended responses and semi-structured interviews, with 63 junior and senior high school teachers participating. Findings indicate that most teachers understand and value problem posing for assessing students' conceptual understanding, although some hold limited or incorrect knowledge. Its practice is infrequent, mostly in formative assessments such as daily assignments or group activities, and rarely in summative assessments. Key challenges include time constraints, difficulties in designing and evaluating tasks, and lack of targeted professional development. Teachers expressed needs for structured workshops, step-by-step implementation guides, digital learning media, reduced administrative workload, and regular opportunities for students to practice problem posing. These findings highlight gaps between teachers' knowledge, implementation, and support. Addressing these gaps through sustained professional learning is essential to strengthen teachers' capacity and guide the design of effective problem-posing assessment models in subsequent R&D stages.

KEYWORDS
Problem posing; assessment; mathematics education; conceptual understanding; teacher perceptions.

INTRODUCTION

Mathematics education aims to develop students' conceptual understanding, problem-solving skills, and critical thinking abilities (Al-Mutawah et al., 2019; Wanabuliandari et al., 2023). However, traditional assessment methods, such as multiple-choice and procedural-based tests, often focus on rote memorization and procedural fluency rather than assessing students' deeper conceptual understanding and higher-order thinking skills (Bisson et al., 2016; Zhu et al., 2023). To address this limitation, researchers have explored alternative assessment approaches. One such approach is Cognitive Diagnostic Models (CDM), which utilizes statistical models to analyze students' mastery of specific cognitive skills, providing a more detailed insight into their conceptual understanding (Saso et al., 2023). Additionally, performance-based assessments, such as projects, presentations, and portfolios, offer a broader perspective by emphasizing the application of knowledge in real-world contexts (Djamalovna, 2024; Sibanda, 2023).

As a result of the limitations of traditional assessments, there is growing interest in alternative assessment strategies that can provide deeper insights into students' mathematical thinking. One such approach is problem posing assessment, which involves students in generating, modifying, or reformulating mathematical problems based on given situations or concepts (Kojima, 2020).

Problem posing assessment has been recognized as an effective tool for evaluating students' conceptual understanding (Asanre & Chinaka, 2024; Ferreira & Monteiro, 2022; Kwek, 2015). By engaging in problem formulation, students demonstrate their grasp of mathematical principles, their ability to connect different concepts, and their creative thinking skills. Research indicates that problem posing can reveal students' misconceptions more clearly than traditional assessment methods, making it a valuable tool for educators (Mishra & Iyer, 2015; Parhizgar et al., 2022). However, despite its potential, problem posing assessment is not widely implemented in mathematics classrooms, particularly due to challenges related to teachers' knowledge, beliefs, and instructional practices.

Teachers play a crucial role in shaping assessment practices in the classroom (Bhagwonparsadh & Pule, 2024; Mabhoza & Olawale, 2024; Suwandi, 2023). Their perspectives on problem posing assessments, including perceptions of the benefits, challenges and support needed-strongly influence their implementation (Spinillo et al., 2024). Therefore, a deep understanding of teachers' needs and perspectives is crucial in designing professional development programs and learning strategies that support the integration of problem posing assessment in mathematics education.

Several studies have identified challenges in implementing problem posing in real classrooms, particularly those related to teachers' confidence, training, and beliefs (Li et al., 2020; Li et al., 2022). Teachers often express uncertainty in designing appropriate problem posing tasks and assessing students' responses effective (Crespo, 2003). These challenges highlight the importance of exploring teachers' needs and perspectives to ensure meaningful integration of this method.

Research on teachers' assessment conceptions and practices also reveals a persistent gap between beliefs and implementation. While teachers recognize that student characteristics should inform assessment design, this principle is not consistently enacted in classroom practice (Acar-Erdol & Yildizli, 2018). Teachers who value assessment for improvement and accountability tend to align their practices accordingly; however, these conceptions account for only a portion of their behavior, explaining approximately 27.3% of the variance (Takele & Melese, 2022). These findings underscore a disconnect between theoretical ideals and actual practice, emphasizing the need for a clearer understanding of teacher readiness and systemic support mechanisms.

Although problem posing has been recognized as an important skill in mathematics education, both for developing students' conceptual abilities and as an assessment tool for teachers, its implementation in the field still faces various challenges. Several studies have explored teachers' views on problem posing. For example, a study of 277 primary school teachers in Turkey showed that teachers had a positive view of the application of problem posing to students, but were negative about the existing mathematics curriculum and textbooks (Kilic, 2013).

Another study using a content analysis approach also highlighted that teachers' views on problem posing skills are shaped by their experiences and practical knowledge (Erdik, 2019). However, limited support from learning resources is also an obstacle. For example, textbook analyses revealed that problem-posing tasks were limited in number, unevenly distributed, and lacked variety. Teachers also noted that such tasks did not stimulate diverse problem-posing strategies (Divrik et al., 2020; Yıldız & Ev Çimen, 2017). Although problem posing has been explicitly emphasized in curriculum standards, its actual implementation remains limited, even in countries such as China and the United States (Cai & Jiang, 2017).

While these studies have made important contributions to our understanding of problem posing in mathematics education, the focus has not been specifically on analysis teachers' needs for implementing problem posing as an assessment tool. In fact, to ensure effective implementation in the classroom, an in-depth understanding of teachers' perceptions, challenges and support needs is crucial. Therefore, this study aims to fill the gap in understanding how mathematics teachers perceive and utilize problem posing assessment. By conducting a needs analysis on their use of this assessment type, we aim to gather insights that will serve as a foundation for designing professional development programs and relevant learning resources tailored to the needs of educators.

Considering the growing emphasis on alternative assessment methods in mathematics education and the limited integration of problem posing in classroom assessment practices, this study seeks to conduct a needs analysis to understand mathematics teachers' perspectives, experiences, and challenges in implementing problem posing as an assessment tool. Specifically, the study addresses the following research questions:

1. How do mathematics teachers understand, value, and experience problem posing assessment for evaluating students' conceptual understanding?
2. What assessment practices related to problem posing are currently implemented in mathematics classrooms?
3. What challenges do teachers encounter in using problem posing as an assessment tool?
4. What forms of support do teachers need to effectively integrate problem posing into classroom assessment?

METHOD

Design

This study is part of a larger Research and Development (R&D) framework aimed at designing an effective problem posing assessment model for mathematics teachers. The present paper specifically reports on the preliminary phase, which focuses on needs assessment. This phase is crucial for identifying gaps in current assessment practices, challenges experienced by teachers, and their expectations for an improved assessment model (Borg & Gall, 1984).

To achieve a comprehensive understanding of the needs in the preliminary phase of this R&D study, a mixed-methods strategy was adopted**.** This approach integrates both quantitative data and qualitative data. The integration of these data types enabled triangulation, enhancing the depth and credibility of findings related to mathematics teachers' perceptions, practices, and expectations regarding problem posing assessment. Mixed methods are particularly well-suited for the need analysis phase in R&D research, as they allow researchers to obtain both breadth and depth in understanding user needs and contextual (Park, 2021).

The needs assessment process adhered to a systematic, stepwise procedure based on standard frameworks, as outlined below:

1. Define the Goal of the Assessment

The primary objective of the need assessment is to identify what mathematics teachers need and expect from an assessment model that utilizes problem posing as a tool to evaluate students' conceptual understanding.

2. Identify Target Audiences and Data Sources

The target audience includes junior and senior high school mathematics teachers with varying years of teaching experience. Data were collected from questionnaire and semi-structured interviews conducted with selected participants.

3. Conduct the Analysis

Data from closed-ended items, open-ended responses, and teacher interviews were integrated to capture both patterns and contextual insights.

4. Summarize the Results

The results were synthesized to highlight key trends, patterns, and emerging themes related to teachers' assessment practices, challenges, and expectations for a problem posing assessment model.

5. Get Feedback from Key Stakeholders

Preliminary findings were shared with senior mathematics teachers, mathematics subject supervisors, and representatives from Mathematics Teachers' Association to validate interpretations and ensure contextual relevance.

6. Share the Analysis

The results were systematically documented and disseminated through internal reports to participating schools, presentations to representatives from Mathematics Teachers' Association and the Education Office, and academic publications, ensuring transparency and broad accessibility.

7. Take Action

Based on the identified needs and priorities, the next R&D phase will focus on designing the prototype of the problem posing assessment model, developing rubrics and instructional materials, and planning pilot testing and validation in classroom settings.

Participants

This study involved 63 mathematics teachers from junior and senior high schools in Palu City, Central Sulawesi, Indonesia. Participants were selected using purposive sampling based on the following inclusion criteria:

(1) at least five years of teaching experience,

(2) active involvement in mathematics instruction, and

(3) familiarity with or interest in open-ended assessment strategies such as problem-posing.

Purposive sampling was used as it aligned with the exploratory objectives of this need assessment phase, which aimed to gain a broad and in-depth understanding of teachers' perceptions, current assessment practices, challenges, and support needs in integrating problem-posing tasks into classroom assessment, rather than to achieve statistical generalization.

The sample size was determined not based on statistical generalization, but in accordance with the research purpose**,** guiding questions**,** and research design. The number of participants in a study should be informed primarily by what the study seeks to understand and how it is methodologically structured (Onwuegbuzie & Collins, 2007). Therefore, the purposive selection of 63 participants was considered appropriate to ensure data relevance, diversity, and depth in addressing the research questions and informing the subsequent model development phase of this study. The number of respondents and their demographic characteristics are presented in Table 1.

The fact that most respondents (62%) had over a decade of teaching experience suggests that they were likely to possess well-developed pedagogical knowledge and be familiar with a variety of assessment strategies, including problem-posing assessment. This demographic distribution supports the relevance and credibility of the insights gathered in this study.

Table 1.

Respondents' Demographic Characteristics

Characteristic	Category	Number	Percentage
Education Level	Middle School	28	45%
	High School	35	55%
Teaching Experience	0-10 years	24	38%
	More than 10 years	39	62%

For the qualitative phase, eight teachers were purposefully selected for in-depth interviews. The number of participants was guided by the principle of information power, considering the study's focused aim, the specificity of the participant group, and the high relevance of selected individuals to the research objectives (Malterud et al., 2016). Variation in teaching experience and responses from the survey phase informed the selection process to ensure diverse and information-rich perspectives. This sample size was deemed sufficient to generate meaningful themes without redundancy, aligning with the exploratory nature of the study.

Instruments

This study employed two types of instruments: a structured questionnaire and a semi-structured interview guide.

Questionnaire

The questionnaire development was based on the need assessment framework. The questionnaire items were designed to capture teachers' current assessment methods, their understanding and expectations regarding problem posing, and the perceived challenges or gaps that may hinder its implementation in classroom practice. The initial version of the questionnaire consisted of 15 items. Following expert review and validation, two additional open-ended items were added to capture more in-depth insights into teachers' experiences and suggestions regarding the use of problem posing in assessment. Consequently, the final version of the questionnaire comprised 17 items.

The questionnaire was structured into four main sections, aligned with specific indicators reflecting teachers' needs related to problem posing assessment, as follows:

1. Respondent Background (Items 1–2)
2. Current Assessment Practices (Items 3–11)
3. Perceptions and Challenges (Items 12–13)
4. Reflection and Further Development (Items 14–17)

The questionnaire consisted of closed-ended multiple-choice questions and Likert-type scale items. The multiple-choice questions were designed to capture factual information about teachers' current assessment practices (e.g., types of assessments used), while the Likert-type items used a 5-point scale (from "Strongly Disagree" to "Strongly Agree") to measure teachers'

beliefs, perceptions, and attitudes toward problem posing assessment. In addition, a few open-ended questions were included to allow participants to elaborate on their experiences, challenges, and suggestions for improving assessment practices. The structure and distribution of items are presented in the Table of Specification (ToS) below.

Table 2.

Specification of the Questionnaire Instrument

Section	Dimension / Construct	Type of Item	Item Numbers	Number of Items	Purpose
1	Teacher Demographics	Close-ended,	1-2	2	To gather background information on teaching experience and school level
2	Assessment Methods	Multiple response, Likert Scale	3-8	6	To explore assessment practices
3	Awareness and Use of Problem Posing	Dichotomous, Likert Scale, Checklist	9-11	3	To explore the extent of problem posing usage
4	Effectiveness and Challenges	Likert Scale, Multiple response	12 -13	2	To examine teachers' perceptions of effectiveness and implementation challenges
5	Feedback	Likert Scale, Multiple response	14 -15	2	To investigate feedback practices
6	Reflection and Further Development	Open-ended	16-17	2	To explore teachers' reflections and gather suggestions for improvement

Interview Guide

The interview guide was developed based on the conceptual framework and the questionnaire domains. It focused on four key themes: understanding, implementation, challenges, and support needs. While the guide provided consistency, the semi-structured design allowed for probing and follow-up questions based on participants' responses. Table 3 presents the alignment between each theme, indicator, and sample interview questions.

Table 3.

Semi-Structured Interview Guide Aligned with Research Focus

Theme	Indicators	Sample Questions
Understanding of problem posing assessment	Teachers' knowledge of the concept	What do you know about problem posing assessment?
Classroom implementation	Prior use of problem posing assessment	Have you ever used problem posing tasks in your classroom?
Challenges in implementation	Perceived difficulties	What challenges do you face in implementing problem posing assessment?
Support needs	Forms of support	What kind of support do you need to apply this assessment effectively?

Instrument Development and Validation

The instrument was first validated through expert judgment involving three university-level mathematics education lecturers experienced in assessment development. The experts evaluated the relevance, scope, and clarity of the items in relation to the research objectives and suggested revisions to improve alignment with assessment indicators. Based on their feedback, two open-ended questions were added to Section Reflection and Further Development.

Following expert validation, the revised instrument was piloted with 10 mathematics teachers who were not part of the actual study participants. The pilot test aimed to examine item clarity, interpretability of responses, and technical aspects of the printed questionnaire format and layout. In line with the goal of gathering validity and reliability evidence, only the 8 Likert-scale items were subjected to statistical analysis. Item-total correlations were calculated to assess construct validity and internal consistency was measured using Cronbach's Alpha.

The item-total correlation values ranged from 0.396 to 0.830, indicating acceptable levels of construct validity. The overall Cronbach's Alpha coefficient was 0.77, suggesting good internal reliability. These findings demonstrate that the Likert-scale portion of the questionnaire is both conceptually grounded and statistically reliable for use in the main study.

To further establish content validity, a detailed conceptual mapping was conducted, aligning each questionnaire item with specific indicators and descriptors derived from the theoretical framework of problem posing assessment. This process ensured the valid development of item stems, the appropriateness of the response scales, and the coverage of key dimensions, including classroom practices.

The following Table 4 summarizes the alignment of items using Likert scale only with their corresponding indicators and descriptors:

Table 4.

Indicators and Descriptors Based on Needs Assessment

Item	Indicator (Current State / Representation of Need)	Descriptor (What the Item Measures)
4-8	Reliance on a variety of assessment methods for assessing conceptual understanding	Frequency of using written tests, project or product-based tasks, presentation, classroom observation, and classroom discussion as a benchmark, indicating the potential need to introduce alternative assessments such as problem posing.
10	Degree of implementation of problem posing in actual classroom practice	Frequency of using problem posing as an assessment method
12	Teachers' perceptions of the effectiveness of problem posing in assessing students' understanding	Level of agreement regarding the effectiveness of problem posing
14	Consistency in providing feedback after problem posing assessment	Frequency of feedback provision following problem posing assessment

Data Analysis

The data from the questionnaire were analyzed using descriptive statistics, including frequency distributions and percentages, to identify common patterns in teachers' responses. In line with the purpose of this study as a need analysis, participants' responses were interpreted in relation to their teaching experience, level of understanding of problem posing assessment, perceived challenges in implementation, and support needs.

Although the sample size was relatively limited, cross-tabulations and simple comparative analyses were conducted to explore trends based on participants' backgrounds (e.g., teaching level and years of experience). These analyses helped to uncover variations in needs and perceptions across different subgroups. Furthermore, responses to the open-ended questions and transcripts from semi-structured interviews were analyzed thematically. Thematic analysis was employed following the six-phase framework, which included familiarization with the data, initial coding, theme identification, theme refinement, and reporting (Braun & Clarke, 2006). An inductive coding process allowed key themes to emerge from the data, particularly those reflecting teachers' experiences, challenges, and suggestions for improving the implementation of problem posing assessment.

To ensure trustworthiness, peer debriefing was conducted with two qualitative researchers to review coding decisions and thematic structures. Member checking was also carried out with selected interview participants to verify the accuracy of the interpretations. Triangulation of data sources enhanced the credibility and comprehensiveness of the findings.

FINDINGS

This section presents the findings from the need analysis phase, which serves as the foundation for developing a problem posing assessment model. The results are organized according to the four research questions: (1) teachers' understanding, valuation, and experiences with problem posing assessment, (2) the implementation of problem posing in classroom practice, (3) challenges encountered by teachers, and (4) forms of support needed to facilitate its effective implementation.

Teachers' Understanding, Valuation, and Experiences with Problem Posing Assessment

The findings are organized into two subthemes: (1) teachers' understanding and experiences with problem posing assessment and (2) value attributed to the assessment.

Teachers' Understanding and Experiences with Problem Posing Assessment

Data from Item 9 of the questionnaire indicated that 79.4% of teachers reported familiarity with problem posing assessment. However, responses to open-ended questions and data from semi-structured interviews with eight selected teachers revealed significant variation in their actual understanding and implementation.

The result of interview, several teachers demonstrated limited or inaccurate understanding. For example, Teacher W conflated problem posing with problem solving, describing it as a linear process of planning and solving rather than having students generate problems. Similarly, Teacher B, initially unfamiliar with the term, described assigning students to write questions during remedial activities, but did not consider it an assessment tool. These examples reflect partial or misaligned understanding of the concept.

Teachers A, Z, and H demonstrated a clear conceptual understanding of problem posing assessment but reported limited implementation in their classrooms. While they acknowledged its potential to enhance students' mathematical thinking, they cited various constraints that hindered regular use. These challenges are explored further in the findings related to Research Question 3.

In contrast, three teachers demonstrated clear understanding and purposeful use. Teacher S employed problem posing at the beginning of lessons to activate prior knowledge and gauge students' initial conceptions. Teachers R and G used collaborative group-based problem posing, where students designed and solved each other's problems. These practices encouraged peer learning and creative engagement but also revealed that some students struggled to formulate meaningful problems without sufficient conceptual grounding.

Additional responses to the open-ended questionnaire item (Item 16) reinforced these insights. Some teachers described problem posing as effective for encouraging critical thinking and increasing student participation during lessons. Others highlighted its value in helping students express mathematical problems in ways that were more meaningful and understandable to them. Several respondents observed that students became more enthusiastic when engaging in problem posing activities; however, they also noted that the preparation and design of such tasks required considerable time and effort, which limited their

frequent use. It was also reported that many students demonstrated limited creativity, often replicating familiar problem structures with only minor numerical variations. One teacher reflected that problem posing appeared to be more effective with high-ability students than with those who struggled conceptually.

Valuation of Problem Posing Assessment

Teachers' perceptions of the effectiveness of problem posing assessment were captured in Item 12 of the questionnaire. As shown in Table 5, a majority of the respondents viewed this method positively. Specifically, 42.86% rated it as effective and 15.87% as very effective, with another 15.87% selecting quite effective. Only one teacher (1.59%) considered it less effective, and none selected not effective.

Table 5.

Perceived Effectiveness of Problem Posing Assessment

Effectiveness Level	Number of Respondents	Percentage (%)
Very Effective	10	15.87
Effective	27	42.86
Quite Effective	10	15.87
Less Effective	1	1.59
Not Effective	0	0
No Response	15	23.81
Total	63	

Table 5 presents an overview of teachers' perceptions regarding the effectiveness of problem posing as an assessment tool. A substantial number of teachers viewed this method as effective for evaluating students' conceptual understanding. However, it is noteworthy that 15 teachers (23.81%) did not respond to this item. Further analysis suggested that this nonresponse was not random; rather, it reflected a lack of prior experience with or familiarity with the concept of problem posing assessment. These teachers either had never implemented the method in their classrooms or were unaware of its use as an assessment strategy.

In summary, the majority of teachers reported that they understand problem posing assessment and consider problem posing as an effective method to measure students' conceptual understanding of mathematics. However, some teachers still have limited or incorrect understanding of the concept. In addition, several teachers noted that the preparation and design of such tasks required considerable time and effort, which limited their frequent use.

Current Implementation of Problem Posing in Classroom Assessment

This section examines how mathematics teachers implement problem posing within classroom assessments. The analysis addresses the types of assessments employed, the relative frequency of problem-posing tasks, the instructional contexts in which they are applied, and the forms of

feedback provided. These findings provide a comprehensive overview of the degree to which problem posing has been integrated into everyday assessment practices.

Position of Problem Posing Among Assessment Types

To understand the assessment practices in mathematics classrooms, teachers were asked to indicate the types of assessment methods they commonly used to evaluate students' conceptual understanding (Item 3). The results indicate that written tests remain the predominant form of assessment (100%), followed by presentations (74,6%), class discussions (65,08), and project-based tasks (49,21). Classroom observations (39,68) are employed to a lesser extent, with noticeable variations depending on the school level and teachers' experience.

Interestingly, despite the widely acknowledged pedagogical advantages of problem posing, none of the participants identified it under the "other" assessment methods category. This absence suggests that problem posing is either not recognized by teachers as a formal assessment tool or has yet to be effectively incorporated into their regular assessment practices.

A deeper understanding of the extent to which various assessment methods are utilized in classrooms was sought by asking teachers to report the frequency of their use of each method for evaluating students' conceptual understanding. Table 6 presents a summary of the frequency distributions for each assessment type as reported by the participants.

Table 6.

Frequency of use of assessment types

Assessment types	Frequency of use (%)				
	Very Often	Often	Sometimes	Rarely	Never
Writen test	50.79	46,03	3,17	0	0
Project or work assignment	3,17	11,11	46,9	30,6	20,63
Presentation	7,937	39,68	44,44	6,3492	1,59
Observation	4,76	30	28,6	16	19
Class Discussion	15,9	49,2	20,6	0	3,175

From Table 6, written tests are the most frequently used method by mathematics teachers. Class discussions are also often applied in evaluating concept understanding. While projects/work assignments and problem posing are relatively rarely used and usually only applied occasionally. Presentation and observation are also commonly used, although the frequency varies among teachers

Frequency and Context of Problem Posing Assessment

Data from Item 10 reveals that most teachers do not regularly incorporate problem posing into their assessment practices. Specifically, 30.16% of respondents reported using problem posing very rarely, followed by 25.4% who selected rarely, and another 25.4% who chose occasionally. Only 17.5% of teachers reported using it frequently, while 1.59% selected the very frequently

category. These findings suggest that, although teachers may understand the potential benefits of problem posing, the approach has not yet been fully integrated into their regular assessment practices.

To further understand the context of problem posing implementation, data from Item 11 indicate that the majority of teachers (66,7%) use problem posing in daily assignments. Meanwhile, only 22.2 % teachers reported its use in daily quizzes, 4.8 % teachers in mid-term exams, and only 3.2% teachers used it in final exams. In addition, 3.2% teachers selected the "other" category, which referred to learning activities or indicated that they never used problem posing. These finding reinforces that problem-posing is more commonly used in formative assessments such as daily tasks compared to summative assessments like mid-term and final exams, which are typically more standardized and structured.

These quantitative findings are further supported by interviews with several teachers. For instance, Teacher S reported using problem posing at the beginning of the lesson to diagnose students' initial understanding. Meanwhile, Teachers R and G implemented problem posing through collaborative group activities, in which students were asked to generate problems within their groups and present them to other groups for solving. Overall, the data suggest a discrepancy between teachers' recognition of the value of problem posing and their routine assessment practices.

Feedback Practice on Problem Posing Task

Of the total 63 respondents, only 48 teachers (76.2%) responded to Items 14 and 15. A total of 15 teachers (23.8%) did not provide responses. Therefore, the analysis in this subsection focuses on the 48 teachers who have experience implementing problem posing in the classroom.

The majority of teachers reported that they regularly provide feedback on students' problem posing tasks. A total of 8 teachers (16.7%) indicated Very Frequently, 19 teachers (39.6%) Frequently, and 15 teachers (31.25%) Occasionally provided feedback. In contrast, only 4 teachers (8.3%) selected Rarely, and 2 teachers (4.17%) reported Never providing feedback.

Data from Item 15 indicates that oral feedback is the most commonly used form, selected by 32 out of 48 teachers (66.7%). In addition, written feedback and classroom discussions are also frequently used, each reported by 23 teachers (47.9%). However, the use of digital or visual media as a means of providing feedback remains very limited, with only 3 teachers (6.25%) reporting its use.

In summary, although various forms of assessment such as written tests, class discussions, and presentations are widely practiced, problem posing is notably absent as a recognized assessment method among participating teachers. The current practice of problem posing assessment in mathematics classes is still limited and not yet routine. It is generally applied more in formative assessments, such as daily assignments, than in summative assessments like mid-term and final exams. Some teachers use problem posing to diagnose students' initial understanding at the beginning of lessons, while others implement it in

collaborative group activities where students generate and solve problems together. The majority of teachers provide verbal feedback on the results of problem posing activities.

Challenges Encountered by Teachers

The questionnaires given to 63 mathematics teachers also illustrate the challenges they face in implementing the problem posing assessment method. Some of the challenges that were often expressed by the teachers included difficulties in developing problems, time constraints, difficulties in assessing student answers, and low student creativity. The frequency of these challenges is presented in detail in Table 7.

Table 7.

Challenges in Implementing Problem Posing Assessment

Challenges	Number of Respondents	Percentage (%)
Difficulty in designing questions	23	36.51
Limited time	28	44.44
Difficulty in assessing students' answers	10	15.87
Low student creativity	30	47.60
Others	0	0
Did not answer	15	23.81

Table 7 shows that the main challenges teachers face in using problem-posing assessments are low student creativity (47.6%) and time constraints (44.44%). Developing appropriate problems is also a significant challenge (36.51%). Although the method presents certain challenges, no teachers reported difficulties beyond the options provided in the questionnaire, and 23.81% chose not to respond, possibly due to limited experience with the method.

In addition to questionnaire responses, interviews with selected teachers revealed more nuanced challenges in implementing problem posing within classroom settings. A primary obstacle identified was time constraints. For example, Teacher Z reported that the limited duration of mathematics lessons made it difficult to allocate sufficient time for designing problem posing tasks, guiding students during the activity, and conducting thorough evaluations.

Another significant challenge related to the assessment of students' responses. Given that each student may pose different problems with unique solutions, teachers found the evaluation process to be more complex and time-consuming compared to conventional assessment formats. Teacher A shared uncertainty about how to assign scores to such diverse outputs, indicating a lack of established rubrics or criteria to judge the quality and mathematical relevance of posed problems. This concern aligns with the 15.87% of respondents who found evaluating student work difficult.

Moreover, Teacher H emphasized the absence of specific and in-depth professional development opportunities focused on problem posing. Many teachers expressed that they lacked the pedagogical tools and confidence necessary to design meaningful tasks, foster student creativity, or fairly assess student-generated problems. These concerns highlight a broader systemic issue—namely, the absence of adequate training and support.

In summary, time constraints are the primary obstacle in implementing problem posing. Teachers reported difficulties in designing tasks, guiding students, and conducting thorough evaluations within the limited duration of mathematics lessons. Assessing students' work also posed a challenge, as each student generated different problems, making it difficult to assign scores without clear rubrics. In addition, the lack of targeted professional development left teachers feeling less confident and insufficiently equipped with the pedagogical skills needed to design meaningful tasks, foster student creativity, and evaluate results fairly.

Form of Support Needs for Effective Use of Problem Posing

Responses to Item 17 reveal that teachers identified several key supports needed to enhance the effective use of problem posing as an assessment method for mathematical understanding. These needs can be grouped into six major categories:

Table 8.

Categories of Teacher Support Needs for Effective Implementation of Problem Posing

Support Category	Specific Needs	Example Teacher Statements
Training / In-House Training (IHT) / Workshop	Workshops, IHT sessions, or technical training on designing problem posing tasks	"Need IHT on problem posing"
References and Books	Guidebooks, scholarly articles, and sample problems	"Need reference books and special training on problem posing"
Strengthening Understanding & Skills	Step-by-step implementation guidelines, scoring methods, practice in problem creation	"Please provide guidance on how to design tasks according to students' abilities"
Learning Media	Digital tools, worksheets, templates, and visual aids	"Need to increase learning media that stimulate critical thinking"
Time & Workload Support	Reduction of administrative duties and teaching hours	"Reduce administrative tasks so I can focus on designing problem posing tasks"
Opportunities for Student Practice	Regular in-class problem posing activities	"If students are often given the opportunity, they will get used to creating their own tasks"

Table 8 presents six categories of teacher support needs for the effective implementation of problem posing. The most frequently mentioned need was training and workshops on designing problem posing tasks, followed by access to relevant references and step-by-step implementation guidelines. Several teachers also highlighted the need for digital learning media

to stimulate students' critical thinking, as well as reduced administrative workload to allow more time for task development. Additionally, some teachers emphasized that students require regular opportunities to practice problem posing in class in order to build familiarity and confidence.

DISCUSSION

This section discusses the research findings in relation to the four research questions. Specifically, it addresses: (1) teachers' understanding, valuation, and experiences with problem posing assessment; (2) the implementation of problem posing in classroom practice; (3) challenges encountered by teachers; and (4) forms of support needed to facilitate its effective implementation.

Teachers' Understanding, Valuation, and Experiences with Problem Posing Assessment

The finding of the first research question revealed that most teachers reported understanding the concept of problem posing assessment and recognized its potential as an effective tool for evaluating students' conceptual understanding of mathematics, which aligns closely with the findings of (Yao et al, 2021). Their study emphasizes the effectiveness of problem-posing tasks in diagnosing preservice teachers' conceptual understanding, demonstrating that problem posing can elicit deeper insights into learners' conceptual grasp compared to traditional problem-solving tasks. Thus, both the current study and previous research highlight the significant potential of problem posing as a diagnostic assessment method for uncovering students' mathematical understanding.

Nevertheless, the results also reveal that some teachers still hold limited or inaccurate conceptions of problem posing. For example, several respondents equated problem posing with problem solving. This is consistent with Cai & Hwang (2020), who found that the overall understanding of problem posing among educators remains relatively limited, particularly regarding its effective integration into instructional practices.

Teachers' understanding of problem posing remains largely passive or conceptual, rather than grounded in direct experience. Therefore, further training is necessary to ensure that teachers feel competent in applying problem posing in practice. These findings highlight the need for greater conceptual clarity, targeted professional development, and sustained support to help teachers move from informal or incidental use toward deliberate and pedagogically grounded implementation in assessment. Supporting this, (Shahini, 2025) found a strong positive connection between participation in pedagogical practice and the effective integration of theoretical knowledge into practical application.

Implementation of Problem Posing in Classroom Practice

The findings related to the second research question revealed that although various forms of assessment, such as written tests, class discussions, and presentations, are widely used to evaluate students' conceptual understanding in mathematics, problem posing remains absent as a formally recognized assessment method among the participating teachers (Item 3).

Nevertheless, the majority of respondents reported being familiar with problem-posing assessment (Item 9). This discrepancy indicates a significant gap between conceptual knowledge and practical implementation in the assessment of students' mathematical conceptual understanding. These findings are consistent with prior research showing that, although teachers possess conceptual knowledge of problem posing, it is rarely used in classrooms (Yao et al., 2023). Cai & Hwang (2021) highlight both the scarcity of problem-posing tasks in curricular materials and the insufficient teacher buy-in to implement them effectively. Such disconnection may be caused by insufficient training, lack of resources, or uncertainty about how to apply problem posing effectively.

These findings indicate that teachers' knowledge of problem posing is likely still superficial and has not yet reached the stage of practical application. Many teachers may lack confidence or sufficient professional support, such as targeted training or practical guidance, to effectively implement problem posing. Additionally, the absence of problem posing integration into the curriculum, administrative demands, and the habitual reliance on traditional assessment methods like written tests can pose significant obstacles. Therefore, there is a clear need to diversify assessment methods by integrating problem posing as an innovative alternative. To achieve this, teachers require ongoing support and practical assistance for effective implementation.

Another finding in this study is that problem posing is used more frequently in formative assessments than in summative assessments. This indicates that teachers feel more comfortable applying problem posing in low-stakes, ongoing learning contexts, such as daily assignments, rather than in high-stakes evaluations like mid-term or final exams. Addressing this need through targeted professional development and resource support could enhance the breadth and depth of assessment practices, ensuring that problem posing contributes not only to the learning process but also to the robust measurement of students' learning outcomes. This finding is consistent with Wang et al. (2022) who emphasize that problem posing can significantly contribute to both the learning process and the assessment of students' learning outcomes.

Challenges Encountered in Its Application

The finding of the third research question revealed that the limited duration of mathematics lessons often made it difficult for teachers to carry out problem posing activities effectively. Time constraints hinder not only the design of problem posing tasks, but also the facilitation of students' engagement and the conduct of thorough evaluations. This finding aligns with Bonotto & Dal Santo (2014), who emphasize that effective problem posing requires sufficient instructional time for task preparation, scaffolding students' creative thinking, and supporting their problem-formulation processes. These finding is consistent with the research of Kaur & Rosli (2021), who found that teachers frequently encounter conceptual difficulties in designing and implementing problem-posing tasks appropriately.

A further challenge lies in the evaluation process, as each student typically produces unique problems, making uniform assessment difficult without well-defined scoring rubrics. Cankoy & Özder (2017) emphasizes that the use of analytical rubrics helps teachers assess problem posing more fairly and consistently, even though each student produces different problems. To address this gap, professional development programs should incorporate training on rubric design, calibration of scoring among teachers, and strategies for applying rubrics consistently across diverse student work. Furthermore, the rubrics should be adaptable to various levels of mathematical complexity and creativity, ensuring that evaluation supports both rigor and innovation. This targeted support is essential to enable teachers to assess problem-posing tasks in a fair, transparent, and pedagogically sound manner.

The findings of this study also indicated the lack of targeted professional development emerged as a key factor contributing to teachers' limited confidence and insufficient pedagogical skills in implementing problem posing effectively. Without structured training, teachers reported difficulties in designing meaningful tasks, fostering student creativity, and evaluating results fairly. These findings are consistent with Cai & Hwang (2021), who emphasize that the development of problem posing expertise requires explicit training in both content knowledge and pedagogical strategies.

These results underscore the need for systematic capacity building that addresses both the technical and pedagogical dimensions of problem posing assessment. Professional learning programs should include strategies for efficient task design, approaches to guide students within limited class time, and the development of adaptable scoring rubrics. Moreover, curriculum adjustments or flexible scheduling could help alleviate time pressures, enabling teachers to incorporate problem posing more meaningfully. In this way, the gap between theoretical support for problem posing and its practical enactment in classrooms can be narrowed.

Forms of Support Needed to Facilitate Its Effective Implementation.

The findings related to the fourth research question revealed that teachers expressed a strong need for targeted professional development in designing problem posing tasks, supported by access to relevant references and step-by-step implementation guidelines. Such needs point to a gap not only in individual teacher readiness but also in the systemic provision of sustained professional learning opportunities. This aligns closely with prior research (Sadiq et al., 2024), which underscores that continuing professional development (CPD) is essential for enhancing teachers' professional competency and equipping them to navigate the diverse and challenging contexts of contemporary educational environments. Addressing these needs through structured CPD initiatives can therefore play a pivotal role in bridging the gap between the theoretical value of problem posing assessment and its consistent application in classroom practice.

This implies the necessity of structured and continuous CPD programs that focus on designing problem posing tasks tailored to students' abilities, supported by the provision of

reference materials, guidebooks, sample problems, and digital learning media. Workload management, particularly the reduction of non-teaching administrative tasks, is also essential to allow teachers to allocate more time to instructional design and evaluation. At the policy level, integrating problem posing into curriculum and assessment frameworks could help ensure sustained and consistent application, while teacher workload policies should allocate dedicated time for professional learning.

CONCLUSION

This study reveals that most mathematics teachers understand and value problem-posing assessment as a method for evaluating students' conceptual understanding, although some still hold limited or incorrect knowledge. Its practice is infrequent and primarily applied in formative contexts such as daily assignments, collaborative group activities, or to diagnose students' initial understanding, with teachers typically providing verbal feedback on student-generated problems.

Key challenges include time constraints, difficulties in designing and evaluating tasks, and lack of targeted professional development. Teachers expressed needs for structured workshops, step-by-step guides, digital learning media, reduced administrative workload, and regular opportunities for students to practice problem posing. These findings highlight gaps between teachers' knowledge, practice, and support, providing a foundation for developing effective problem-posing assessment models within the R&D process and emphasizing the importance of sustained professional learning to strengthen teachers' capacity and enhance student learning outcomes.

However, this study is limited by its reliance on self-reported data from a purposive sample of mathematics teachers in one region, which may restrict the generalizability of the findings. Future research should therefore involve broader samples and complementary methods to capture a more comprehensive perspective.

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