EMTEKA: Jurnal Pendidikan Matematika
Volume 7, No. 2, 2026. 672-684
DOI: https://doi.org/10.24127/emteka.v6i1.11678

e-ISSN 2746-5594
p-ISSN 2746-5608

PRE-SERVICE TEACHERS' RESILIENCE IN MATHEMATICAL PROBLEM POSING BASED ON MATHEMATICAL LITERACY ABILITY

Fulgensius Efrem Men[1*], Kanisius Mandur[2], Yohannes Marriono Jamun[3] , Silverster T. R. Bagio [4]

[1*,2,3,4] Universitas Katolik Indonesia Santu Paulus, Manggarai, Indonesia.
*Corresponding author. Jl. Jend. Ahmad Yani, Universitas Katolik Indonesia Santu Paulus, 86518, Manggarai, Indonesia.

E-mail: pa-01-0583@instruktur.belajar.id [1*]
kanisiusmandur@gmail.com [2]
ryojamun@gmail.com [3]
silversterbagio@gmail.com [4]

Received 28 April 2026; Received in revised form 25 June 2026; Accepted 03 July 2026

ABSTRACT
This study aims to analyze the mathematical resilience of preservice teachers in posing mathematical problems based on their mathematical literacy ability. This research employed a descriptive qualitative approach, involving students of a mathematics education study program as the research subjects. The research instruments included a mathematical literacy test, a mathematical problem-posing task, a mathematical resilience questionnaire, and semi-structured interviews. The data were analyzed through data reduction, data presentation, categorization of findings, and conclusion drawing. The results indicate that preservice teachers with high mathematical literacy tend to demonstrate strong mathematical resilience, as reflected in their perseverance, self-confidence, strategic flexibility, and willingness to revise the problems they pose. In contrast, preservice teachers with low mathematical literacy tend to produce routine, less contextual problems and have trouble maintaining their strategies when facing obstacles. These findings affirm that mathematical resilience and mathematical literacy are two mutually supportive aspects in producing creative, contextual, and meaningful mathematical problem posing. The implications of this study point to the need to strengthen problem-posing-based learning in mathematics teacher education.
Keywords: mathematics education; mathematical literacy; problem posing; mathematics preservice teachers; mathematical resilience.

ABSTRAK
Penelitian ini bertujuan untuk menganalisis resiliensi matematis calon guru dalam pengajuan soal matematika berdasarkan kemampuan literasi matematika. Penelitian menggunakan pendekatan kualitatif deskriptif dengan subjek mahasiswa program studi pendidikan matematika. Instrumen penelitian meliputi tes literasi matematika, tugas pengajuan soal (problem posing), angket resiliensi matematis, dan wawancara semi-terstruktur. Data dianalisis melalui reduksi data, penyajian data, kategorisasi temuan, dan penarikan kesimpulan. Hasil penelitian menunjukkan bahwa calon guru dengan literasi matematika tinggi cenderung memiliki resiliensi matematis yang kuat, ditandai dengan ketekunan, kepercayaan diri, fleksibilitas strategi, dan kemauan merevisi soal. Sebaliknya, calon guru dengan literasi matematika rendah cenderung menghasilkan soal rutin, kurang kontekstual, dan mengalami kesulitan mempertahankan strategi ketika menghadapi hambatan. Temuan ini menegaskan bahwa resiliensi matematis dan literasi matematika merupakan dua aspek yang saling mendukung dalam menghasilkan pengajuan soal matematika yang kreatif, kontekstual, dan bermakna. Implikasi penelitian ini mengarah pada perlunya penguatan pembelajaran berbasis problem posing dalam pendidikan calon guru matematika.
Kata kunci: *calon guru matematika; literasi matematika; pendidikan matematika; problem posing resiliensi matematis*

EMTEKA: Jurnal Pendidikan Matematika
Volume 7, No. 2, 2026. 672-684
DOI: https://doi.org/10.24127/emteka.v6i1.11678

e-ISSN 2746-5594
p-ISSN 2746-5608

Introduction

21st-century mathematics education is no longer sufficient when understood merely as the mastery of procedures and formulas. Instead, mathematics learning must be directed toward developing critical, creative, communicative, and collaborative thinking skills, alongside the ability to use mathematics to read, model, and solve real-world problems. The OECD (2023) reinforces that mathematical literacy encompasses the capacity to reason mathematically and to formulate, employ, and interpret mathematics in a variety of contexts; this definition clarifies that mathematics education must move beyond procedural exercises toward making sense of real-world situations. In the Indonesian context, Stacey (2011) highlights the significance of the PISA framework as it positions mathematics as a tool for understanding and decision-making in daily life rather than a mere collection of formulas. This urgency is further underscored by Indonesia's PISA 2022 performance: the country's mathematics score stood at 366, falling significantly below the OECD average of 472, with only 18% of Indonesian students achieving at least Level 2 in mathematics, compared to the OECD average of 69% (OECD, 2023). These data indicate a critical need to strengthen the education of pre-service mathematics teachers so that they can design learning experiences that accustom students to reasoning, modeling situations, and making informed mathematical decisions.

One crucial professional competence for pre-service mathematics teachers is the ability to generate problems, known as problem posing. Problem posing involves designing, modifying, and developing problems from specific situations, enabling students not only to solve problems but also to comprehend problem structures, interconnections between concepts, and the mathematical reasoning underlying a given situation. Cai and Hwang (2020) explain that problem posing plays an essential role in learning because teachers can utilize this activity to formulate or reformulate problems, assess student comprehension, and expand opportunities for mathematical thinking. In the context of pre-service teacher education, Leavy and Hourigan (2020) demonstrate that practicing the formulation of mathematically meaningful problems helps prospective teachers develop sensitivity toward problem quality, such as contextual appropriateness, cognitive demand, and the potential emergence of various solution strategies. Thus, problem posing serves not only as an instructional strategy but also as a means to build pre-service teachers' mathematical creativity and pedagogical content knowledge.

Despite its importance, pre-service teachers frequently encounter challenges when transforming real-world contexts into clear, challenging, and solvable mathematical problems. These difficulties may relate to conceptual understanding, mathematical literacy, accuracy in selecting sufficient information, linguistic clarity, contextual authenticity, and the willingness to take intellectual risks when designing non-routine problems. Rianasari and Guzon (2024) provide evidence from the Indonesian context that pre-service mathematics teachers still tend to produce realistic problems with low cognitive demands, and some experience difficulties

e-ISSN 2746-5594
p-ISSN 2746-5608

solving the very problems they composed; these findings indicate that problem-posing ability does not automatically develop simply because pre-service teachers have studied mathematical content. Leavy and Hourigan (2022) reinforce this argument through the F-PosE framework, which evaluates problem quality across several indicators, including motivating contexts, linguistic clarity, curricular coherence, cognitive demand, the number of solution steps supporting reasoning, strategy diversity, multiple solution pathways, and the probability of success. Therefore, the quality of problem posing is determined not only by cognitive knowledge but also by the readiness of pre-service teachers to re-examine contexts, revise problem structures, and refine phrasing until the problems become logical and meaningful.

One highly relevant affective factor in this process is mathematical resilience. Mathematical resilience can be understood as an individual's capacity to persist, maintain a positive attitude, and continuously employ new strategies when facing mathematical difficulties. Johnston-Wilder and Lee (2010) introduced mathematical resilience as a construct emphasizing courage when confronting obstacles in learning mathematics and shifting perspectives to view difficulties as an inherent part of the learning process. Kooken et al. (2016) subsequently developed the Mathematical Resilience Scale with three primary dimensions: value, struggle, and growth. These three dimensions help explain why individuals persist when faced with challenging mathematical tasks. In the context of pre-service teachers, mathematical resilience is vital because the process of designing contextual problems frequently requires revision, exploration, and reflection on errors. The connection between affective aspects and problem posing is also evident in the findings of Baumanns and Rott (2024), who noted that the characteristics of problem-posing tasks influence the creative performance and self-efficacy of pre-service teachers; this suggests that self-belief and readiness to engage with open-ended tasks play a key role in the quality of the generated problems. When pre-service teachers are asked to create problems from open-ended contexts, they must endure uncertainty, reassess data adequacy, modify mathematical models, and improve phrasing to ensure the problems remain logical and meaningful.

Based on the aforementioned rationale, this study analyzes the mathematical resilience of pre-service teachers in mathematical problem posing based on their mathematical literacy levels. Conceptually, mathematical literacy serves as the cognitive foundation for formulating, employing, and interpreting mathematics in real contexts; problem posing provides the space to actualize this ability through task design; while mathematical resilience acts as the affective-motivational support that enables pre-service teachers to remain persistent, confident, flexible, and reflective during the design and revision process. A research gap is identified since the study by Rianasari and Guzon (2024) highlighted the ability of Indonesian pre-service teachers to design realistic mathematical tasks but did not specifically link it to mathematical resilience profiles based on mathematical literacy levels. On the other hand, Zhang et al. (2024) demonstrated that problem-posing competence can be enhanced through intervention, but their synthesis emphasized intervention effectiveness rather than the relationship between mathematical literacy, resilience, and the quality of problems posed by pre-service teachers. The novelty of this study lies in the integration of these three constructs within a single analytical framework

e-ISSN 2746-5594
p-ISSN 2746-5608

to explain problem-posing quality from cognitive, affective, and pedagogical perspectives simultaneously.

Research Methods

This study employs a descriptive qualitative approach. This approach was selected because the primary objective of the research is to provide an in-depth description of the characteristics of mathematical literacy, mathematical resilience, and pre-service teachers' problem-posing ability, rather than statistically testing causal relationships.

The research subjects consisted of three students from the mathematics education study program. The participants were selected purposively, considering their involvement in mathematical literacy and problem-posing tasks. The respondents had completed a mathematics learning strategies course or a similar course that included instruction on task and problem design. Subsequently, the participants were administered a mathematical literacy test to categorize them into high, medium, and low mathematical literacy groups. From each group, one subject exhibiting the widest variance was selected.

The research instruments comprised a mathematical literacy test, a mathematical problem-posing task, a mathematical resilience questionnaire, and a semi-structured interview guide. The mathematical literacy test was utilized to identify students' ability to comprehend contexts, model situations, apply procedures, and interpret results. The problem-posing task was employed to evaluate the quality of the generated problems. The mathematical resilience questionnaire was used to map aspects of persistence, confidence, flexibility, and attitudes toward challenges. Finally, the interviews were conducted to gain deeper insights into the students' rationales for designing and revising the problems.

Data were collected through the administration of tests, problem-posing assignments, questionnaires, and interviews. Data analysis was performed through data reduction, data display, thematic coding, and conclusion drawing. The results of the literacy test were categorized into high, medium, and low levels. The results of the problem-posing task were analyzed based on context, linguistic clarity, complexity, solvability, and creativity. The questionnaire and interview data were used to interpret the indicators of mathematical resilience that emerged during the problem-posing process. The interview data were triangulated over time (time triangulation) to ensure data validity.

Results and Discussion

Mathematical Resilience Profiles of Pre-Service Teachers with High Mathematical Literacy in Problem Posing

The following are the results of the problem-posing task of pre-service teachers with high mathematical resilience in Figure 1.

EMTEKA: Jurnal Pendidikan Matematika
Volume 7, No. 2, 2026. 672-684
DOI: https://doi.org/10.24127/emteka.v6i1.11678
e-ISSN 2746-5594
p-ISSN 2746-5608

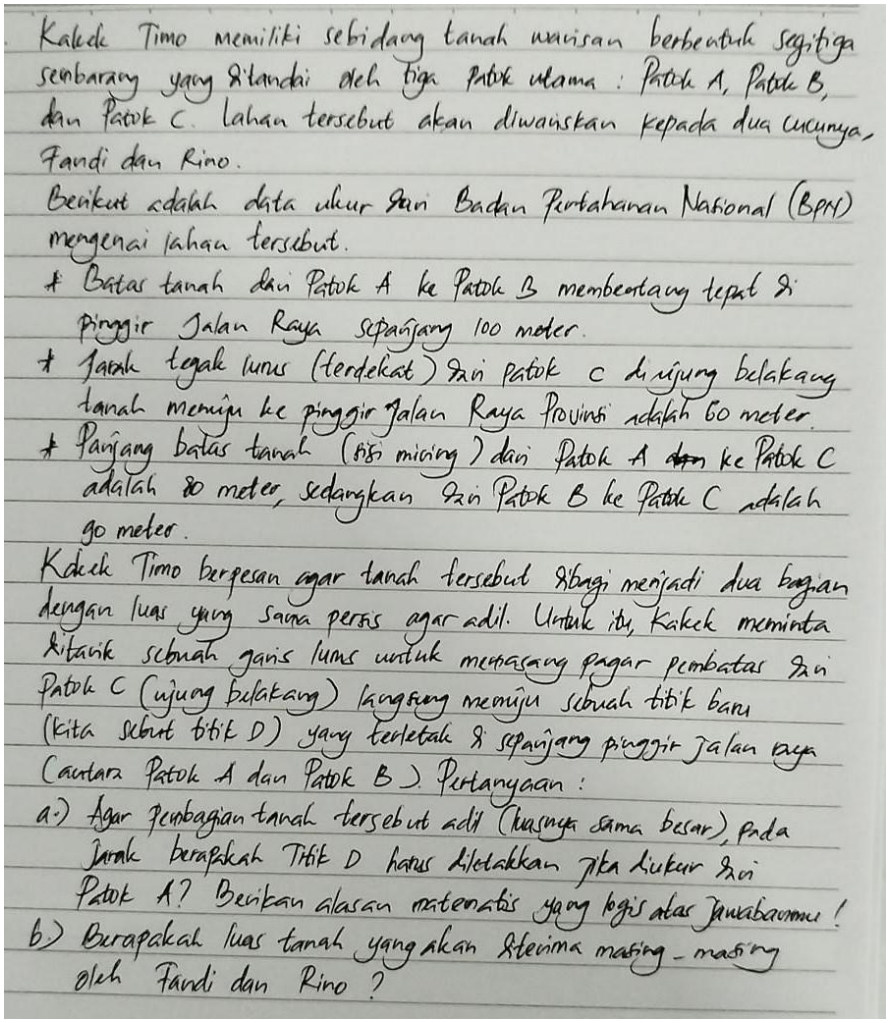
Kakek Timo memiliki sebidang tanah warisan berbentuk segitiga sembarang yang dilandai oleh tiga patok utama : Patok A, Patok B, dan Patok C. Lahan tersebut akan diwariskan kepada dua cucunya, Fandi dan Rino.
Berikut adalah data ukur dari Badan Pertahanan Nasional (BPN) mengenai lahan tersebut.
* Batas tanah dari Patok A ke Patok B membentang tepat di pinggir Jalan Raya sepanjang 100 meter.
* Jarak tegak lurus (terdekat) dari patok C di ujung belakang tanah menuju ke pinggir Jalan Raya Provinsi adalah 60 meter.
* Panjang batas tanah (sisi miring) dari Patok A ~~dan~~ ke Patok C adalah 80 meter, sedangkan dari Patok B ke Patok C adalah 90 meter.
Kakek Timo berpesan agar tanah tersebut dibagi menjadi dua bagian dengan luas yang sama persis agar adil. Untuk itu, Kakek meminta ditarik sebuah garis lurus untuk memagang pagar pembatas dari Patok C (ujung belakang) langsung menuju sebuah titik baru (kita sebut titik D) yang terletak di sepanjang pinggir jalan raya (antara Patok A dan Patok B). Pertanyaan :
a) Agar pembagian tanah tersebut adil (luasnya sama besar), pada jarak berapakah Titik D harus diletakkan jika diukur dari Patok A? Berikan alasan matematis yang logis atas jawabanmu!
b) Berapakah luas tanah yang akan diterima masing-masing oleh Fandi dan Rino?

Figure 1. the problem-posing task of pre-service teachers with high mathematical resilience

Pre-service teachers with high mathematical literacy demonstrate strong mathematical resilience during the problem-posing process. They are capable of thoroughly reviewing contextual situations, distinguishing between relevant and irrelevant information, and subsequently transforming these situations into solvable mathematical structures. This capability is crucial, as high-quality problem posing demands not only that pre-service teachers formulate questions, but also that they coherently connect contexts, concepts, representations, and potential solution strategies (Cai & Hwang, 2020; Leavy & Hourigan, 2020; Özgen, 2019).

Regarding the aspect of persistence, pre-service teachers in this category do not give up when their initial problem designs lack clarity. They tend to re-examine the context, refine data, adjust questions, and re-test the solvability of the problems. Such persistence indicates that difficulties are viewed as an inherent part of the refinement process, rather than a justification for abandoning the task. This attitude aligns with the concept of mathematical resilience, which emphasizes an individual's capacity to remain positively engaged when encountering obstacles in mathematical activities (Ariyanto et al., 2017; Johnston-Wilder & Lee, 2010; Lee & Johnston-Wilder, 2017).

e-ISSN 2746-5594
p-ISSN 2746-5608

In terms of confidence, prospective teachers with high literacy levels boldly select non-routine contexts, such as social, economic, environmental, or daily activity themes that require modeling. Rather than merely mimicking problems they have previously encountered, they develop novel questions with explicit mathematical objectives. This confidence is evident in their ability to articulate the rationales behind their conceptual selections, estimate difficulty levels, and demonstrate the relationship between the questions and mathematical literacy competencies. Research by Baumanns and Rott (2024) indicates that self-efficacy is linked to creative problem-posing performance in pre-service teachers, while Leikin and Elgrably (2020) affirm that investigative activities can foster creativity and proof-related skills in problem posing.

With respect to strategy flexibility, pre-service teachers with high literacy skills are capable of altering their perspectives when the generated problems fail to meet specified criteria. The revisions they undertake are not superficial, such as merely modifying numbers, but instead address the problem structure, forms of representation, levels of complexity, and contextual clarity. This flexibility indicates well-developed metacognitive control in evaluating problem quality. These findings support Hartmann et al. (2024), who demonstrated that metacognitive process variables play a role in modeling-related problem posing, as well as Cai et al. (2023), who emphasized the importance of prompts and task characteristics in influencing problem-posing quality.

Consequently, the profile of pre-service teachers with high mathematical literacy can be characterized as a resilient-productive profile. They are persistent, confident, flexible, reflective, and capable of executing profound revisions. The problems they generate tend to be contextual, creative, complex, clear, and solvable. This profile shows that robust mathematical literacy serves as the cognitive foundation, while mathematical resilience acts as the affective reinforcer in generating meaningful problem posing.

Mathematical Resilience Profiles of Pre-Service Teachers with Medium Mathematical Literacy in Problem Posing

The following are the results of the problem-posing task of pre-service teachers with medium mathematical resilience in Figure 2.

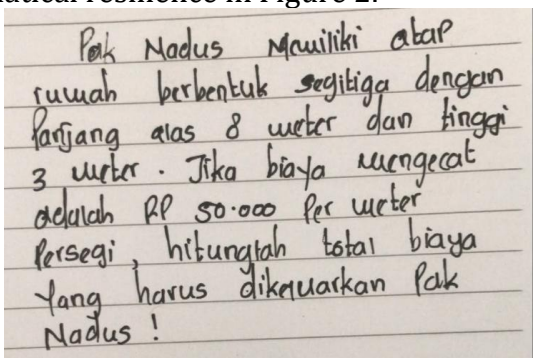

Figure 2. The problem-posing task of pre-service teachers with medium mathematical resilience

Pre-service teachers with medium mathematical literacy display developing but not yet stable mathematical resilience. They generally understand the broader context and can generate solvable problems; however, they remain inconsistent in selecting the most relevant information, establishing mathematical models, and

e-ISSN 2746-5594
p-ISSN 2746-5608

advancing problem complexity. These characteristics demonstrate that while their problem-posing abilities have begun to form, they still require reinforcement through examples, scaffolding, feedback, and reflective practice (Silber & Cai, 2017; Kozakli Ulger et al., 2022; Selek, 2024).

Regarding persistence, prospective teachers in this category consistently attempt to complete tasks, but their persistence frequently depends on external guidance. When a chosen context proves inappropriate, they are capable of rectifying the problem after receiving input from lecturers, peers, or eliciting questions. This indicates that their resilience is potential: they do not immediately surrender, but they are not yet fully autonomous in evaluating their own generated problems.

In terms of confidence, pre-service teachers with medium literacy tend to select safe contexts that closely resemble examples they have previously studied. Although the resulting problems are typically solvable, their levels of novelty and complexity are inconsistent. They remain cautious about utilizing non-routine contexts due to concerns that the problems might become unclear or unsolvable. This phenomenon aligns with research by Mallart et al. (2018), which shows that pre-service teachers can encounter difficulties in formulating problems that are relevant, curriculum-compliant, and appropriately gradable.

Concerning strategy flexibility, pre-service teachers with medium literacy are capable of modifying certain elements of a problem, such as refining phrasing, substituting data, or simplifying questions. However, these alterations do not consistently enhance the overall quality of the problem. Revisions are frequently restricted to technical aspects and do not fully integrate the relationships between context, concepts, and mathematical literacy objectives. Therefore, problem-posing instruction for this group should be directed toward exercises in analyzing problem quality, comparing alternative questions, and evaluating whether a problem genuinely demands reasoning, modeling, and interpretation.

The profile of pre-service teachers with medium mathematical literacy can be classified as a resilient-developing profile. They demonstrate a willingness to try, are reasonably receptive to revision, and can improve problems upon receiving feedback. Nonetheless, their independence, willingness to take mathematical risks, and flexibility in task design still require reinforcement. With appropriate guidance, this group has the potential to progress toward a resilient-productive profile.

Mathematical Resilience Profiles of Pre-Service Teachers with Low Mathematical Literacy in Problem Posing

The following are the results of the problem-posing task of pre-service teachers with low mathematical resilience in Figure 3.

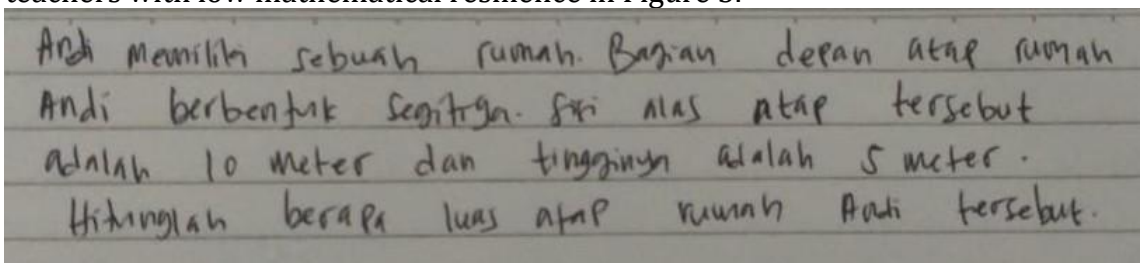

Figure 3. The problem-posing task of pre-service teachers with low mathematical resilience

e-ISSN 2746-5594
p-ISSN 2746-5608

Pre-service teachers with low mathematical literacy demonstrate weak mathematical resilience during the problem-posing process. They encounter substantial difficulties in comprehending the mathematical structure of real-world situations, identifying critical information, and translating contexts into mathematical problems. Consequently, the problems they pose tend to be routine, procedural, less realistic, and lacking in interpretative demands. This limitation indicates that low mathematical literacy can impede the manifestation of resilient behavior, as prospective teachers lack a sufficient cognitive baseline to explore contexts deeply.

Regarding persistence, pre-service teachers in this category tend to cease efforts quickly when encountering difficulties. They frequently opt for simple problems close to routine procedures to evade the risk of errors. When a problem design lacks clarity, they more commonly replace the entire problem with an easier form rather than refining the contextual structure and mathematical concepts. This condition shows that low persistence does not occur in isolation but is intrinsically linked to low contextual understanding and a lack of belief in one's mathematical capabilities.

In terms of confidence, prospective teachers with low literacy exhibit hesitation in selecting appropriate mathematical concepts. They tend to depend heavily on existing problem examples, resulting in generated problems that lack variation and novelty. This tendency aligns with problem-posing literature indicating that participants without a strong grasp of problem structures frequently produce imitative, less complex, or unsolvable problems (Kaur & Rosli, 2021; Silver & Cai, 1996; Xu et al., 2020).

With respect to strategy flexibility, pre-service teachers with low literacy remain limited in their capacity to execute revisions. Adjustments are generally confined to changing numbers or correcting sentences without re-evaluating whether the context, data, and questions constitute a meaningful mathematical problem. They also tend to perceive errors as failures rather than opportunities for reflection. In contrast, problem posing necessitates an iterative process involving exploration, evaluation, and repeated revision to ensure that problems are clear, contextual, and solvable (Cai, 2022; Li et al., 2022; Silver, 2013).

Accordingly, the profile of pre-service teachers with low mathematical literacy can be referred to as a profile requiring reinforcement. They necessitate concurrent support on two fronts: the reinforcement of mathematical literacy as a foundation for understanding context, and the strengthening of mathematical resilience to foster the courage to try, persist, and revise problems. Appropriate instructional strategies for this group include providing contextual problem examples, comparative analyses between routine and literacy-based problems, structured prompts, group discussions, and incremental feedback.

The research findings demonstrate that mathematical literacy and mathematical resilience reinforce one another within the problem-posing process. Mathematical literacy functions as the cognitive foundation that assists pre-service teachers in comprehending contexts, selecting information, constructing models, and interpreting results. Meanwhile, mathematical resilience operates as the affective driver that helps them persist when facing ambiguity, errors, or the

e-ISSN 2746-5594
p-ISSN 2746-5608

necessity to revise problems. The stronger a pre-service teacher's mathematical literacy, the greater their likelihood of demonstrating resilient behavior during problem posing.

Theoretically, these results reinforce the perspective that problem posing is a complex activity involving cognition, affection, metacognition, and creativity. Problem posing should not be understood merely as the act of creating questions, but rather as a process of designing mathematical situations that are meaningful, solvable, and instructionally valuable. Therefore, instruction within teacher education programs must design systematic problem-posing experiences, ranging from understanding context, identifying concepts, formulating questions, and testing solvability, to refining problem quality.

Practically, pre-service teachers with high literacy must be challenged with non-routine contexts and open problem-posing tasks to foster their creativity and reflective abilities. Pre-service teachers with medium literacy require scaffolding and feedback to deepen contexts and enhance problem complexity. Meanwhile, pre-service teachers with low literacy need assistance through more structured prompts, step-by-step examples, and problem-revision exercises to prevent them from merely producing procedural tasks. Through these approaches, problem posing can serve as a vehicle to build mathematical literacy while simultaneously strengthening the mathematical resilience of pre-service teachers in Table 1.

Table 1. Pre-Service Teachers' Mathematical Resilience Based on Mathematical Literacy Levels in Problem Posing

Resilience Aspect	High Mathematical Literacy	Medium Mathematical Literacy	Low Mathematical Literacy
Persistence	Persists in trying, re-evaluates the context, and refines the problem until it becomes meaningful.	Persists in trying, but requires direction or feedback to refine the problem.	Abandons efforts quickly when encountering difficulties and opts for more routine problems.
Confidence	Boldly selects non-routine contexts and articulates the rationales for utilizing specific mathematical concepts.	Moderately confident, but still selects safe contexts that closely resemble studied examples.	Hesitant in determining mathematical concepts and tends to mimic existing problem examples.
Strategy Flexibility	Capable of modifying data, contexts, questions, or representations to ensure the problem is more logical.	Capable of modifying certain elements of the problem, but alterations do not consistently enhance overall quality.	Restricted to superficial adjustments, such as modifying numbers or phrasing.

e-ISSN 2746-5594
p-ISSN 2746-5608

Attitude Toward Challenges	Views difficulties as an inherent part of exploration and problem refinement.	Accepts challenges after receiving support or eliciting questions.	Tends to evade challenges and selects simple questions.
Revision Capacity	Revisions are performed autonomously and address context, language, structure, and problem solvability.	Revisions are performed after receiving input and focus primarily on clarity aspects.	Revisions fail to address the relationships between context and mathematical concepts.
Problem Quality	Contextual, creative, complex, clear, and solvable.	Reasonably contextual and solvable, but complexity remains inconsistent.	Routine, procedural, less realistic, and lacking in interpretative demands.

Table 1 confirms that differences in resilience profiles are evident not only in the final quality of the problems but also in the processes prospective teachers employ when encountering obstacles. The high-literacy group exhibits an explorative and reflective process; the medium-literacy group demonstrates a developing process supported by guidance; whereas the low-literacy group reveals a need for more robust support in understanding contexts and building the courage to execute revisions.

Furthermore, problem-posing tasks must be differentiated to match the profiles of pre-service teachers. Applying uniform treatments across all categories is less effective because the obstacles encountered by each group differ. High-literacy pre-service teachers require challenges that expand their creativity; medium-literacy individuals need reinforcement via scaffolding; whereas low-literacy prospective teachers require initial assistance to comprehend contexts and build self-confidence shows in Table 2.

Table 2. Instructional Implications Based on Mathematical Resilience and Literacy Profiles

Pre-Service Teacher Category	**Reinforcement Needs**	**Recommended Instructional Strategies**
High Literacy	More complex challenges, spaces for exploration, and opportunities to generate open-ended problems.	Problem-posing tasks based on non-routine contexts, peer reviews, metacognitive reflections, and modeling-task development.
Medium Literacy	Scaffolding to deepen contexts, select relevant	Step-by-step examples, problem-quality rubrics,

e-ISSN 2746-5594
p-ISSN 2746-5608

	information, and enhance problem complexity.	group discussions, eliciting questions, and feedback-based revisions.
Low Literacy	Reinforcement of contextual understanding, self-confidence, and the courage to attempt new strategies.	Structured prompts, analyses of routine vs. contextual problems, simple modeling exercises, and incremental revision guidance.

Conclusion and Suggestion

The mathematical resilience profiles of pre-service teachers in problem posing vary according to their mathematical literacy levels. Prospective teachers with high mathematical literacy tend to possess strong mathematical resilience, characterized by persistence, self-confidence, strategy flexibility, and a willingness to revise problems. Conversely, pre-service teachers with low mathematical literacy tend to generate routine, less contextual problems and encounter difficulties maintaining their strategies when facing obstacles. These differences demonstrate that mathematical literacy influences not only the quality of the posed problems but also the manner in which pre-service teachers persist, evaluate, and revise problems when confronting difficulties.

Based on these findings, this study offers the following suggestions: (1) Mathematics teacher education programs need to integrate literacy-based problem-posing tasks in a sustainable and continuous manner. (2) Lecturers should provide constructive feedback and revision opportunities to allow pre-service teachers to develop their mathematical resilience during task design. (3) Future research could employ a mixed-methods approach to quantitatively and qualitatively analyze the relationships between mathematical literacy, mathematical resilience, and problem-posing quality. (4) Problem-posing assessment instruments need further development by incorporating comprehensive indicators such as context, complexity, creativity, solvability, and linguistic clarity.

Reference

Ariyanto, L., Herman, T., Sumarmo, U., & Suryadi, D. (2017). Developing mathematical resilience of prospective math teachers. *Journal of Physics: Conference Series*, *895*(1), 1–6. https://doi.org/10.1088/1742-6596/895/1/012062

Baumanns, L., & Rott, B. (2024). Problem-posing tasks and their influence on pre-service teachers' creative problem-posing performance and self-efficacy. *The Journal of Mathematical Behavior*, *73-83*. https://doi.org/10.1016/j.jmathb.2024.101130

Cai, J. (2022). What research says about teaching mathematics through problem posing. *Éducation et Didactique*, *16*(3), 31–50. https://doi.org/10.4000/educationdidactique.10642

Cai, J., & Hwang, S. (2020). Learning to teach through mathematical problem posing: Theoretical considerations, methodology, and directions for future research.

e-ISSN 2746-5594
p-ISSN 2746-5608

International Journal of Educational Research, *102*. https://doi.org/10.1016/j.ijer.2019.01.001

Cai, J., Ran, H., Hwang, S., Ma, Y., Han, J., & Muirhead, F. (2023). Impact of prompts on students' mathematical problem posing. *The Journal of Mathematical Behavior*, *72*. https://doi.org/10.1016/j.jmathb.2023.101087

Hartmann, L.-M., Schukajlow, S., Niss, M., & Jankvist, U. T. (2024). Preservice teachers' metacognitive process variables in modeling-related problem posing. *The Journal of Mathematical Behavior*, *76-86*. https://doi.org/10.1016/j.jmathb.2024.101195

Johnston-Wilder, S., & Lee, C. (2010). Mathematical resilience. *Mathematics Teaching*, *218*, 38–41.

Kaur, A., & Rosli, R. (2021). Problem posing in mathematics education research: A systematic review. *International Journal of Academic Research in Progressive Education and Development*, *10*(1), 438–456. https://doi.org/10.6007/IJARPED/v10-i1/8641

Kooken, J., Welsh, M. E., McCoach, D. B., Johnston-Wilder, S., & Lee, C. (2016). Development and validation of the Mathematical Resilience Scale. *Measurement and Evaluation in Counseling and Development*, *49*(3), 217–242. https://doi.org/10.1177/0748175615596782

Kozakli Ulger, T., Bozkurt, I., & Altun, M. (2022). Analyzing in-service teachers' process of mathematical literacy problem posing. *International Electronic Journal of Mathematics Education*, *17*(3), 1-10. https://doi.org/10.29333/iejme/11985

Leavy, A., & Hourigan, M. (2020). Posing mathematically worthwhile problems: Developing the problem-posing skills of prospective teachers. *Journal of Mathematics Teacher Education*, *23*(4), 341–361. https://doi.org/10.1007/s10857-018-09425-w

Leavy, A., & Hourigan, M. (2022). The Framework for Posing Elementary Mathematics Problems (F-PosE): Supporting teachers to evaluate and select problems for use in elementary mathematics. Educational Studies in Mathematics, 111(1), 147–176. https://doi.org/10.1007/s10649-022-10155-3

Lee, C., & Johnston-Wilder, S. (2017). The construct of mathematical resilience. In U. Xolocotzin Eligio (Ed.), *Understanding emotions in mathematical thinking and learning* pp. 269–291. https://doi.org/10.1016/B978-0-12-802218-4.00010-8

Leikin, R., & Elgrably, H. (2020). Problem posing through investigations for the development and evaluation of proof-related skills and creativity skills of prospective high school mathematics teachers. *International Journal of Educational Research*, *102*. https://doi.org/10.1016/j.ijer.2019.04.002

Li, X., Zhou, W., Hwang, S., & Cai, J. (2022). Learning to teach mathematics through problem posing: Teachers' beliefs and their instructional practices. *International Journal of Educational Research*, *115*. https://doi.org/10.1016/j.ijer.2022.102038

Mallart, A., Font, V., & Diez, J. (2018). Case study on mathematics pre-service teachers' difficulties in problem posing. *Eurasia Journal of Mathematics,*

e-ISSN 2746-5594
p-ISSN 2746-5608

Science and Technology Education, *14*(4), 1465–1481. https://doi.org/10.29333/ejmste/83682

OECD. (2023). *PISA 2022 results (Volume I): The state of learning and equity in education*. Paris: OECD Publishing.

Özgen, K. (2019). Problem-posing skills for mathematical literacy: The sample of teachers and pre-service teachers. *Eurasian Journal of Educational Research*, *19*(84), 179–212. https://doi.org/10.14689/ejer.2019.84.9

Rianasari, V. F., & Guzon, A. F. H. (2024). Investigating preservice se condary mathematics teachers' skills in posing realistic mathematics tasks. Jurnal Elemen, 10(3), 533–545. https://doi.org/10.29408/jel.v10i3.25607

Selek, H. K. G. (2024). The preservice mathematics teachers' views on the process of mathematics literacy problem writing. *Shanlax International Journal of Education*, *12*(1), 148–155. https://doi.org/10.34293/education.v12i3.7283

Silber, S., & Cai, J. (2017). Pre-service teachers' free and structured mathematical problem posing. *International Journal of Mathematical Education in Science and Technology*, *48*(2), 163–184. https://doi.org/10.1080/0020739X.2016.1232843

Silver, E. A. (2013). Problem-posing research in mathematics education: Looking back, looking around, and looking ahead. *Educational Studies in Mathematics*, *83*(1), 157–162. https://doi.org/10.1007/s10649-013-9477-3

Silver, E. A., & Cai, J. (1996). An analysis of arithmetic problem posing by middle school students. *Journal for Research in Mathematics Education*, *27*(5), 521–539. https://doi.org/10.2307/749846

Stacey, K. (2011). The PISA view of mathematical literacy in Indonesia. *Journal on Mathematics Education*, *2*(2), 95–126. https://doi.org/10.22342/jme.2.2.746.95-126

Xu, B., Cai, J., Liu, Q., & Hwang, S. (2020). Teachers' predictions of students' mathematical thinking related to problem posing. *International Journal of Educational Research*, *102*. https://doi.org/10.1016/j.ijer.2019.04.005

Zhang, L., Stylianides, G. J., & Stylianides, A. J. (2024). Enhancing mathematical problem posing competence: A meta-analysis of intervention studies. International Journal of STEM Education, 11(48). https://doi.org/10.1186/s40594-024-00507-1