Kognitif
Jurnal Riset HOTS Pendidikan Matematika
Volume - 6 No - 2 2026 Page 486 – 497
ISSN 2776-9704 P-ISSN 2776-9984
https://doi.org/10.51574/kognitif.v6i2.3450

Students' Mathematical Problem-Solving Ability in Solving Quadratic Function Problems

Yusuf Devan Nr, Lilis Marina Angraini, Astri Wahyuni, Putri Wahyuni

How to cite: Nr, Y. D., Angraini, L. M., Wahyuni, A., & Wahyuni, P. (2026). Students' Mathematical Problem-Solving Ability in Solving Quadratic Function Problems. *Kognitif: Jurnal Riset HOTS Pendidikan Matematika*, *6*(2), 486–497. https://doi.org/10.51574/kognitif.v6i2.3450

To link to this artcle: https://doi.org/10.51574/kognitif.v6i2.3450

Kognitif: Jurnal Riset HOTS Pendidikan Matematika
https://doi.org/10.51574/kognitif.v6i2.3450 Volume 6, No 2, April - June 2026, pp. 486 – 497

Students' Mathematical Problem-Solving Ability in Solving Quadratic Function Problems

Yusuf Devan Nr[1*], Lilis Marina Angraini[1], Astri Wahyuni[1], Putri Wahyuni[1]

[1]Department of Mathematics Education, Faculty of Teacher Training and Education, Universitas Islam Riau

Article Info

Article history:

Received Jun 21, 2025
Accepted Mar 07, 2026
Published Online May 02, 2026

Keywords:

Mathematical Problem-Solving Ability
Mathematics Learning
Quadratic Function Problems
Qualitative Approach

ABSTRACT

Problem-solving ability is a central component of mathematics learning because it enables students to understand problems, develop solution strategies, implement mathematical procedures, and evaluate the correctness of their answers. This study aimed to describe Grade 10 students' mathematical problem-solving ability in solving quadratic function problems. A descriptive quantitative design supported by follow-up interviews was employed. The participants were 34 students from Class X.2 of SMA Negeri 3 Tualang. Data were collected through a mathematical problem-solving test and semi-structured interviews with six students selected to represent high, medium, and low levels of problem-solving ability. The test scores were categorized into three levels, and the interview data were used to clarify students' solution processes. The findings showed that two students were classified in the high category with scores above 34.51, 25 students were classified in the medium category with scores ranging from 15.79 to 34.51, and four students were classified in the low category with scores below 15.79. Overall, students' mathematical problem-solving ability in quadratic functions was categorized as medium. The interview results indicated that students mainly experienced difficulties in planning solution strategies and checking the correctness of their answers.

Corresponding Author:

Yusuf Devan Nr,
Department of Mathematics Education,
Faculty of Teacher Training and Education,
Universitas Islam Riau,
Kaharuddin Nasution Street No.113, Marpoyan, Pekanbaru, Riau, Indonesia, 28284
✉ ydevannr17@gmaul.com

Introduction

Education is essential for cultivating exceptional human resources. Education is fundamental to every advancement and quality enhancement. Education empowers individuals to achieve their full potential, both personally and socially. This aligns with the perspective of Paus et al. (2023), which posits that education is a deliberate and structured endeavour facilitated by educators who cultivate an engaging and dynamic learning environment, enabling students to actively enhance their capabilities. The 1945 Constitution and Law Number 20 of

2003 regarding the National Education System, education is a fundamental and systematic endeavour to foster a conducive learning environment and process, enabling students to actively enhance their capabilities. Education should significantly advance mathematical learning, as mathematics underpins science and plays a crucial role in shaping attitudes, intelligence, and personality. Veugelers (2019) asserted that education, encompassing mathematics, plays a crucial role in equipping the younger generation for participation in societal life.

Mathematics is a subject that significantly influences the realm of education. Lestari (2015) posited that mathematics functions as a mechanism that generates exceptional generations prepared to engage with change. Usman et al. (2022) asserted that mathematics is a universal discipline that significantly contributes to the advancement of modern technology, with its applications spanning diverse scientific domains and enhancing human cognition. Consequently, it is imperative for pupils to receive comprehensive mathematics instruction and to attain mathematical knowledge at the earliest opportunity to adapt to this always changing world. Nevertheless, mathematics is sometimes regarded as a challenging topic, tedious, abstract, and necessitating exceptional skills, which not all students possess to answer mathematical issues. This impression may foster unfavourable attitudes among pupils towards mathematics and diminish their confidence in resolving mathematical difficulties (Imaroh et al., 2021).

A primary objective of mathematics education in schools is to enable students to solve problems (Maulana & Santosa, 2024). Mathematical problem-solving skills are vital in mathematics education, as they are applicable to contemporary issues and can facilitate the acquisition of knowledge for future endeavours (Ngaeni & Saefudin, 2017). Consequently, problem-solving emerges as a crucial endeavour in mathematics education, wherein the abilities developed can typically be applied to address various different challenges. This is corroborated by a statement from the National Council of Teachers of Mathematics (NCTM), which delineates the mathematical competencies that students must possess: problem solving, reasoning, proof, communication, connection, and representation.

Problem-solving capacity is a skill or potential inherent in students, enabling them to address issues and implement solutions in daily life. Suratmi & Purnami (2017) assert that students must acquire problem-solving skills to address challenges associated with their learning activities, including the resolution of mathematical difficulties. A student's intelligence is evidenced by their problem-solving abilities, including the capacity to identify solutions and address everyday challenges appropriately, meticulously, and harmoniously in accordance with the specific circumstances and conditions of the issue. Ramadhani & Hakim (2021) stated that a correlation exists between problem-solving skills and both academic learning and daily living, underscoring the significance of these talents for every student.

Nonetheless, pupils' problem-solving capabilities are still regarded as inadequate. According to the findings of KPLP researchers conducted in September 2024 at the secondary education level, numerous students faced challenges when presented with problem-solving questions. Students exhibited diminished capacity to formulate methods for problem-solving. Several pupils also struggled to comprehend the issues presented in the questions. The PISA survey results also demonstrate students' deficient problem-solving abilities. In this assessment, problem-solving serves as a cognitive indication (Ariandi, 2016). The 2022 PISA survey findings indicated that Indonesia's performance declined relative to 2018, with the average mathematics score for Indonesian pupils dropping from 375 in 2018 to 366 in 2022, far below the OECD average. The issue of inadequate mathematical problem-solving skills arises from pupils' inability to comprehend the offered problems, as they are accustomed to doing routine exercises.

Kognitif: Jurnal Riset HOTS Pendidikan Matematika
https://doi.org/10.51574/kognitif.v6i2.3450 Volume 6, No 2, April - June 2026, pp. 486 – 497

Moreover, certain pupils comprehended the challenge and navigated the procedures, yet failed to verify their work, leading to erroneous outcomes. This aligns with the assertion by Elita et al. (2019) that students have challenges in resolving story problems, formulating enquiries, devising solution strategies, and addressing the presented problems. Nasution et al. (2017) share a comparable perspective, noting that students encounter challenges in mathematics, particularly in problem-solving skills, during the processes of comprehension, diagrammatic representation, graph interpretation, and grasping formal mathematical concepts.

The topic of functions serves as a means to assess students' problem-solving capabilities in mathematics lectures. Mathematics serves as a medium for learning, encompassing functions. Despite appearing challenging, they are essential to master as a foundational mathematical theory for addressing several common situations quantitatively (Kadarisma & Martin, 2020). Functions play a crucial function in linking mathematical concepts. The researcher aims to investigate the problem-solving capabilities of tenth-grade high school pupils about the topic of functions. This research is innovative due to the selection of distinct people compared to other studies, as well as the functional material that has not been extensively associated with these abilities, particularly in the research location. The research findings are anticipated to serve as informational resources for advancing subsequent studies across a wide range of topics.

Method

Research Design

This study employs a descriptive research design utilising a quantitative descriptive methodology. Quantitative descriptive research is a methodological approach that seeks to elucidate current phenomena in a field through detailed numerical data. This research use statistical analysis to process the gathered data, yielding a more objective and quantifiable representation of the issue under investigation. Researchers prioritise the methodical and measurable presentation of the conditions or circumstances of research participants, utilising statistically processed data, rather than concentrating on the link between variables or hypothesis testing.

Participants

The study population consisted of all Grade 10 students at SMA Negeri 3 Tualang during the 2024/2025 academic year. The whole population comprised 128 pupils allocated among four classes. The sample was identified using purposive sampling. Class X.2 was chosen based on the mathematics teacher's endorsement and previous classroom observations demonstrating its relevance to the study's focus. The sample comprised 34 Grade 10 students from Class X.2 at SMA Negeri 3 Tualang.

Instruments

This study employed two main instruments: a mathematical problem-solving ability test and a semi-structured interview protocol. The mathematical problem-solving test consisted of four essay items on quadratic functions. The items were designed to assess four indicators of mathematical problem solving: understanding the problem, developing a solution plan, implementing the solution plan, and re-examining the obtained results.

Each test item required students to interpret the information provided, identify the mathematical relationship involved, determine an appropriate strategy, carry out the solution process, and verify the final answer. The test items covered graphical, procedural, and contextual problems related to quadratic functions, as presented in Table 1.

Table 1. Description of the Mathematical Problem-Solving Test Items

Item	Mathematical Content	Task Focus	Problem-Solving Indicators Assessed
1	Quadratic function and finite domain	Students were asked to draw the graph of $f(x) = x^2 - 2x - 3$ for the domain x={−2,−1,0,1,2,3,4.	Understanding the problem, planning, solving, and reviewing
2	Elements of a quadratic function	Students were asked to determine the turning point of the graph of $f(x) = 2x^2 - 4x + 5$	Understanding the problem, planning, solving, and reviewing
3	Maximum value of a quadratic function	Students were asked to determine the maximum height of a projectile represented by $h(t) = 40t - 5t^2$.	Understanding the problem, planning, solving, and reviewing
4	Optimization problem involving area	Students were asked to determine the maximum area of a rectangular house with a fixed perimeter of 72 m.	Understanding the problem, planning, solving, and reviewing

Students' responses were scored using an analytic rubric adapted from Purnamasari & Setiawan (2019). The rubric consisted of four assessed aspects: identifying and understanding the problem, planning the solution, solving the problem according to the plan, and evaluating or rechecking the result. The maximum score for each item was 12, consisting of 3 points for understanding the problem, 3 points for planning the solution, 4 points for implementing the solution, and 2 points for evaluating the answer. Thus, the maximum total score for the four items was 48.

The students' mathematical problem-solving ability was then categorized into three levels based on the mean and standard deviation of the test scores, following Arikunto's classification. Students with scores greater than or equal $\bar{X} + SD$ were categorized as having high problem-solving ability. Students with scores between $\bar{X} - SD$ and $\bar{X} + SD$ were categorized as having moderate problem-solving ability. Students with scores less than or equal to $\bar{X} - SD$ were categorized as having low problem-solving ability.

Before being administered, the test was validated by two mathematics education lecturers to examine its content validity. The validation covered the alignment of the items with the learning objectives, the suitability of the items with the indicators, the relevance of the items to mathematical problem-solving indicators, clarity of the problem statements, feasibility of solution, clarity of instructions, and appropriateness of the language for students. The content validity was analyzed using Aiken's V index, which ranges from 0 to 1. The obtained validation results showed that the average Aiken's V values for the observed aspects ranged from 0.97 to 1.00. The item-level Aiken's V values were 0.982 for Item 1, 1.000 for Item 2, 0.982 for Item 3, and 0.982 for Item 4. These results indicate that all test items had very high content validity and were appropriate for use in the study.

The second instrument was a semi-structured interview protocol. The interview was used to verify and deepen the written test data, particularly to explore students' reasoning, solution strategies, and difficulties that could not be fully identified from their written responses. The interviews were conducted individually and recorded using audiovisual equipment to support accurate data organization and analysis. The interview protocol was also reviewed by expert validators, and its content validity was analyzed using Aiken's V. The validation result showed an Aiken's V value of 0.988, indicating that the interview protocol had very high content validity and was suitable for use in the study.

Kognitif: Jurnal Riset HOTS Pendidikan Matematika
https://doi.org/10.51574/kognitif.v6i2.3450 Volume 6, No 2, April - June 2026, pp. 486 – 497

Data Collection

Data were collected using a mathematical problem-solving test and semi-structured interviews. The test was used to assess students' ability to solve problems involving quadratic functions. After the test, semi-structured interviews were conducted to clarify students' written responses and explore their reasoning processes, solution strategies, and mathematical representations. The use of both techniques allowed the researchers to obtain more comprehensive evidence of students' mathematical problem-solving ability.

Data Analysis

Data were examined via descriptive quantitative and qualitative methodologies. The students' results on the mathematical problem-solving assessment were initially determined according to the scoring rubric. The scores were subsequently analysed descriptively and categorised into three tiers of problem-solving proficiency: high, moderate, and low. This classification was employed to delineate the distribution of students' mathematical problem-solving capabilities in addressing quadratic function problems.The interview data underwent qualitative analysis in three phases: data reduction, data display, and conclusion formulation. During the data reduction phase, students' interview replies were curated, structured, and concentrated on material pertinent to their mathematical problem-solving methodologies. During the data presentation phase, the condensed data were articulated in narrative format to illustrate students' reasoning, methods, challenges, and representations. During the conclusion-drawing phase, the interview data were analysed and juxtaposed with the test results to achieve a more thorough comprehension of students' problem-solving capabilities. The outcomes of the test and interview analyses were subsequently amalgamated to address the study questions. The quantitative exam findings indicated students' mathematical problem-solving proficiency, but the qualitative interview data elucidated students' comprehension of the problems, solution planning, strategy implementation, and response evaluation. This integration facilitated a more comprehensive characterisation of students' mathematical problem-solving proficiency at each level.

Research Findings

The mathematical problem-solving test consisted of four essay items, each designed to assess four indicators of problem solving: understanding the problem, developing a solution plan, implementing the plan, and re-examining the answer. The test was administered to 34 students in Class X.2. The results showed variations in students' mathematical problem-solving ability, as presented in Table 2.

Table 2. Categorization of Students' Mathematical Problem-Solving Ability

Category	Score Criteria	Number of Students
High	Score > 34.51	2
Moderate	15.78 < Score ≤ 34.51	25
Low	Score ≤ 15.78	7

Based on Table 2, most students were classified in the moderate category. Only a small number of students reached the high category, while several students remained in the low category. This result indicates that students' mathematical problem-solving ability in quadratic function material was generally at a moderate level. Although most students were able to solve some of the given problems, they still experienced difficulties in applying complete problem-solving procedures, especially in more complex and contextual problems. Students' achievement in each problem-solving indicator is presented in Table 3.

Table 3. Percentage of Student Achievement Across Problem-Solving Indicators

Item	Understanding the Problem	Developing a Plan	Implementing the Plan	Re-examining the Answer
1	98%	94%	79%	45%
2	84%	76%	76%	66%
3	44%	58%	44%	14%
4	4%	2%	0%	0%

Table 3 shows that students performed best on the first and second items. These items required students to work with more direct forms of quadratic functions, such as drawing a graph from a given function and determining the turning point of a quadratic graph. In these items, most students were able to understand the problem, develop a solution plan, and implement the plan.

However, students' performance decreased substantially on the third and fourth items. The third item involved a contextual problem about projectile motion, while the fourth item required students to formulate and solve an optimization problem involving the maximum area of a rectangle. The low achievement in these items indicates that many students had difficulty translating contextual information into mathematical models. The most serious difficulty appeared in the fourth item, where almost all students failed to develop an appropriate solution plan, implement the plan, and re-examine the answer.

The analysis of students' written work also showed different patterns of problem-solving ability. Students in the high-ability category were generally able to follow Polya's problem-solving stages. They could identify the information given in the problem, determine an appropriate strategy, carry out the solution, and draw a conclusion. However, some of them still made minor errors, such as forgetting to write certain steps or not providing a complete verification of the final answer.

Students in the moderate-ability category were able to solve several problems correctly, particularly problems that were presented in a direct mathematical form. However, their performance was not consistent across all items. Some students were able to determine the required formula or procedure but made errors in computation, coordinate determination, or interpretation of the final result. In some cases, students could reach the correct answer but did not clearly write the rechecking stage or final conclusion.

Students in the low-ability category experienced more fundamental difficulties. They often had difficulty understanding the problem, identifying the known and required information, and determining the appropriate strategy. These difficulties affected the next stages of problem solving. As a result, students were unable to carry out the solution process correctly and could not re-examine their answers.

The analysis of students' work on Item 1 showed that most students could understand the problem and draw the graph of the given quadratic function. However, several students still made errors in determining coordinate points and drawing the graph accurately. Some students were also confused about the steps or formula needed, even though they could partly complete the task.

Kognitif: Jurnal Riset HOTS Pendidikan Matematika
https://doi.org/10.51574/kognitif.v6i2.3450 Volume 6, No 2, April - June 2026, pp. 486 – 497

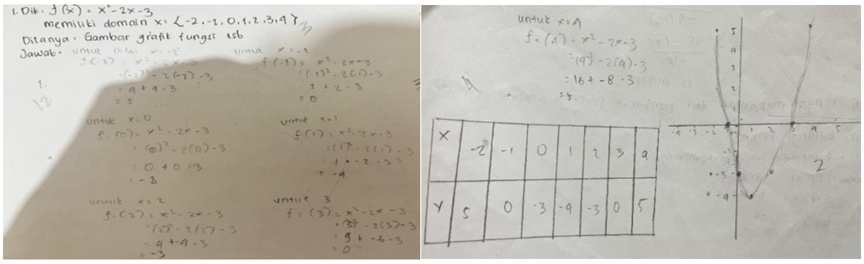
Figure 1. Student's Work Results on Question Number 1

In Item 2, students' responses showed better performance. Several students were able to identify the elements of the quadratic function and determine the turning point correctly. This suggests that students were more familiar with procedural tasks involving quadratic functions. Nevertheless, some students still failed to understand the problem completely and could only write the known information without continuing to the solution process.

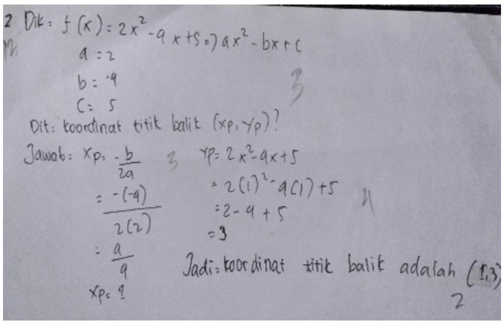

Figure 2. Student's Work Results on Question Number 2

In Item 3, students began to show greater difficulty. Although some students understood the context of the problem, they made errors in identifying the values of the coefficients in the quadratic function. These errors led to incorrect final answers. Some students could use an appropriate procedure but failed to draw a complete conclusion or recheck the result.

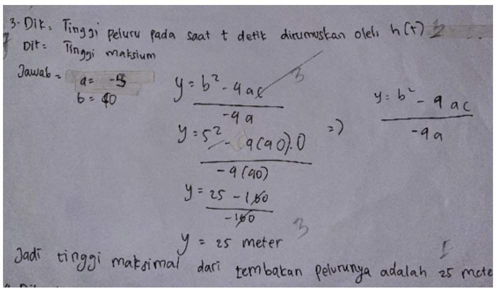

Figure 3. Student's Work Results on Question Number 3

Item 4 was the most difficult problem for students. This item required students to construct a quadratic function from a contextual situation before determining the maximum area. Most students were unable to formulate the mathematical model correctly. Some students only identified part of the information, while others attempted an initial plan but could not continue the solution process. This finding indicates that students still struggled with non-routine optimization problems that require mathematical modeling.

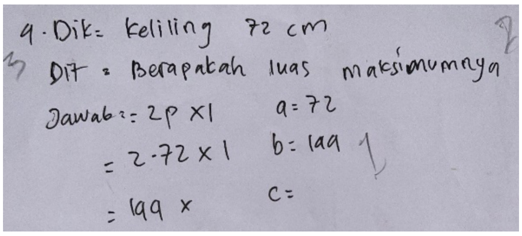

Figure 4. Student's Work Results on Question Number 3

Overall, the results show that students' mathematical problem-solving ability was strongest in direct procedural problems and weakest in contextual and non-routine problems. The main difficulties were found in translating verbal information into mathematical representations, selecting appropriate strategies, carrying out accurate procedures, and rechecking the final answer.

The findings of this study were synthesized based on students' test scores, achievement across Polya's problem-solving indicators, and analysis of students' written responses. This synthesis was conducted to identify the overall pattern of students' mathematical problem-solving ability in quadratic function material. A summary of the main research findings is presented in Table 4.

Table 4. Summary of Research Findings

Aspect Analyzed	Main Finding	Evidence from Data	Interpretation
Overall problem-solving ability	Students' mathematical problem-solving ability was generally in the moderate category.	Most students were classified in the moderate category.	Students had basic problem-solving ability, but their performance was not yet consistent across all problem-solving stages.
Distribution of ability levels	Students' abilities varied across high, moderate, and low categories.	The results showed students in all three categories.	The class was not homogeneous in mathematical problem-solving ability.
Understanding the problem	Students performed well on direct mathematical problems but struggled with contextual problems.	The percentage was high in Items 1 and 2, but decreased sharply in Items 3 and 4.	Students understood symbolic problems more easily than verbal contextual problems.
Developing a solution plan	Students could develop plans for routine problems but struggled with modeling problems.	Achievement was high in Items 1 and 2, lower in Item 3, and very low in Item 4.	Students had difficulty translating contextual information into mathematical procedures.
Implementing the plan	Students could carry out procedures in familiar problems but failed in complex problems.	Implementation was relatively high in Items 1 and 2, lower in Item 3, and absent in Item 4.	Procedural success depended on students' familiarity with the problem structure.
Re-examining the answer	Rechecking was one of the weakest stages.	The re-examining percentage was low, especially in Items 3 and 4.	Students were not accustomed to verifying or justifying their final answers.

Discussion

The results demonstrate that students' mathematical problem-solving capabilities differed among the three proficiency levels. Students classified as high-ability successfully resolved the assigned issues by adhering to Polya's stages of problem-solving. They could comprehend the issue, devise a suitable approach, execute the solution procedure, and verify the results obtained. Students in the moderate-ability category exhibited adequate problem-solving skills, however their performance lacked consistency across all levels. Several students in this group continued to make errors, especially in identifying coordinate points and comprehending the components of quadratic functions.

Conversely, students in the low-ability category had not yet acquired the proficiency to solve the issues effectively. Their primary challenge manifested during the preliminary phase of comprehending the issue. They encountered challenges in recognising the provided material, discerning the enquiry, and formulating the problem mathematically. This challenge impacted subsequent phases, including solution preparation, strategy implementation, and final answer verification. This conclusion aligns with Masitha et al. (2024), who indicated that students with limited mathematical proficiency frequently struggle to accurately identify difficulties and encounter uncertainty when articulating the known and required information.

The results corroborate the findings of Elita et al. (2025), which indicated that students with high and moderate talents could devise solution strategies, resolve difficulties, verify their work, and make conclusions. Conversely, pupils with lower aptitude had a higher frequency of errors and demonstrated diminished capacity to assess their responses. Diah et al. (2023) revealed analogous findings, indicating that high-ability students fulfilled all of Polya’s problem-solving indicators, moderate-ability students satisfied only a subset of the indicators, and low-ability students failed to meet the indicators entirely.

The findings indicate that students' challenges in addressing quadratic function issues extend beyond mere calculation errors. They are also associated with challenges in comprehending issue contexts, converting verbal information into mathematical forms, choosing appropriate procedures, and evaluating the accuracy of answers. This issue becomes more apparent when pupils encounter non-routine challenges. Students of varying abilities may encounter challenges with non-routine assignments due to their greater familiarity with routine exercises. Putri & Rezeki (2025) also asserted that pupils' deficient problem-solving skills may stem from their restricted exposure to non-routine tasks necessitating advanced mathematical reasoning.

Consequently, mathematics training ought to afford pupils increased opportunities to tackle non-routine problems. Educators must enhance students' foundational conceptual comprehension, assist them in discerning pertinent information, and instruct them in employing diverse representations, including graphs, equations, tables, and verbal explanations. Students must to be motivated to evaluate their solutions and substantiate their responses. These activities can enhance students' comprehensive mathematical problem-solving abilities, particularly in the study of quadratic functions.

Conclusion

The data analysis results indicate that students' proficiency in solving mathematical problems related to quadratic functions is often categorised as moderate. The majority of students successfully resolved the assigned issues at a moderate proficiency, however encountered challenges at various phases of the problem-solving process. The challenges primarily involved strategizing solutions, executing procedures with precision, and verifying the results achieved. The findings indicate that mathematics educators must provide learning activities that offer increased possibilities for students to tackle non-routine issues, understand mathematical data, and substantiate their solution methodologies. Education should emphasise not only the acquisition of accurate answers but also the enhancement of students' capacity to comprehend challenges, devise solutions, execute plans, and assess outcomes. Future research may investigate additional aspects affecting students' mathematical problem-solving capabilities, including gender, prior mathematical knowledge, learning methods, or students' attitudes towards mathematics. Future researchers are advised to conduct a preliminary ability assessment prior to the primary data collection to have a greater understanding of students' foundational problem-solving skills.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Author Y.D.N. conceived the research idea presented and collected the data. L.M.A., A.W., and P.W. were the supervisors in this research, actively participated in developing the theory, methodology, organizing and analyzing the data, discussing the results, and approving the final version of the work. All authors declare that the final version of this paper has been read and approved. The total percentage of contributions to the conceptualization, preparation, and correction of this paper are as follows: Y.D.N.: 40%, L.M.A.: 30%, A.W.: 15%, and P.W.: 15%.

Data Availability Statement

The authors state that the data supporting the findings of this study will be made available by the corresponding author, [Y.D.N.], upon reasonable request.

References

Ariandi, Y. (2016). Analisis Kemampuan Pemecahan Masalah Berdasarkan Aktivitas Belajar Pada Model Pembelajaran PBL. *Seminar Nasional Matematika X Universitas Negeri Semarang*. https://journal.unnes.ac.id/sju/prisma/article/view/21561/10276

Diah Purwandari, I., Rahayu, S., & Dasna, I. W. (2022). Inquiry Learning Model in Chemistry Learning : A Review. *JRPK: Jurnal Riset Pendidikan Kimia*, *12*(1), 38–46. https://doi.org/10.21009/jrpk.121.06

Elita, S. G., Habibi, M., Putra, A., & Nelpita Ulandari. (2019). Pengaruh Pembelajaran Problem Based Learning dengan Pendekatan Metakognisi terhadap Kemampuan Pemecahan Masalah Matematis. *Mosharafa: Jurnal Pendidikan Matematika*, *8*(3), 447–458. https://doi.org/10.31980/mosharafa.v8i3.580

Imaroh, A., Umah, U., Asriningsih, T. M., Pesantren, U., Darul ', T., Jombang, U., Pp, K., Ulum, D., Jombang, P., & Timur, J. (2021). Analisis kemampuan pemecahan masalah matematika ditinjau dari self-efficacy siswa pada materi sistem persamaan linear tiga variabel. *Jurnal Pembelajaran Matematika Inovatif*, *4*(4). https://doi.org/10.22460/jpmi.v4i4.843-856

Kadarisma, G., & Martin, I. (2020). Analisis Kemampuan Pemecahan Masalah Matematis Siswa SMA Pada Materi Fungsi. *Jurnal Pembelajaran Matematika Inovatif*, *3*(6). http://dx.doi.org/10.33087/phi.v6i1.184

Lestari, I. (2015). Pengaruh Waktu Belajar dan Minat Belajar Terhadap Hasil Belajar Matematika. *Jurnal Formatif*, *3*(2). https://journal.lppmunindra.ac.id/index.php/Formatif/article/view/118/0

Lestari, K. E., & Yudhanegara, M. R. (2019). *Penelitian Pendidikan Matematika*. Refika Aditama.

Masitha, C., Sinulingga, H. M. ., & Ammy, P. M. (2024). Meningkatkan Kemampuan Pemecahan Masalah Siswa Menggunakan Model Pembelajaran Problem Based

Learning. *Kognitif: Jurnal Riset HOTS Pendidikan Matematika*, *4*(3), 1275–1286. https://doi.org/10.51574/kognitif.v4i3.1638

Maulana, S. D., & Santosa, C. A. H. F. (2024). Analisis Kemampuan Pemecahan Masalah Matematika Siswa SMA pada Kurikulum Merdeka dan Kurikulum 2013 Berdasarkan Teori Polya. *Jurnal Pendidikan Matematika (JUDIKA EDUCATION)*, *7*(1), 94–105. https://doi.org/10.31539/judika.v7i1.8341

Nasution, Z. M., Surya, E., & Manullang, M. (2017). Perbedaan kemampuan pemecahan masalah matematik dan motivasi belajar siswa yang diberi pendekatan pembelajaran berbasis masalah dengan pendidikan matematika realistik DI SMP Negeri 3 Tebing Tinggi. *PARADIKMA*, *10*(1). https://doi.org/10.24114/paradikma.v10i1.8688

Ngaeni, E. N., & Saefudin, A. A. (2017). Menciptakan Pembelajaran Matematika Yang Efektif Dalam Pemecahan Masalah Matematika Dengan Model Pembelajaran Problem Posing. *Aksioma: Jurnal Pendidikan Matematika FKIP Univ. Muhamaddiyah Mtero*, *6*(2). https://jurnal.ustjogja.ac.id/index.php/union/article/view/1241

Paus, J. R., Rorimpandey, W. H. F., & Tambunan, E. N. (2023). Penerapan Model Pembelajaran Berbasis Proyek Untuk Meningkatkan Hasil Belajar Matematika Siswa Kelas IV SD Inpres Kinilow. *Jurnal Ilmiah Wahana Pendidikan, Desember*, *9*(24), 1084–1096. https://doi.org/10.5281/zenodo.10727161

Purnamasari, I., & Setiawan, W. (2019). Analisis Kemampuan Pemecahan Masalah Matematis Siswa SMP pada Materi SPLDV Ditinjau dari Kemampuan Awal Matematika. *Journal of Medives : Journal of Mathematics Education IKIP Veteran Semarang*, *3*(2), 207. https://doi.org/10.31331/medivesveteran.v3i2.771

Putri, N. S., & Rezeki, S. (2025). Pengaruh Kecemasan Matematis terhadap Kemampuan Pemecahan Masalah Siswa. *Kognitif: Jurnal Riset HOTS Pendidikan Matematika*, *5*(2), 681–696. https://doi.org/10.51574/kognitif.v5i2.3157

Ramadhani, D. A., & Hakim, D. L. (2021). Kemampuan Problem-Solving Matematis Siswa SMA Dalam Menyelesaikan Permasalahan Materi Fungsi. *Jurnal Pembelajaran Matematika Inovatif*, *4*(5). https://doi.org/10.22460/jpmi.v4i5.1113-1122

Retnawati, H. (2016). *Validitas, Reliabelitas dan Karakteristik Butir*. PramaPublishiing.

Suratmi, & Purnami, S. A. (2017). Pengaruh strategi metakognitif terhadap kemampuan pemecahan masalah matematika ditinjau dari persepsi siswa terhadap pelajaran matematika. *UNION: Jurnal Pendidikan Matematika*, *5*(2). https://doi.org/10.24127/ajpm.v6i2.896

Usman, P. M., Tintis, I., & Nihayah, E. F. K. (2022). Analisis Kemampuan Pemecahan Masalah Matematika Siswa dalam Menyelesaikan Sistem Persamaan Linear Tiga Variabel. *Jurnal Basicedu*, *6*(1), 664–674. https://doi.org/10.31004/basicedu.v6i1.1990

Veugelers, W. (2019). *Education for Democratic Intercultural Citizenship*.

Authors Biography

Yusuf Devan Nr is a student in the Mathematics Education Study Program at Universitas Islam Riau, Indonesia. He studied in the program from 2021 to 2025. He was born in Pekanbaru on July 17, 2003. He completed his elementary education at SDS YPPI Tualang in 2015, junior secondary education at SMPS YPPI Tualang in 2018, and senior secondary education at SMAN 3 Tualang in 2021. ✉ ydevannr17@gmaul.com

	**Lilis Marina Angraini** is a lecturer in the Mathematics Education Department, Faculty of Teacher Training and Education, Universitas Islam Riau, Pekanbaru, Indonesia. Her research interests include IT-based learning media, computational thinking skills, and mathematical thinking skills. 🖂 lilismarina@edu.uir.ac.id
	**Astri Wahyuni** is a lecturer in the Mathematics Education Department, Faculty of Teacher Training and Education, Universitas Islam Riau, Pekanbaru, Indonesia. Her research interests include mathematics education, constructivist-based learning models, and the use of ICT in mathematics learning. 🖂 astriwahyuni@edu.uir.id
	**Putri Wahyuni** is a lecturer in the Mathematics Education Department, Faculty of Teacher Training and Education, Universitas Islam Riau, Pekanbaru, Indonesia. Her research interest is in the field of learning media. 🖂 wahyuniputri@edu.uir.ac.id