JURNAL ABSIS
Jurnal Pendidikan Matematika dan Matematika
Vol. 9 No. 2, August 2026

The Effect of the Discovery Learning Model on Students' Mathematical Communication Skills

Fitri Tiara Sani[1], Pentatito Gunowibowo[2], Nurain Suryadinata[3]
[1–3] Universitas Lampung, Bandar Lampung, Indonesia
tiarasanifitri@gmail.com

Received: April 23, 2026 | **Revised:** May 4, 2026 | **Accepted:** August 22, 2026 | **Published:** August 23, 2026

ABSTRACT The demands of 21st-century learning identify mathematical communication skills as an essential competency that needs to be developed through active and meaningful learning models. This study aimed to determine the effect of implementing discovery learning on students' mathematical communication skills. This study employed a quasi-experimental method with a quantitative approach and a pretest--posttest control group design. The population consisted of all eighth-grade students in the regular program at SMP Negeri 10 Bandar Lampung during the 2025/2026 academic year and was distributed across six classes. The research sample was selected using purposive sampling and consisted of class VIII-6, with 30 students, as the experimental class and class VIII-10, with 30 students, as the control class. Data were collected using a mathematical communication skills test. The results showed that discovery learning had a significant effect on students' mathematical communication skills. The Mann--Whitney U test yielded $Z_{\text{count}} = -3.21 < Z_{\text{critical}} = -1.64$ at the 0.05 significance level; therefore, H_0 was rejected. In addition, the mean N-Gain score of students in the discovery learning class (0.69) was higher than that of students in the conventional learning class (0.53), indicating that students taught through discovery learning demonstrated greater improvement in mathematical communication skills.

Keywords: discovery learning, junior high school students, mathematical communication skills, quasi-experimental design

INTRODUCTION

Education is a conscious and planned process aimed at developing students' potential holistically, encompassing intellectual, moral, and social aspects, as well as the skills necessary for life (Rahman et al., 2022). As society and technology continue to develop, education systems must continuously adapt to address the challenges of the 21st century (Siregar, 2021). In this context, learning is shifting from teacher-centered to student-centered approaches to develop the 21st-century skills known as the 6Cs: critical thinking, creativity, communication, collaboration, character, and citizenship (Inganah et al., 2023; Khotimah et al., 2024).

One subject that plays a key role in developing these skills is mathematics (Fajriyah, 2022). Mathematics learning is oriented not only toward mastering concepts but also toward developing various essential competencies, one of which is mathematical communication. This aligns with the learning outcomes established by BSKAP Kemendikdasmen (2025), which emphasize students' ability to communicate mathematical ideas clearly and systematically. Furthermore, communication is identified as one of the primary standards in mathematics education by NCTM (2000), while OECD (2019) emphasizes that mathematical literacy encompasses the ability to represent and communicate solutions logically.

However, various studies indicate that students' mathematical communication skills in Indonesia remain relatively low. The 2015 TIMSS results show that the average mathematics score of Indonesian students was 397, which was categorized as low (Mullis et al., 2016). The 2022 PISA results also show that Indonesian students achieved only 366 points in mathematics, far below the international average (OECD, 2023). These findings indicate that students continue to experience difficulty understanding problems, representing concepts, and communicating solutions accurately.

These findings are supported by studies indicating that students are not yet able to express mathematical ideas systematically through representations, mathematical models, or conclusions (Arina and Nuraeni, 2022; Pratama et al., 2024; Rizki and Budiman, 2025). A similar situation was identified at SMP Negeri 10 Bandar Lampung through preliminary tests and teacher interviews. On the first problem, only 7% of students fulfilled all three indicators of mathematical communication skills, while 93% met only two indicators, namely drawing and mathematical expression. On the second problem, 28.6% of students fulfilled all three indicators, whereas 71.4% met only the drawing and mathematical expression indicators. These responses were not yet of high quality because many students still made errors in constructing mathematical models, performing calculations, and representing problems through drawings. Teacher interviews also indicated that students experienced difficulty understanding problem information, modeling problems mathematically, carrying out accurate calculations, and presenting information visually. This suggests that teacher-centered instruction limits students' active engagement in constructing and communicating mathematical understanding.

To address these issues, a student-centered learning model that encourages active engagement in discovering concepts is needed. One model that can be implemented is discovery learning, which emphasizes exploration, information processing, and drawing conclusions independently through the stages of stimulation, problem statement, data collection, data processing, verification, and generalization (Damanik et al., 2020). This model provides students with opportunities to express ideas and construct understanding more systematically.

Several previous studies have shown that discovery learning positively affects students' mathematical communication skills (Etia et al., 2019; Fahmi et al., 2019; Sabrina, 2023). However, research specifically examining the effect of this model on mathematical communication skills in specific junior high school contexts and subject areas remains limited.

Based on this discussion, there is a gap between the demands of mathematics education, which emphasize mathematical communication skills, and students' current proficiency. Therefore, this study aimed to examine the effect of implementing the discovery learning model on students' mathematical communication skills.

RESEARCH METHOD

This quantitative study employed a quasi-experimental design. The population consisted of all 185 eighth-grade students in the regular program at SMP Negeri 10 Bandar Lampung during the odd semester of the 2025/2026 academic year. Purposive sampling was used because the selected classes had relatively similar mean final-semester assessment scores and were taught by the same teacher; therefore, their initial abilities were considered comparable. Based on these considerations, class VIII-6 was designated as the experimental class and taught using discovery learning, while class VIII-10 was designated as the control class and taught using conventional instruction. The study used a pretest–posttest control group design. Both groups completed a pretest to determine their initial abilities, received different treatments, and completed a posttest to determine their final abilities. The research design is presented in Table 1 (Sugiyono, 2023).

Table 1. Pretest--Posttest Control Group Design

Group	Pretest	Treatment	Posttest
Experimental	O_1	X_1	O_2
Control	O_3	X_2	O_4

Description: O_1 = pretest score of the experimental group; O_2 = posttest score of the experimental group; O_3 = pretest score of the control group; O_4 = posttest score of the control group; X_1 = discovery learning; X_2 = conventional instruction.

Data were collected using an essay test designed to measure students' mathematical communication skills. The test was based on three indicators: drawing, mathematical expression, and written text. The drawing indicator measured students' ability to present mathematical ideas through pictures or diagrams; the mathematical expression indicator measured students' ability to express mathematical ideas using mathematical symbols or models; and the written text indicator measured students' ability to explain ideas or problem-solving procedures in writing.

The instrument consisted of three open-ended items designed according to the mathematical communication indicators. Before being administered, the instrument underwent pilot testing to determine its validity, reliability, discriminating power, and difficulty level. The analysis showed that all items met the established criteria and were suitable for data collection. A summary of the pilot-test results is presented in Table 2.

Table 2. Summary of Test Instrument Pilot Study Results

Item	Validity	Reliability	Discriminating Power	Difficulty Level	Conclusion
1	Valid	0.77 (Reliable)	0.53 (Good)	0.62 (Moderate)	Usable
2			0.58 (Good)	0.62 (Moderate)	
3			0.48 (Good)	0.52 (Moderate)	

Normalized gain scores were used to determine the improvement in students' mathematical communication skills. The N-Gain score was calculated using the following formula:

$$\text{N-Gain} = \frac{\text{posttest score} - \text{pretest score}}{\text{maximum possible score} - \text{pretest score}}.$$

Before hypothesis testing, prerequisite tests were conducted, including a normality test using the chi-square test and a homogeneity test. The experimental-class data were normally distributed, whereas the control-class data were not normally distributed. Therefore, the nonparametric Mann–Whitney U test was used to determine whether the improvement in mathematical communication skills differed between the experimental and control classes at a significance level of 0.05.

RESULTS AND DISCUSSION

The initial stage of data collection involved administering a pretest to the experimental and control classes to assess students' initial mathematical communication skills. The pretest results are presented in Table 3.

Table 3. Students' Initial Mathematical Communication Skills

Class	Students	Mean	Minimum	Maximum	Standard Deviation
Experimental	30	4.67	2	11	2.35
Control	30	6.17	3	12	2.48

Table 3 shows that the mean initial mathematical communication score of students in the control class was higher than that of students in the experimental class, with a difference of 1.50. The control class also obtained higher minimum and maximum scores.

https://doi.org/10.30606/absis.v9i2.4478

However, the standard deviations of the two classes were relatively similar, indicating that the distributions of students' initial abilities tended to be comparable.

Students' final mathematical communication skills in the experimental and control classes were assessed through a posttest. The posttest results are presented in Table 4.

Table 4. Students' Final Mathematical Communication Skills

Class	Students	Mean	Minimum	Maximum	Standard Deviation
Experimental	30	17.80	9	23	4.25
Control	30	15.67	9	21	3.13

Table 4 shows that the experimental class obtained a higher mean final mathematical communication score than the control class, with a difference of 2.13. The maximum score in the experimental class was also higher than that in the control class. This indicates that instruction using discovery learning resulted in better final outcomes than conventional instruction.

Gain data were calculated from the pretest and posttest results to assess the improvement in mathematical communication skills in both classes. The N-Gain scores are presented in Table 5.

Table 5. Improvement in Students' Mathematical Communication Skills

Class	Students	Mean	Minimum	Maximum	Standard Deviation
Experimental	30	0.69	0.22	0.95	0.20
Control	30	0.53	0.19	0.86	0.16

Table 5 shows that the experimental class achieved a higher mean improvement in mathematical communication skills than the control class. This indicates that discovery learning was more effective than conventional instruction in improving students' mathematical communication skills.

Students' achievement on each mathematical communication indicator was then analyzed to identify improvements in each aspect. The results are presented in Table 6.

Table 6. Achievement of Mathematical Communication Skills Indicators

Indicator	Experimental		Control	
	Pretest	Posttest	Pretest	Posttest
Drawing	17%	69%	22%	51%
Written text	9%	60%	13%	52%
Mathematical expression	32%	91%	40%	88%

Table 6 shows that all mathematical communication indicators improved in both classes, but the improvement in the experimental class was greater. These findings indicate that discovery learning was more effective in developing students' mathematical communication skills, particularly in the drawing and mathematical expression indicators. Although written text had the lowest achievement, the experimental class demonstrated greater progress in expressing mathematical ideas in writing. Overall, the results confirm that discovery learning enhanced students' mathematical communication skills more effectively than conventional learning.

Following the descriptive analysis, hypothesis testing was conducted to determine whether the improvement in mathematical communication skills differed between the two classes. Because the N-Gain data of one class were not normally distributed, the nonparametric Mann–Whitney U test was used. The results are presented in Table 7.

Table 7. Mann--Whitney U Test Results

Z_{count}	Z_{critical}	α	Decision
-3.21	-1.64	0.05	H_0 is rejected

Table 7 shows that, at a significance level of $\alpha = 0.05$, Z_{count} was smaller than Z_{critical}; therefore, H_0 was rejected. This indicates that the improvement in mathematical communication skills of students who participated in discovery learning was statistically greater than that of students who participated in conventional learning. The hypothesis-test results indicate that discovery learning had a greater effect on students' mathematical communication skills than conventional learning. This is evidenced by the higher N-Gain scores in the experimental class and the stronger achievement of the communication indicators. These findings are consistent with Ocha (2025), who found that discovery learning was effective in improving students' mathematical communication skills. Thus, implementing discovery learning contributes to the development of students' mathematical communication skills.

This improvement was observed for each indicator. For the drawing indicator, both classes improved, but the experimental class achieved higher results than the conventional class. In the experimental class, the percentage of achievement increased from

17% on the pretest to 69% on the posttest. Students became increasingly able to represent problems through diagrams, although some drawings remained incomplete or inaccurate. During learning, students were presented with problems in student worksheets that required them to express mathematical ideas through drawings and relate them to the concepts being studied. These activities encouraged students to represent mathematical ideas visually and made conceptual understanding clearer. This finding aligns with Hodiyanto (2017), who states that visual representation is an essential component of mathematical communication because it helps students understand and explain concepts more clearly.

For the written text indicator, students' mathematical communication skills also improved, with the experimental class achieving higher results than the control class. The percentage of achievement increased from 9% on the pretest to 60% on the posttest. This improvement was evident in students' ability to write solution procedures and answers in response to the worksheet problems. Through these activities, students became accustomed to organizing ideas systematically and coherently. However, achievement on this indicator remained relatively lower than on the other indicators. Although students were able to write solution procedures, many were still unable to clearly explain their reasoning or provide accurate conclusions. Written mathematical communication requires not only conceptual understanding but also the ability to construct coherent and logical arguments. This finding aligns with Riyadi et al. (2021), who state that systematically writing mathematical ideas is a complex skill and is relatively more difficult to develop than visual or symbolic representation.

For the mathematical expression indicator, both classes improved, but the experimental class achieved higher results than the control class. In the experimental class, achievement increased from 32% on the pretest to 91% on the posttest. This improvement was evident in students' ability to express mathematical ideas in symbolic form or as mathematical models. Most students constructed mathematical models correctly, although some calculation errors remained. In discovery learning, students were encouraged to understand a problem before expressing it symbolically. Group discussions also encouraged students to exchange ideas while constructing mathematical models, thereby deepening their conceptual understanding. This aligns with Aurelyasari and Nur (2023), who state that mathematical expression reflects students' ability to present ideas logically, systematically, and accurately.

The improvement in students' mathematical communication skills was influenced by the stages of discovery learning integrated into the student worksheets: stimulation, problem statement, data collection, data processing, verification, and generalization. During stimulation, students received guiding questions related to the material to foster curiosity about the problems being studied. This aligns with Muyassaroh and Waluya (2023), who state that stimuli encourage students to understand problems more deeply. During the problem statement stage, students were guided to identify important information and formulate the problem based on the given question. This activity helped students understand the context before constructing a mathematical model. Noviyanto and Wardani (2020) and Marisya and Sukma (2020) state that this stage trains students to identify problems, formulate questions, and develop initial hypotheses as a basis for problem-solving.

During data collection, students gathered relevant information through group discussions, reading learning resources, and asking the teacher questions. Hosnan (2014) states that students are encouraged to actively seek and discover information as a foundation for problem-solving during this stage. During data processing, students processed the information they had gathered by constructing mathematical models, performing calculations, and representing the results in various forms. Ilmiati (2024) and Budiastuti et al. (2023) explain that this stage trains students to analyze and process data to find solutions to the given problems.

During verification, students rechecked the accuracy of their answers by reviewing their solution procedures or substituting their results into the equation. This activity improved accuracy and reinforced conceptual understanding. This aligns with Ilmiati (2024), who states that verification aims to ensure consistency between the results obtained and the given problem. The final stage was generalization, in which students drew conclusions based on the results of their discussions and learning activities. Students presented their answers and systematically explained the procedures they used. According to Dari and Ahmad (2020), generalization helps students draw conclusions based on findings from the learning process.

Overall, discovery learning provided a more meaningful learning experience because students were actively engaged in every stage of the learning process. Students not only understood concepts but were also trained to communicate mathematical ideas through various forms of representation. This aligns with Etia et al. (2019), who state that discovery learning trains students to express ideas through discussion, and with Welinawati (2018), who asserts that exploration- and collaboration-based learning enhances students' active participation. In contrast, conventional learning tended to be teacher-centered, resulting in less active student involvement in discussions and the expression of ideas. Consequently, students' mathematical communication skills were not developed optimally. Laili et al. (2024) state that conventional learning tends to make students more passive and limits their opportunities to develop communication skills. Based on the overall discussion, discovery learning had a more positive effect on students' mathematical communication skills than conventional learning. The model encouraged students to actively understand, process, and communicate mathematical ideas, allowing their mathematical communication skills to develop more effectively.

CONCLUSION AND SUGGESTIONS

Based on the results and discussion, it can be concluded that the implementation of discovery learning had an effect on the mathematical communication skills of eighth-grade students. These findings highlight the importance of discovery learning in mathematics instruction because it encourages students to actively express ideas and systematically present solutions through various forms of representation.

Teachers are therefore encouraged to implement discovery learning with more targeted guidance, particularly during the data collection and data processing stages, by providing clear examples, step-by-step exercises, and practice in writing solution procedures in a logical sequence. From an academic perspective, this study strengthens the empirical evidence regarding the effectiveness of discovery learning in improving mathematical communication skills. Future studies should examine the implementation of this model with a focus on indicators that still show relatively low achievement, such as drawing and written text, and should employ a longer research period to obtain optimal results.

Artificial Intelligence Statement: The authors declare that no generative artificial intelligence or AI-assisted technologies were used in conducting the research or preparing the submitted manuscript.

Author Contribution Statement: FTS: Conceptualization, methodology, software, validation, formal analysis, investigation, resources, data curation, writing–original draft, writing–review and editing, visualization, project administration, and funding acquisition. PG: Supervision. NS: Supervision.

Funding Statement: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of Interest Statement: The authors declare no conflict of interest.

REFERENCES

Arina, J., & Nuraeni, R. (2022). Kemampuan komunikasi matematis siswa kelas X SMK di Ponpes Nurul Huda. *Plusminus: Jurnal Pendidikan Matematika, 2*(2), 315–324. https://journal.institutpendidikan.ac.id/index.php/plusminus/article/view/1107

Aurelyasari, S., & Nur, I. R. D. (2023). Analysis of mathematical communication skills of junior high school students on algebra material. *Radian Journal: Research and Review in Mathematics Education, 1*(3), 127–134. https://doi.org/10.35706/rjrme.v1i3.7153

Badan Standar, Kurikulum, dan Asesmen Pendidikan. (2025). *Keputusan Kepala Badan Standar, Kurikulum, dan Asesmen Pendidikan Kementerian Pendidikan Dasar dan Menengah Nomor 046/H/KR/2025 tentang capaian pembelajaran pada pendidikan anak usia dini, jenjang pendidikan dasar, dan jenjang pendidikan menengah*. Kementerian Pendidikan Dasar dan Menengah. https://bpmpbabel.kemendikdasmen.go.id/PPID/wp-content/uploads/2025/07/KepKaBSKAP-046_2025-ttg-CP.pdf

Budiastuti, P. N., Rosdiana, R., & Ekowati, A. (2023). Analisis langkah-langkah model pembelajaran discovery learning dalam rencana pelaksanaan pembelajaran teks cerita inspiratif kelas IX SMP di Kabupaten Bogor Utara. *Triangulasi: Jurnal Pendidikan Kebahasaan, Kesastraan, dan Pembelajaran, 3*(1), 39–45. https://doi.org/10.55215/triangulasi.v3i1.5129

Damanik, R. U. F., Marbun, B., & Atika, E. D. (2020). Upaya meningkatkan kemampuan komunikasi matematis siswa melalui penerapan model pembelajaran discovery learning di kelas VIII SMPN 23 Medan. *Prosiding Seminar Nasional Matematika dan Pendidikan Matematika, 5*, 25–34. https://conference.upgris.ac.id/index.php/senatik/article/view/845/534

Dari, F. W., & Ahmad, S. (2020). Model discovery learning sebagai upaya meningkatkan kemampuan berpikir kritis siswa SD. *Jurnal Pendidikan Tambusai, 4*(2), 1469–1479. https://jptam.org/index.php/jptam/article/view/612

Etia, Gunowibowo, P., & Wijaya, A. P. (2019). Pengaruh model discovery learning terhadap kemampuan komunikasi matematis siswa. *Limacon: Journal of Mathematics Education, 1*(2), 101–110. https://jurnal.fkip.unila.ac.id/index.php/limacon/article/view/19917

Fahmi, A. N., Sutiarso, S., & Coesamin, M. (2019). Pengaruh model pembelajaran discovery terhadap peningkatan kemampuan komunikasi matematis siswa. *Jurnal Pendidikan Matematika, 7*(6), 705–716. https://jurnal.fkip.unila.ac.id/index.php/MTK/article/view/20009/pdf

Fajriyah, E. (2022). Kemampuan literasi numerasi siswa pada pembelajaran matematika di abad 21. *Prosiding Seminar Nasional Pendidikan, 4*, 403–409. https://prosiding.unma.ac.id/index.php/semnasfkip/article/view/824

Hodiyanto. (2017). Kemampuan komunikasi matematis dalam pembelajaran matematika. *AdMathEdu: Jurnal Ilmiah Pendidikan Matematika, Ilmu Matematika, dan Matematika Terapan, 7*(1), 9–18. https://doi.org/10.12928/admathedu.v7i1.7397

Hosnan, M. (2014). *Pendekatan saintifik dan kontekstual dalam pembelajaran abad 21: Kunci sukses implementasi Kurikulum 2013*. Ghalia Indonesia.

Ilmiati, A. (2024). Penerapan model discovery learning terhadap literasi sains pada pembelajaran fisika. *Jurnal Citra Pendidikan, 4*(2), 1768–1776. https://jurnalilmiahcitrabakti.ac.id/jil/index.php/jcp/article/view/2989

Inganah, S., Darmayanti, R., & Rizqi, N. (2023). Problems, solutions, and expectations: 6C integration of 21st-century education into learning mathematics. *JEMS: Jurnal Edukasi Matematika dan Sains, 11*(1), 220–238. https://doi.org/10.25273/jems.v11i1.14646

Khotimah, S., Bambang, B., Purwati, A. S., & Aysi, S. A. H. (2024). Enhancing the 6Cs as 21st-century skills among higher education students through entrepreneurial project learning. *Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran, 10*(4), 1528–1536. https://e-journal.undikma.ac.id/index.php/jurnalkependidikan/article/view/13117

Laili, A., Lestari, N. A. P., & Sudewiputri, M. P. (2024). Pengaruh model pembelajaran discovery learning terhadap hasil belajar IPA siswa SD. *Jurnal Ilmiah Pendidikan Citra Bakti, 11*(1), 1–10. https://jurnal.citrabakti.ac.id/index.php/jil/article/view/2147

Marisya, A., & Sukma, E. (2020). Konsep model discovery learning pada pembelajaran tematik terpadu di sekolah dasar menurut pandangan para ahli. *Jurnal Pendidikan Tambusai, 4*(3), 2189–2198. https://jptam.org/index.php/jptam/article/view/697

Mullis, I. V. S., Martin, M. O., Foy, P., & Hooper, M. (2016). *TIMSS 2015 international results in mathematics*. TIMSS & PIRLS International Study Center, Boston College. https://timssandpirls.bc.edu/timss2015/international-results/wp-content/uploads/filebase/full%20pdfs/T15-International-Results-in-Mathematics.pdf

Muyassaroh, F. A., & Waluya, S. B. (2023). Systematic literature review: Kemampuan representasi matematis pada model discovery learning rentang tahun 2018–2023. *Prosiding Seminar Nasional MIPATI, 2*(1), 138–154. https://jurnal.stkipbjm.ac.id/index.php/mipati/article/view/2581

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*.

Noviyanto, W. Y., & Wardani, N. S. (2020). Meta analisis pengaruh pendekatan discovery learning terhadap kemampuan berpikir kritis siswa kelas V tematik muatan IPA. *Thinking Skills and Creativity Journal, 3*(1), 1–7. https://ejournal.undiksha.ac.id/index.php/TSCJ/article/view/27959

OECD. (2019). *PISA 2018 results (Volume I): What students know and can do*. OECD Publishing. https://www.oecd.org/en/publications/pisa-2018-results-volume-i_5f07c754-en.html

OECD. (2023). *PISA 2022 results (Volume I): The state of learning and equity in education*. OECD Publishing. https://doi.org/10.1787/53f23881-en

Ocha, A. (2025). Pengaruh model discovery learning terhadap kemampuan komunikasi matematis siswa (studi pada siswa kelas VII SMP Muhammadiyah 3 Bandar Lampung semester ganjil tahun pelajaran 2024/2025). *Skripsi*. Fakultas Keguruan dan Ilmu Pendidikan, Universitas Lampung. https://digilib.unila.ac.id/91819/

Pratama, I. W. A., Salingkat, S., & Lajiba, S. B. S. (2024). Analisis kemampuan komunikasi matematis ditinjau dari resiliensi matematika siswa. *NUMERIC: Jurnal Penelitian dan Inovasi Pendidikan Matematika, 2*(1), 25–39. https://doi.org/10.53090/numeric.v2i1.603

Rahman, A. B. P., Munandar, S. A., Fitriani, A., Karlina, Y., & Yumriani. (2022). Pengertian pendidikan, ilmu pendidikan dan unsur-unsur pendidikan. *Al Urwatul Wutsqa: Kajian Pendidikan Islam, 2*(1), 1–8. https://journal.unismuh.ac.id/index.php/alurwatul/article/view/7757

Riyadi, S., Noviartati, K., & Abidin, Z. (2021). Kemampuan komunikasi matematis tulis siswa Samin dalam memecahkan masalah geometri. *Ethnomathematics Journal, 2*(1), 31–37. https://doi.org/10.21831/ej.v2i1.36192

Rizki, L., & Budiman, I. (2025). Analisis kemampuan komunikasi matematis siswa SMK dalam menyelesaikan soal cerita pada materi statistika. *Didactical Mathematics, 7*(1), 173–181. https://doi.org/10.31949/dm.v7i1.13365

Sabrina, F. (2023). Pengaruh model pembelajaran discovery learning terhadap kemampuan komunikasi matematis siswa kelas IX SMPN 7 Padang. *Jurnal Edukasi dan Penelitian Matematika, 13*(1), 1–4. https://ejournal.unp.ac.id/students/index.php/pmat/article/view/15643/5893

Siregar, E. S. (2021). Dampak reformasi pendidikan Indonesia di abad 21. *Jurnal Guru Kita PGSD, 5*(4), 123–136. https://doi.org/10.24114/jgk.v5i4.28403

Sugiyono. (2023). *Metode penelitian pendidikan: Kuantitatif, kualitatif, kombinasi, R&D, dan penelitian pendidikan*. Alfabeta.

Welinawati, W. (2018). Penerapan model discovery learning untuk meningkatkan kemampuan pemahaman matematis siswa kelas VII SMPN 25 Pekanbaru. *Jurnal Pendidikan Tambusai, 2*(3), 1401–1428. https://jptam.org/index.php/jptam/article/view/125