http://dx.doi.org/10.18623/rvd.v22.n5.3786

THE EFFECT OF CASE-BASED LEARNING ON MATHEMATICAL PROBLEM-SOLVING ABILITIES

O EFEITO DA APRENDIZAGEM BASEADA EM CASOS NAS HABILIDADES DE RESOLUÇÃO DE PROBLEMAS MATEMÁTICOS

Article received on: 9/3/2025
Article accepted on: 11/3/2025

Ratih Wulandari*
*Universitas Negeri Surabaya, Indonesia
Orchid: https://orcid.org/0009-0006-1566-3642
asslafiyahassyafiiyah@gmail.com

Mustaji*
*Universitas Negeri Surabaya, Indonesia
Orchid: https://orcid.org/0000-0003-1748-2707
ijireditor7@gmail.com

Andi Mariono*
*Universitas Negeri Surabaya, Indonesia
Orchid: https://orcid.org/0000-0002-7746-1038
andimariono@unesa.ac.id

Fajar Arianto*
*Universitas Negeri Surabaya, Indonesia
Orchid: https://orcid.org/0000-0002-5026-0092
fajararianto@unesa.ac.id

The authors declare that there is no conflict of interest

Abstract
This study investigates the effect of the case-based learning (CBL) model on students' mathematical problem-solving abilities. The need for effective learning strategies is increasingly urgent, especially in mathematics, where many students struggle to understand concepts and apply them to non-routine problems. Case-based learning is considered a relevant approach because it presents real-life contextual problems that require analytical thinking, independent reasoning, and the integration of knowledge. This quantitative study employed a one-group pretest–posttest design involving 140 students. Data were collected using mathematical problem-solving tests administered before and after the intervention. The analysis included normality tests, homogeneity tests, and independent sample t-tests to determine the significance of differences in students' performance. The results showed that both pretest and posttest data were normally distributed and homogeneous. The independent t-test revealed a significance value of 0.000 < 0.050, indicating a significant improvement in

Resumo
Este estudo investiga o efeito do modelo de aprendizagem baseada em casos (ABC) nas habilidades de resolução de problemas matemáticos dos alunos. A necessidade de estratégias de aprendizagem eficazes é cada vez mais urgente, especialmente em matemática, onde muitos alunos têm dificuldades para compreender conceitos e aplicá-los a problemas não rotineiros. A aprendizagem baseada em casos é considerada uma abordagem relevante porque apresenta problemas contextuais da vida real que exigem pensamento analítico, raciocínio independente e integração de conhecimento. Este estudo quantitativo empregou um delineamento pré-teste/pós-teste com um único grupo, envolvendo 140 alunos. Os dados foram coletados por meio de testes de resolução de problemas matemáticos aplicados antes e depois da intervenção. A análise incluiu testes de normalidade, testes de homogeneidade e testes t de amostras independentes para determinar a significância das diferenças no desempenho dos alunos. Os resultados mostraram que os dados do pré-teste e do pós-

mathematical problem-solving abilities after the implementation of the CBL model. These findings align with previous studies demonstrating that CBL enhances students' analytical, critical thinking, communication, and mathematical reasoning skills. The model encourages students to engage actively in exploring cases, formulating solutions, and evaluating outcomes, thereby fostering deeper understanding and transferable competencies. Overall, the study concludes that the case-based learning model has a positive and significant effect on students' mathematical problem-solving abilities. The researchers recommend the broader use of CBL across various subjects and suggest integrating it with other innovative learning strategies to support the development of essential cognitive skills in elementary and secondary education.

Keywords: Case Based Learning. Problem Solving. Mathematics.

teste apresentaram distribuição normal e homogeneidade. O teste t independente revelou um valor de significância de 0,000 < 0,050, indicando uma melhora significativa nas habilidades de resolução de problemas matemáticos após a implementação do modelo ABC. Essas descobertas estão alinhadas com estudos anteriores que demonstram que a Aprendizagem Baseada em Casos (ABC) aprimora as habilidades analíticas, de pensamento crítico, de comunicação e de raciocínio matemático dos alunos. O modelo incentiva os alunos a se envolverem ativamente na exploração de casos, na formulação de soluções e na avaliação de resultados, promovendo, assim, uma compreensão mais profunda e competências transferíveis. No geral, o estudo conclui que o modelo de aprendizagem baseada em casos tem um efeito positivo e significativo nas habilidades de resolução de problemas matemáticos dos alunos. Os pesquisadores recomendam o uso mais amplo da ABC em diversas disciplinas e sugerem sua integração com outras estratégias de aprendizagem inovadoras para apoiar o desenvolvimento de habilidades cognitivas essenciais no ensino fundamental e médio.

Palavras-chave: *Aprendizagem Baseada em Casos. Resolução de Problemas. Matemática.*

1 INTRODUCTION

In the current globalized world, learning is developing at a quick pace, necessitating an education system that can adapt and execute efficient and pertinent teaching strategies (Amelda *et al*., 2024; Habibulloh, 2024; Wahrudin, 2025; Muzakki & Munif, 2025; At-tamimy & Eloy, 2025). This is due to the fact that education is crucial in molding the future generation to be capable and intellectual (Rouf, 2025; Abror & Fatinnah, 2025; Habibulloh, 2025; Munif & Wahrudin, 2025; Muzakki *et al*., 2023). Optimizing the learning process to enable each student to realize their full potential is a significant challenge in the field of education (Syafi'i & Ikwandi, 2023; Munif *et al*., 2023; Sina, 2025; Pradhana *et al*., 2025; Chaanpraserta *et al*., 2024). When a sizable portion of students find it difficult to manage their studies and are either removed from the program, forced to alter their majors, or have their graduation considerably delayed, academic institutions are confronted with the problem of low performance (Embarak,

2021; Abror *et al*., 2024; Ma *et al*., 2024; Riveira, *et al*., 2014; Satyawati & Dwikurnaningsih, 2024). In fundamental disciplines like mathematics, which serve as the basis for the development of logical and analytical thinking abilities, efforts to enhance the learning process are especially crucial (Eli Dwi Nabila, 2025; Sisilia Putri Adinda, 2025). This is consistent with the requirement to apply cutting-edge learning models and auxiliary technologies in order to enhance the caliber and results of student learning (Islami *et al*., 2024; Tata Ihsan *et al*., 2025).

Based on studies and findings in the field, it appears that elementary school students' understanding of concepts and problem solving is still relatively low, especially in mathematics. This is supported by other findings which show that there are several obstacles during the mathematics learning process, resulting in more than half of students experiencing difficulties in understanding the material taught. The use of inappropriate learning models is one of the reasons why students have difficulty achieving learning objectives (Rahmah & Lubis, 2024). Problems in mathematics exist in problems or words that are not routine problems that cannot be solved simply by using certain formulas, but to solve them, the correct procedure and deeper thinking are required (Siagian *et al*., 2019). These findings indicate that students' basic mathematical abilities are still very low, which hinders their ability to solve everyday problems. This situation requires educators to not only rely on technology as a solution, but also to design learning strategies that involve students in authentic problem-solving activities and active learning that encourages interaction and mutual understanding.

In addition, problem-solving skills in mathematics are equally important to develop in elementary school students. Problem-solving teaches students to think logically, identify and analyze problems, and formulate effective solutions. Polya argues that the process of finding a way out of a difficulty or obstacle, where the achievement of the goal cannot be immediately understood explicitly, presents four steps in problem solving that are often recommended in teaching and assessing the problem-solving process (Utama *et al*., 2022; 'Azah *et al*., 2024). According to Polya, the process of solving mathematical problems involves several important steps, namely understanding the problem, planning the solution, implementing the plan, and reviewing the results (Talantu *et al*., 2023; Nur Efendi & Sholeh, 2023; Sholeh & Muzakki, 2024). This allows students to apply their mathematical knowledge in a more dynamic and adaptive manner. Based on research conducted by, problem-solving skills contribute to students' academic

achievement and help them develop problem-solving skills needed in everyday life. With these skills, students are better prepared to face academic and non-academic challenges that require analytical and creative thinking.

Based on the above description, the case-based learning model is highly relevant to students' lives today. It states that educating children must be in accordance with the nature of the times. Case-based learning is a method of teaching that encourages students to investigate and solve problems using presented cases (Agustin *et al*., 2023; Mahbubi *et al*., 2025). Case-based learning can stimulate students' desire to learn and help them develop independent thinking and analytical skills, acquire expertise in synthesizing information, and apply these skills in practice (Wang *et al*., 2021; Syaifuddin *et al*., 2023 Sholeh, 2025). Case-based learning provides students with the opportunity to experience various cases that arise in everyday life (Salihi & Rosilia, 2023; Habibulloh, 2025; Sholeh, 2025). Thus, case-based learning embodies an education that requires learners to actively engage in real-world problem situations, reflecting the types of encounters that are naturally associated with the instructional content to be acquired.

This learning model is expected to be an innovative solution that not only improves students' mathematical problem-solving skills, but also prepares them for future educational and employment challenges. The results show that the case-based learning model can improve students' mathematical problem-solving skills (Ahmar *et al*., 2023; Saragih *et al*., 2024; Ihfan *et al*., 2025). This proves that this model is expected to improve children's mathematical problem-solving skills.

2 METHOD

This study employed a quantitative research approach with an experimental design to examine the effect of the Case-Based Learning (CBL) model on students' mathematical problem-solving abilities. The study applied a one-group pretest–posttest design, which enables researchers to determine changes in performance before and after treatment.

2.1 Research Design

The design can be expressed symbolically as:

O_1 - X – O_2 (1)

Where:

- O_1= Pretest
- X= CBL treatment
- O_2 = Posttest

This design is commonly used to measure learning gains resulting from an intervention (Fraenkel *et al*., 2012).

2.2 Participants

The study involved 140 students selected as research participants. All participants completed both the pretest and posttest. Students were assumed to have similar academic characteristics, which supports the internal validity of the study (Creswell & Clark, 2007).

2.3 Variables

- Independent Variable: Case-Based Learning (CBL)
- Dependent Variable: Mathematical Problem-Solving Ability

2.4 Instruments and Data Collection

Data were collected using a mathematical problem-solving test, administered twice:

- Pretest to determine initial abilities
- Posttest to measure changes after the CBL intervention

The test consisted of non-routine items aligned with problem-solving indicators adapted from Polya (1957).

2.5 Procedures

The research was carried out through three phases:

- Pretest administration (O_1)
- CBL treatment, where students engaged with real or simulated cases requiring collaborative analysis
- Posttest administration (O_2)

This procedure follows established guidelines for experimental studies in education (Johnson & Christensen, 2020).

2.6 Data analysis

Data analysis included normality testing, homogeneity testing, and hypothesis testing using the independent sample t-test.

2.6.1 Normality Test (Kolmogorov–Smirnov)

The Kolmogorov–Smirnov (K–S) test was used to determine if the data followed a norm al distribution:

$$D = \max |F_0(x) - S_n(x)| \quad (2)$$

Where:

- F_0 (x) = theoretical cumulative distribution
- S_n (x) = sample cumulative distribution

Decision rule: Sig. > 0.05 = normal distribution (Ghasemi & Zahediasl, 2012).

2.7 Homogeneity Test (Levene's Test)

Homogeneity of variance was tested using Levene's Test:

$$W = \frac{(N-k)}{(k-1)} \cdot \frac{\sum_{i=1}^{k} n_i (Z_{i\cdot} - Z_{\cdot\cdot})^2}{\sum_{i=1}^{k} \sum_{j=1}^{n_i} (Z_{ij} - Z_{i\cdot})^2} \quad (3)$$

Decision rule: Sig. > 0.05 = homogeneous variance (Tabachnick & Fidell, 2019).

2.8 Independent Sample t-Test

The difference between pretest and posttest scores was analyzed using the t-test:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S_{\bar{X}_1 - \bar{X}_2}} \quad (4)$$

where:

$$S_{\bar{X}_1 - \bar{X}_2} = \sqrt{S_p^2 \left(\frac{1}{n_1} + \frac{1}{n_2} \right)} \quad (5)$$

and:

$$S_p^2 = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{(n_1 + n_2 - 2)} \quad (6)$$

Decision rule:

- Sig. < 0.05 = significant effect;
- Sig. > 0.05 = no significant effect.

This procedure follows standard parametric testing guidelines (Field, 2018)

3 RESULT

The research data underwent data quality analysis, and it was found that both data sets were statistically valid and reliable. Next, prerequisite tests consisting of normality and homogeneity tests were conducted, followed by an independent sample t-test. The results obtained by the researcher were the result of mathematical problem-solving tests. The results of the research data analysis were presented using descriptive and inferential analysis. The following are the results of the normality test:

Normality testing is data testing that aims to determine whether the sample used is normal or abnormal. The results are shown in the following table

Table 1

Normality Test

One-Sample Kolmogorov-Smirnov Test					
		Pretest_Experiment	Posttest_Experiment	Pretest_Control	Posttest_Control
N		70	70	70	70
Normal Parameters[a,,b]	Mean	33.86	80.64	32.57	75.71
	Std. Deviation	6.548	6.366	7.882	7.532
Most Extreme Differences	Absolute	.155	.155	.150	.148
	Positive	.136	.155	.103	.128
	Negative	-.155	-.145	-.150	-.148
Kolmogorov-Smirnov Z		1.297	1.293	1.251	1.238
Asymp. Sig. (2-tailed)		.069	.071	.087	.093
a. Test distribution is Normal.					
b. Calculated from data.					

Based on the data in table 1, it can be seen that the significance value of the pretest for the experimental group is 0.069 and for the control group is 0.087, while the posttest value for the experimental group is 0.071 and for the control group is 0.093. All data show > 0.050 , therefore it can be concluded that the data are normally distributed. Then, the homogeneity test is as follows:

Table 2

Homogenity Test

Test of Homogeneity of Variances				
	Levene Statistic	df1	df2	Sig.
Pretest	3.267	1	138	.073
Posttest	1.110	1	138	.294

Table 2 above shows the results of the homogeneity test on the pretest and posttest data, with significant results of 0.073 for the pretest and 0.294 for the posttest, both of which are > 0.05. Therefore, the data results show that both data sets are statistically homogeneous. Next, hypothesis testing was conducted after determining through a prerequisite test that the samples taken were normal and homogeneous using an independent sample t-test, and the results of the test are shown in the following table:

Table 3

Hypothesis Test

Independent Samples Test						
			Pretest		Posttest	
			Equal variances assumed	Equal variances not assumed	Equal variances assumed	Equal variances not assumed
Levene's Test for Equality of Variances		F	3.267		1.110	
		Sig.	.073		.294	
t-test for Equality of Means		t	1.050	1.050	4.181	4.181
		df	138	133.511	138	134.271
		Sig. (2-tailed)	.296	.296	.000	.000
		Mean Difference	1.286	1.286	4.929	4.929
		Std. Error Difference	1.225	1.225	1.179	1.179
	95% Confidence Interval of the Difference	Lower	-1.136	-1.137	2.598	2.597
		Upper	3.708	3.708	7.259	7.260

Based on table 3 above, it can be seen that the pretest significance value of 0.296 > 0.05, the result shows the average initial ability of students before being given treatment. Meanwhile, the pretest significance value of 0.000 < 0.05 shows that the case-based learning model has a significant effect on students' mathematical problem-solving abilities.

4 DISCUSSION

Based on the research results, data from the experimental group and control group were normally distributed and statistically homogeneous in terms of the relationship between independent and dependent variables. Based on the t-test, there was an effect between the case-based learning model and students' mathematical problem-solving abilities, with a significance level of 0.000 < 0.05. Supported by research findings showing that case-based learning has a significant effect on students' mathematical problem-solving abilities (E. R. Dewi *et al*., 2022; Miftah *et al*., 2024; Irwanto *et al*., 2024; Gusyaa *et al*., 2025; Fitriani *et al*., 2025). Previous studies have shown that case-based learning plays a significant role in influencing students' problem-solving abilities, proving that this model is highly suitable for implementation.

However, in addition to that, the role of case-based learning in learning also influences abilities or skills that are certainly needed to achieve good and desired learning outcomes and learning objectives. The results of the study indicate that case-based learning can improve student learning activities and mathematical communication skills (Anwar & Rahmawati, 2024), improving mathematical analysis (Andini *et al*., 2023), enhancing critical thinking skills (Putri *et al*., 2024; Sunaryo *et al*., 2024; Sunaryo *et al*., 2024; Ningsih *et al*., 2025). This shows that the implementation of case-based learning has a significant impact on many things, especially in the learning process. And if explored further, it can certainly improve the competencies required of students.

The advantages of case-based learning include helping students sort factual data, apply analytical tools, and develop analytical, collaborative, and communication skills. By using cases, students can see theory in practice and become more interested and engaged in class. CBL can also develop students' abilities in group learning, speaking, and critical thinking (Zaki & Qaaf, 2025). Case-based learning also enables scientific inquiry and conclusion building, as well as the integration of knowledge and practice (Supardi *et al*., 2022). Case-based learning provides a clear structure during project sessions. Several courses can apply the case-based learning model (Farikah *et al*., 2022; C. A. Dewi & Hamid, 2025). Other advantages include: students can express cases or issues and use cases that they relate to new situations; students can develop analysis, collaborate, and communicate skillfully; students are more involved in the learning process.

5 CONCLUSION

This study concludes that the Case-Based Learning (CBL) model has a significant and positive effect on students' mathematical problem-solving abilities. The results of the independent sample t-test demonstrated that students' posttest scores improved substantially compared to their pretest scores, with a significance value of 0.000, indicating a strong statistical impact of the intervention. These findings confirm that CBL effectively promotes deeper cognitive engagement, analytical reasoning, and the integration of conceptual understanding in solving non-routine mathematical problems. The model's emphasis on real-world cases requires students to interpret information, formulate strategies, evaluate alternative solutions, and justify their reasoning—skills that

align with the higher-order thinking competencies required in contemporary education systems. Furthermore, the results resonate with the theoretical foundations of Polya's problem-solving framework, which emphasizes understanding, planning, implementing, and reflecting. They also align with previous international studies showing that case-based learning enhances cognitive flexibility, learner autonomy, and collaborative problem-solving across various fields of study. The outcomes of this study suggest that CBL not only strengthens students' mathematical competencies but also cultivates thinking dispositions essential for academic progression and lifelong learning.

Based on these findings, the study strongly recommends the broader implementation of Case-Based Learning in mathematics instruction and other subject areas that require analytical and critical thinking. Educators are encouraged to design learning environments that incorporate authentic cases, promote dialogic inquiry, and engage students in reflective problem-solving processes. Integrating CBL with other innovative pedagogical approaches—such as project-based learning, inquiry-based learning, and technology-enhanced instruction—may further elevate students' learning outcomes and support diverse learning needs. Schools and policymakers should consider adopting CBL as part of curriculum reform initiatives aimed at strengthening 21st-century competencies, particularly in contexts where students traditionally struggle with mathematics. Future research may extend this study by exploring the long-term effects of CBL, its implementation across different grade levels, and its interaction with factors such as learning motivation, digital literacy, and classroom environment. In conclusion, Case-Based Learning represents a promising, evidence-based instructional model that prepares students not only to excel in mathematical problem solving but also to navigate complex real-world challenges with confidence, creativity, and critical awareness.

REFERENCES

Abror, S., & Fatinnah, S. (2025). Project-Based Learning (PjBL) as a Strategy to Enhance Critical Thinking Skills in Elementary Students. *International Journal of Multidisciplinary Research and Innovation*, *1*(1). https://doi.org/10.64084/ijmri.v1i1.47

Abror, S., Mutrofin, M., & Hardinanto, E. (2024). Reimagining Teacher Professional Development to Link Theory and Practice. *JTL: Journal of Teaching and Learning*, *1*(1), 22–36.

Agustin, F., Nur, D., Eky, A., Sari, M. K., & Madiun, U. P. (2023). Efektifitas Model Case Based Learning (CBL) Terhadap Kemampuan Pemecahan Masalah Siswa Pada Pembelajaran Tematik Kelas V di SDN 03 Madiun Lor. *Caruban: Jurnal Ilmiah Pendidikan Dasar*, *6*(3).

Ahmar, D. S., Azzajjad, M. F., & Ahmar, A. S. (2023). Adapting to Change: The Effects of Case Study Approaches on Problem-Solving Skills. *ARRUS Journal of Mathematics and Applied Science*, *3*(2), 97–108.

Amelda, M., Jonson, L., Kafaur, K., Sharema, N., & Ahbadi, S. (2024). Learning Strategies in Religious Education to Foster Spiritual Values Among Generation Z. *IJEMR: International Journal of Education Management and Religion*, *1*(1).

Andini, N. D., Salsabila, E., & Haeruman, L. D. (2023). Pengaruh Model Case-Based Learning terhadap Kemampuan Penalaran Matematis Peserta Didik SMA Negeri 03 Tambun Selatan. *JRPMS (Jurnal Riset Pembelajaran Matematika Sekolah)*, *7*(2019), 87–100.

Anwar, R. B., & Rahmawati, D. (2024). Case Based Learning Sebagai Upaya Peningkatan Aktivitas Belajar Dan Komunikasi Matematis. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *13*(4), 1361–1371.

At-tamimy, M. I., & Eloy, M. J. A. (2025). Educational Perception in Urban and Rural Communities: A Qualitative Study. *International Journal of Interdisciplinary Research*, *1*(1).

‘Azah, N., Sholeh, M. I., Aziz, A. A., Al-Fatih, M., Pratiwi, E. Y. R., & Masruroh, L. (2024). Implementation of the Pancasila Student Profile Strengthening Project for Preserving Local Traditions at MTsN 17 Jombang. *Jurnal Pendidikan Dan Pembelajaran Indonesia (JPPI)*, *4*(3), 1069–1082. https://doi.org/10.53299/jppi.v4i3.700

Chaanpraserta, P., Thomas, J. L., & Mitchelle, S. (2024). Innovative Learning Strategies for Enhancing Student Engagement in Multicultural Classrooms. *JTL: Journal of Teaching and Learning*, *1*(1), 57–72.

Creswell, J. W., & Clark, V. P. (2007). *Mixed methods research.* Thousand Oaks, CA.

Dewi, C. A., & Hamid, A. (2025). PENGARUH MODEL CASE BASED LEARNING (CBL) TERHADAP KETERAMPILAN GENERIK SAINS DAN PEMAHAMAN KONSEP SISWA KELAS X PADA MATERI MINYAK BUMI. *Jurnal Ilmiah Pendidikan Kimia “Hydrogen,”* *3*(2), 294–301.

Dewi, E. R., Dewi, E. R., & Nurjanah, A. (2022). Problem-based learning and case-based learning: Which is more effective for fostering mathematical connection? *Jurnal Riset Pendidikan Matematika Volume*, *9*(2), 124–136.

Eli Dwi Nabila, E. D. N. (2025). Implementation of Scramble Type Cooperative Learning Method in Improving Creative Thinking Skills of Arabic Language Subject Students at MIN 11 Blitar. *The Elementary Journal*, *3*(2), 60–68. https://doi.org/10.56404/tej.v3i2.164

Embarak, O. (2021). ScienceDirect ScienceDirect A New Paradigm Through Machine Learning: A Learning A New Paradigm Through Machine Learning: A Learning Maximization Approach for Sustainable Education Maximization Approach for Sustainable Education. *Procedia Computer Science*, *191*, 445–450. https://doi.org/10.1016/j.procs.2021.07.055

Farikah, Mulyani, M., Astuty, & Cahyaningrum, A. (2022). Learning Case and Project-based Model Methods: Challenges and Opportunities. *DWIJA CENDEKIA: Jurnal Riset Pedagogik*, *6*(3), 492–500.

Field, A. (2018). DISCOVERING STATISTICS USING BM SPSS STATISTICS. *SAGE Publications*.

Fitriani, R., Anggoro, B. S., & Nabila, S. U. (2025). Efektivitas Case Base Learning Dan Peran Curiosity Dalam Meningkatkan Kemampuan Pemecahan Masalah Matematis. *Pendas : Jurnal Ilmiah Pendidikan Dasar*, *10*(3), 299–310.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). *How to desIgn and evaluate research In educatIon (8th ed.).* Mc Graw HIll.

Ghasemi, A., & Zahediasl, S. (2012). Normality Tests for Statistical Analysis: A Guide for Non-Statisticians. *International Journal of Endocrinology and Metabolism*, *10*(2), 486–489. https://doi.org/10.5812/ijem.3505

Gusyaa, C. Z. Z., Oktaviaa, R., Yantoa, F., & Wati, F. (2025). The Implementation of Case-Based Learning (CBL) Model to Improve Students' Problem-Solving Skills at SMPN 30 Padang. *SEMESTA Journal of Science Education and Teaching*, *8*(2), 129–138. https://doi.org/10.24036/semesta/vol8-iss2/639 SEMESTA

Habibulloh, M. (2024). The Role of Islamic Education in Building Interreligious Tolerance in Indonesia. *IJEMR: International Journal of Education Management and Religion*, *1*(2), 63–82.

Habibulloh, M. (2025a). Ethics of Artificial Intelligence Usage in Education: A Qualitative Study on Teachers' and Students' Perceptions. *International Journal of Interdisciplinary Research*, *1*(1).

Habibulloh, M. (2025b). Teachers' Professional Development and Its Influence on Teaching Innovation in Rural Schools. *International Journal of Multidisciplinary Research and Innovation*, *1*(1). https://doi.org/10.64084/ijmri.v1i1.46

Ihfan, A., Fahmi, K., Duananda, M., Degeng, K., & Soepriyanto, Y. (2025). The impact of the case-based learning model and learning motivation on learning outcomes. *Journal of Research in Instructional*, *5*(1), 258–270.

Irwanto, I., Pratiwi, Y., & Rizkyani, H. (2024). The Effect of Case-Based Learning on Students ' Problem-Solving Ability. *International Journal of Religion*, *3538*(6), 235–242.

Islami, M. F., Nasir, Rasid, Nurzima, & Mujiati. (2024). Perbandingan Kualitas Pendidikan Antara Sekolah Negeri Dan Sekolah Swasta: Eksplorasi Pada Aspek Pembelajaran. *Kelola Jurnal Manajemen Pendidikan*, *11*(2), 183–196.

Johnson, B., & Christensen, L. (2020). *Educational Research*. SAGE.

Ma, X. Z., Ertmer, P. A., & Pelgrumen, C. P. (2024). The Impact of Technology Integration on Student Learning Outcomes. *JTL: Journal of Teaching and Learning*, *1*(1), 73–90.

Mahbubi, M., Cholili, A. H., & Huda, A. A. S. (2025). Enhancing Educational Quality Through Effective Communication in Private Universities. *Journal of Education and Learning Sciences*, *05*(01). https://doi.org/10.56404/jels.v5i1.124

Miftah, R., Dahlan, J. A., Kurniawati, L., & Herman, T. (2024). How does interactive case-based learning improve students ' complex mathematical problem-solving abilities ? *Journal of Honai Math*, *7*(August), 307–326.

Munif, M., Patoni, A., & Maunah, B. (2023). Pengaruh Dimensi Kepemimpinan Transformational terhadap Budaya Kerja. *JMPI: Jurnal Manajemen, Pendidikan dan Pemikiran Islam*, *1*(1), 71–83. https://doi.org/10.71305/jmpi.v1i1.23

Munif, M., & Wahrudin, B. (2025). Transnational Legal Cooperation And Global Trade: Rethinking International Investment Law In The Era Of Sustainable Development. *Journal of Law, Policy and Global Development*, *1*(1). https://doi.org/10.71305/jlpgd.v1i1.334

Muzakki, H., Binti Maunah, & Achmad Patoni. (2023). Budaya Kepemimpinan Transformatif di Lembaga Pendidikan Islam. *JMPI: Jurnal Manajemen, Pendidikan dan Pemikiran Islam*, *1*(1), 57–70. https://doi.org/10.71305/jmpi.v1i1.2

Muzakki, H., & Munif, M. (2025). Evaluating Public Sector Efficiency And Its Influence On Economic Development Across Nations. *International Journal of Economics and Development*, *1*(1).

Ningsih, D. R., Putri, R. E., Sari, W. K., & Arif, K. (2025). Pengaruh Model Case Based Learning Terhadap Keterampilan Berpikir Kritis Siswa Kelas VIII Mtsn 3 Padang. *Jurnal TPACK IPA*, *9*(2), 28–36.

Nur Efendi & Muh Ibnu Sholeh. (2023). Manajemen Pendidikan Dalam Meningkatkan Mutu Pembelajaran. *Academicus: Journal of Teaching and Learning*, *2*(2), 68–85. https://doi.org/10.59373/academicus.v2i2.25

Pradhana, Y., Andriani, V. E., Febriani, A. Z., Nur'aida, T., Berliana, E., & Roihandro, M. D. (2025). Training on Issue and Crisis Management for Village Government Officials of Eureunpalay Village Cibalong Tasikmalaya. *Jurnal Pengabdian Kepada Masyarakat*, *1*(2).

Putri, R. N., Santoso, R. Y., & Hajuan, M. A. (2024). Pengaruh Model Pembelajaran Case Based Learning Berbantuan Lkpd Terhadap Kemampuan Berpikir Kritis. *Dharma Pendidikan*, *19*(2), 99–107. https://doi.org/10.69866/dp.v19i2.534

Rahmah, S., & Lubis, A. H. (2024). Problem Posing as a Learning Model to Improve Primary School Students' Mathematics Learning Outcomes in Gayo Lues. *Journal of Indonesian Primary School*, *1*(4), 93–104.

Riveira, C., Fadhila, A., & O'Reilly, J. (2014). Technological Advancements Shaping Future Learning Environments. *SAHRI: Journal of Studies in Academic, Humanities, Research, and Innovation*, *1*(1), 1–17.

Rouf, A. (2025). Enforcement Challenges in Human Rights Protection Under International Law. *International Journal of Law*, *1*(1), 14–29. https://doi.org/10.64084/ijl.v1i1.52

Salihi, & Rosilia, V. (2023). Pengaruh Penerapan Metode Cooperative Learning Dan Case Based Learning Terkait Pemahaman Mahasiswa Pada Pembelajaran Akuntansi Keperilakuan. *JIRK Journal of Innovation Research and Knowledge*, *2*(10), 3915–3922.

Saragih, S., Nisa, S., Hutapea, N. M., & Dian, R. (2024). The Impact of Case-Based Learning Model Through Problem Solving Skills. *Proceedings of the 6th Sriwijaya University Learning and Education International Conference 2024 (SULE-IC 2024), 2024*.

Satyawati, S. T., & Dwikurnaningsih, Y. (2024). Strategies For Organization In Educational Resource Management. *SAHRI: Journal of Studies in Academic, Humanities, Research, and Innovation*, *1*(1), 33–48.

Sholeh, M. I. (2025a). Bridging Legal Reform And Climate Action: Strengthening Rule Of Law To Advance SDG 13 In The Global South. *Journal of Law, Policy and Global Development, 1*(1), 1-18. https://doi.org/10.71305/jlpgd.v1i1.332

Sholeh, M. I. (2025b). Constitutional Interpretation Within Islamic and Western Legal Frameworks. *International Journal of Law*, *1*(1), 1–13.

Sholeh, M. I., & Muzakki, H. (2024). The Effectiveness of Principal Leadership in Managing a Tahfidz- based Curriculum. *Indonesian Research Journal in Education*, *8*(2).

Siagian, M. V., Saragih, S., & Sinaga, B. (2019). Development of Learning Materials Oriented on Problem-Based Learning Model to Improve Students' Mathematical Problem Solving Ability and Metacognition Ability. *International Electronic Journal of Mathematics Education*, *14*(2), 331–340. https://doi.org/10.29333/iejme/5717

Sina, I. (2025). Pelatihan Pengembangan Lembaga Pendidikan Melalui Strategi Manajemen Yang Efektif. *Jurnal Pengabdian Kepada Masyarakat, 1*(1).

Sisilia Putri Adinda. (2025). Revisiting the Equity Promise of School Zoning Policies in Indonesia: Between Idealism and Implementation. *JUPSI: Jurnal Pendidikan Sosial Indonesia*, *3*(2), 78–87. https://doi.org/10.62238/jupsi.v3i2.214

Sunaryo, Y., Solihah, S., & Yulisma, L. (2024). Mathematical Critical Thinking Skills Through Case- Based Learning with Scaffolding in Cross-Study Program Classes. *Mosharafa: Jurnal Pendidikan Matematika*, *13*(1), 247–258.

Supardi, A., Gumilar, A., & Abdurohman, R. (2022). Pembelajaran Nahwu Dengan Metode Deduktif dan Induktif. *Jurnal Keislaman Dan Pendidikan*, *3*(1), 23–32.

Syafi'i, K., & Ikwandi, M. R. (2023). Strategi Kepala Sekolah Dalam Meningkatkan Mutu Pendidikan Melalui Program Unggulan di SMK Kiyai Mojo Tembelang Jombang. *JMPI: Jurnal Manajemen, Pendidikan, dan Pemikiran Islam*, *1*(2).

Syaifuddin, A., Wijayanto, A., & Patoni, A. (2023). Booklet Developed To Maximize Mathematics Learning. *The Elementary Journal*, *1*(1), 1–10. https://doi.org/10.56404/tej.v1i1.40

Tabachnick, B. G., & Fidell, L. S. (2019). *Using multivariate statistics* (Seventh edition). Pearson.

Talantu, E. G., Monoarfa, J. F., & Regar, V. E. (2023). Analisis Kemampuan Pemecahan Masalah Menurut Polya Bagi Siswa Kelas VIII SMP Negeri 3 Kombi pada Materi Bangun Ruang Sisi Datar. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, *07*(November), 3292–3303.

Tata Ihsan, Pariatman Tanjung, Embun Afifah Honey, Mega Amanda, Dewi Cindia Putri, & M Zainul Hafizi. (2025). The Role of the Kapuas River in Shaping Social Interaction and Cultural Acculturation in Multicultural Communities. *JUPSI: Jurnal Pendidikan Sosial Indonesia*, *3*(2), 58–65. https://doi.org/10.62238/jupsi.v3i2.179

Utama, S. S., Budiyono, & Aryuna, D. R. (2022). Profil Kemampuan Pemecahan Masalah Matematika Berdasarkan Langkah-Langkah Polya Pada Materi Trigonometri Ditinjau Dari Gaya Belajar Siswa Sman 1 Magetan. *Jurnal Pendidikan Matematika Dan Matematika (JPMM)*, *6*(6), 248–259.

Wahrudin, B. (2025). Public Policy Strategies For Enhancing Innovation And SME Competitiveness In Emerging Economies. *International Journal of Economics and Development*, *1*(1). https://doi.org/10.71305/ijed.v1i1.348

Wang, H., Xuan, J., Liu, L., Shen, X., & Xiong, Y. (2021). Problem-based learning and case-based learning in dental education. *Ann Transl Med*, *9*(14), 8–15. https://doi.org/10.21037/atm-21-165

Zaki, A., & Qaaf, M. A. (2025). Implementasi Metode Case Based Learning dalam Pembelajaran Maharah Kalam. *PESHUM : Jurnal Pendidikan, Sosial Dan Humaniora*, *4*(3), 4858–4873.

Authors' Contribution

Both authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

How to cite this article (APA)

Wulandari, R., Mustaji, Mariono, A., & Arianto, F. THE EFFECT OF CASE-BASED LEARNING ON MATHEMATICAL PROBLEM-SOLVING ABILITIES. Veredas Do Direito, e223786. https://doi.org/10.18623/rvd.v22.n5.3786