



EFFORTS TO IMPROVE MATHEMATICAL CRITICAL THINKING SKILLS THROUGH THE REALISTIC MATHEMATICS EDUCATION MODEL ASSISTED BY DIAGRAM BOARD MEDIA

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Abstract

The critical thinking skills of fourth-grade students at SD Negeri Bangetayu Kulon in mathematics remain low, marked by teacher-centred learning, passive students, and a pre-cycle average score of 64.46 with 42.86% completeness. This classroom action research aimed to improve students' critical thinking skills through the Realistic Mathematics Education (RME) model assisted by diagram boards on pictogram and bar chart material. The study followed the Kemmis and McTaggart model across two cycles, with 28 students (12 boys, 16 girls) as subjects. Data was collected through written tests to measure critical thinking skills and observation sheets to assess the implementation of learning activities, using indicators: 1) Apply, 2) Use data to develop critical insight, 3) Analyze, 4) Evaluate, and 5) Synthesize. Results showed the average score increased from 64.46 (42.86%) in the pre-cycle to 74.28 (71.43%) in Cycle I, and 85.5 (82.14%) in Cycle II, exceeding the success indicators' minimum KKTP of 80 and classical completeness of $\geq 80\%$. These findings prove that the RME model assisted by diagram boards effectively improves students' critical thinking skills.

Keywords: Critical Thinking; Diagram Board Media; Realistic Mathematics Education

Abstrak

Kemampuan berpikir kritis murid kelas IV SD Negeri Bangetayu Kulon dalam pembelajaran matematika masih tergolong rendah. Hal ini ditunjukkan oleh proses pembelajaran yang masih berpusat pada guru, sehingga murid cenderung pasif dalam mengikuti pembelajaran. Kondisi tersebut juga terlihat dari hasil pra-siklus, dengan nilai rata-rata kelas sebesar 64,46 dan persentase ketuntasan sebesar 42,86%. Penelitian tindakan kelas ini bertujuan untuk mengetahui peningkatan kemampuan berpikir kritis matematika murid kelas IV melalui penerapan model Pendidikan Matematika Realistik berbantuan media papan diagram pada materi piktogram dan diagram batang. Penelitian ini menggunakan model penelitian tindakan kelas Kemmis dan McTaggart yang dilaksanakan dalam dua siklus. Subjek penelitian terdiri atas 28 murid kelas IV, yaitu 12 murid laki-laki dan 16 murid perempuan. Data penelitian dikumpulkan melalui tes tertulis untuk mengukur kemampuan berpikir kritis dan lembar observasi untuk mengukur keterlaksanaan aktivitas pembelajaran. Indikator kemampuan berpikir kritis yang digunakan meliputi: (1) menerapkan, (2) menggunakan data untuk mengembangkan pemahaman kritis, (3) menganalisis, (4) mengevaluasi, dan (5) menyintesis. Hasil penelitian menunjukkan adanya peningkatan kemampuan berpikir kritis murid pada setiap tahap penelitian. Nilai rata-rata kelas meningkat dari 64,46 dengan persentase ketuntasan sebesar 42,86% pada pra-siklus menjadi 74,28 dengan persentase ketuntasan sebesar 71,43% pada siklus I. Selanjutnya, pada siklus II, nilai rata-rata meningkat menjadi 85,50 dengan persentase ketuntasan sebesar 82,14%. Hasil tersebut telah melampaui indikator keberhasilan penelitian, yaitu nilai kriteria ketercapaian tujuan pembelajaran minimal 80 dan ketuntasan klasikal minimal 80%. Dengan demikian, penerapan model Pendidikan Matematika Realistik berbantuan media papan diagram dapat meningkatkan kemampuan berpikir kritis murid kelas IV pada materi piktogram dan diagram batang.

Kata kunci: Berpikir Kritis; Media Papan Diagram; Realistic Mathematics Education

INTRODUCTION

Education is a vital component of human life. It has no boundaries, extending from children to adults. Law Number 20 of 2003 on the National Education System states that the most basic level of education is elementary school. One subject that is important to teach from elementary school onward is mathematics, because it builds analytical, creative, logical, and critical thinking skills (Liani et al., 2025). Developing conceptual understanding in mathematics is important for improving problem-solving and critical thinking skills (Sa'o et al., 2021). According to Kusmaryono et al. (2024), critical thinking is an essential skill that supports sound decision-making, problem-solving, and effective communication, and helps people avoid bias and flawed reasoning. Critical thinking is also important for elementary school children, because in the 21st century students are expected to have certain skills, one of which is critical thinking. Therefore, teachers need to strengthen students' critical thinking so that they become accustomed to higher-order thinking skills (HOTS) problems.

According to Greenstein (2012), the indicators of critical thinking are: 1) apply, 2) use data to develop critical insight, 3) analyze, 4) evaluate, and 5) synthesize. Critical thinking in elementary school involves a thinking process in which students do not merely receive information but are able to process it, solve problems, and make decisions based on their own experiences (Ramadan et al., 2025). The teacher's role is important here, because teachers guide students to think critically by engaging them with problems found in everyday life. Teachers typically facilitate critical thinking by providing problems accompanied by clear instructions and solution steps, and by encouraging students to double-check their answers (Hidayah et al., 2024).

However, the reality in the field, particularly in fourth-grade mathematics at Bangetayu Kulon Public Elementary School, as observed during the Supervised Teaching Practicum, shows a contrasting situation. Students were physically active in class, but the teacher relied solely on the textbook, instruction remained teacher-centered, and students were passive, merely copying material from the board and working on easy practice problems. Students struggle to interpret data and draw conclusions from diagrams in mathematics. In addition, the pre-cycle average score was low at 64.46, with 12 students meeting the mastery criterion and 16 not meeting it. This indicates that the fourth-grade students' critical thinking skills remain low and that an innovative approach is needed to improve them. Based on this reality, the problem identified is a lack of critical thinking among fourth-grade students at Bangetayu Kulon Public Elementary School. These students are still accustomed to easy problems and still depend on the teacher to solve them. As a result, when they work on HOTS problems, many still cannot solve them, and some do not even understand how to approach the solution.

In response to these symptoms of weak critical thinking, teachers can apply problem-based learning models to train critical thinking skills (Rahmawati et al., 2023). According to Nurhaswinda et al. (2025), a learning model that teachers can use to bridge abstract mathematical content and students' real lives is the Realistic Mathematics Education (RME) model. According to Amin & Sumendap (2022), RME is a mathematics learning model that takes students' real-world experiences in everyday life as the starting point for learning and treats mathematics as an activity through which students acquire new knowledge. This model presents realistic problems to stimulate students to discover mathematical concepts and then apply those concepts to solve problems. Implementing the RME model involves several syntax steps that must be carried out to achieve the learning objectives. According to Hobri (2009, as cited in Isrok'atun & Rosmala, 2021), the steps of the RME model are: 1) understanding the contextual problem, 2) explaining the contextual problem, 3) solving the contextual problem, 4) comparing and discussing answers, and 5) concluding.

In addition, media can be used to optimize learning (Landina & Agustiana, 2022). Learning media plays an important role in supporting students' understanding of the material and their independence in managing their own learning activities (Sutomo & Kusumadewi, 2026). Students become confused when data are presented in narrative form, but the situation is different when data are presented in an attractive, easy-to-read format. The diagram board media helps students read data and easily identify the highest and lowest values. The RME model for pictographs and bar graph material can use the "Diagram Board" media, which helps teachers explain the material. The diagram board is a tool made of styrofoam or cardboard with attractive decorations, allowing students to obtain data in an easily understood display.

METHODS

The research type used is Classroom Action Research (CAR). According to Nanda et al. (2021), CAR is a series of new activities carried out by teachers to improve and optimize learning in the classroom. This study used the Kemmis and McTaggart CAR model, in which the research is cyclical and reflective. The study was conducted in two cycles, each consisting of four stages. Cycle I comprised two meetings, with the stages of planning, implementation, observation, and reflection. After the second meeting of Cycle I, the teacher reflected by evaluating the shortcomings of Cycle I so that they could be addressed in Cycle II. Cycle II also comprised two meetings, and the teacher carried out the stages of planning (incorporating improvements from Cycle I), implementation, observation, and reflection. The study was conducted in the fourth grade at Bangetayu Kulon Public Elementary School with 28 students as research subjects, consisting of 12 boys and 16 girls. It was carried out from March 6 to April 17, 2026. Data were collected through written tests, observation, and documentation. The written test was used to determine improvement in the fourth-grade students' critical thinking skills. The test consisted of five essay questions at cognitive levels C4–C5. The test blueprint used to map each essay question is presented in Table 1 below:

Table 1. Blueprint of the Critical Thinking Ability Instrument

Research Object	Indicator	Sub-indicator	Question Number
Critical Thinking Ability	Apply	Developing curiosity	1
	Use Data to Develop Critical Insight	Developing data	2
	Analyze	Analyzing data	3
	Evaluate	Evaluating or comparing data	5
	Synthesize	Summarizing the results	4

The observation technique was used to determine how well the Realistic Mathematics Education model, and the diagram board media were implemented, as well as student activity during learning. In this study, the classroom teacher observed and completed the teacher activity implementation checklist, and a peer colleague observed and completed the student activity checklist while the study was in progress. The observers completed the checklists using a "Yes" or "No" measurement scale. Meanwhile, documentation served as evidence that the researcher conducted the study at the school.

This study employed validity and reliability tests. The validity of the critical thinking skills test instrument was assessed using content validity, calculated with a formula, and the results showed that all five items were valid. Reliability testing was used to show that the data collected would yield consistent results, that is, to establish the stability of the test items. In addition, to determine the improvement in scores, the researcher used the mean (average) formula, which, according to Syafril (2019), is as follows:

$$Me = \frac{\sum Xi}{n}$$

Where:

$\sum Xi$ = the sum of all student scores
n = the number of students

Critical thinking skills were measured by the achievement of the Learning Objective Achievement Criteria, with a score of ≥ 80 . Therefore, if the percentage of students meeting the criteria exceeds 80% (Yurinda & Hidayat, 2023), it can be concluded that students' critical thinking skills in fourth grade at Bangetayu Kulon Public Elementary School have improved in the pictograph and bar graph material. The percentage of mastery was calculated using the following formula:

$$P = \frac{\text{Number of students who achieved mastery}}{\text{Total number of students}} \times 100\%$$

Next, the percentage of implementation of teacher and student activities was calculated using the following formula

$$P = \frac{\text{Number of activities implemented}}{\text{Total number of activities}} \times 100\%$$

RESULTS AND DISCUSSION

The implementation of the Realistic Mathematics Education (RME) model and diagram board media had a substantial influence on the improvement of students' critical thinking skills. Figure 1 shows the bar chart media as follows:

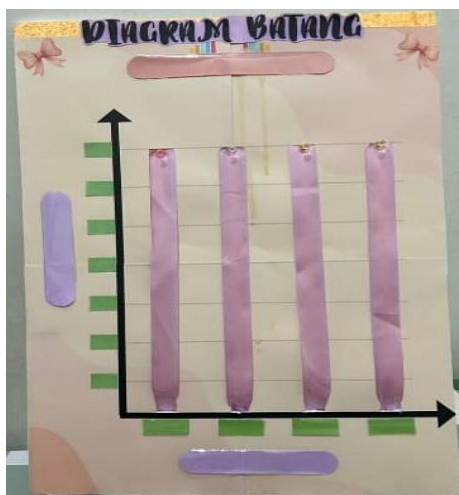


Figure 1. Diagram Board Media

The diagram board media used in this study was made of Styrofoam with printed paper attached to it. To create the bars on the diagram, the researcher used ribbon so that each bar could be adjusted to the height of the data. The steps for using this medium are as follows: (1) the teacher prepares the data to be converted into a bar chart; (2) the title of the chart is written; (3) each data category is written in the space provided; (4) the data values are written (these can be adjusted using multiples); and (5) the ribbon is pulled for each data category according to its value. The percentages of teacher and student activity implementation are presented in Table 2 as follows:

Table 2. Percentage of Implementation of Teacher and Student Activity Sheets

Activity Sheet	Cycle I	Cycle II
Teacher activity	100%	100%
Student activity	66,43%	84,29%

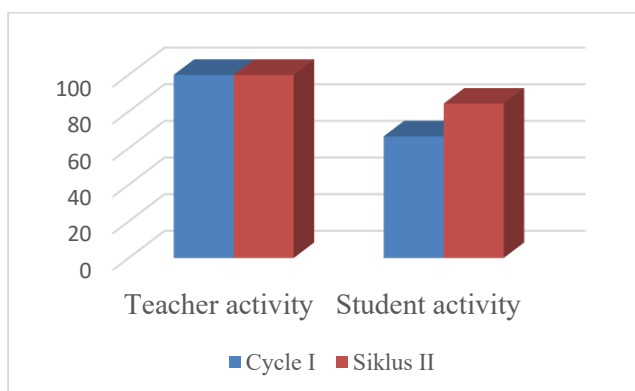


Figure 2. Percentage of Implementation of Teacher and Student Activity Sheets

Based on Table 2 and Figure 2, the teacher fully implemented the learning using the Realistic Mathematics Education (RME) model and diagram board media, with an implementation rate of 100%. Meanwhile, student activity, observed using the student activity sheet, increased from 66.43% in Cycle I to 84.29% in Cycle II. This indicates that the students were active in answering questions, solving the problems given by the teacher, completing student worksheets (LKPD) in groups, presenting their discussion results in front of the class, and drawing conclusions about the material.

Meanwhile, the results of the critical thinking skills test for fourth-grade students showed improvement from the pre-cycle to Cycle I and Cycle II. This significant improvement was obtained from the evaluation conducted in each cycle. In Cycle I, the teacher used a teaching module supported by PowerPoint media. At the end of the session, the teacher conducted an evaluation to measure the extent to which students' critical thinking skills had developed compared with the pre-cycle condition. The evaluation results were then followed up in the reflection stage, in which the teacher addressed shortcomings such as preparing more detailed learning materials, using concrete media in the form of the diagram board, and improving classroom management. These follow-up actions were applied in Cycle II, which resulted in further improvement. The results of the improvement in fourth-grade students' critical thinking at SD Negeri Bangetayu Kulon (Bangetayu Kulon State Elementary School) are presented in the table below:

Table 3. Results of Students' Critical Thinking Skills by Cycle

No.	Cycle	Mean Score	Mastery Percentage
1	Pre-cycle	64,46	42,86%
2	Cycle I	74,28	71,43%
3	Cycle II	85,5	82,14%

The improvement in mean scores for critical thinking skills, when presented as a chart, is shown in Figure 3 as follows:

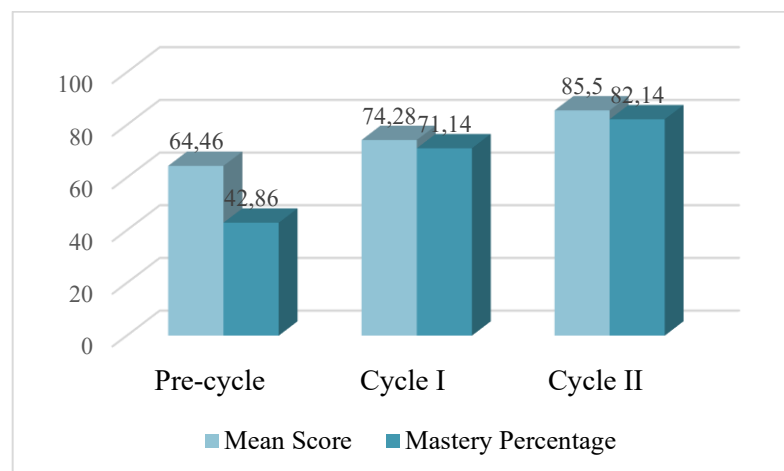


Figure 3. Chart of the Improvement in Mean Scores for Critical Thinking Skills

Based on Table 3 and Figure 3, the application of the Realistic Mathematics Education (RME) model assisted by diagram board media was able to improve the critical thinking skills of fourth-grade students in mathematics at SD Negeri Bangetayu Kulon. This improvement can be seen in the mean scores, which increased substantially in each cycle. The mean class score rose from 64.46 in the pre-cycle to 74.28 in Cycle I and then increased further to 85.5 in Cycle II. The classical mastery percentage also increased, from 42.86% in the pre-cycle to 71.43% in Cycle I, and then to 82.14% in Cycle II. Thus, the actions taken in Cycle II met the success indicators, namely a KKTP score of ≥ 80 and a classical mastery percentage of at least 80%. The improvement in each critical thinking indicator is presented as follows:

Table 4. Percentage by Indicator

No.	Indicator	Pre-cycle	Cycle I	Cycle II
1.	Apply	60,71 %	85,71 %	96,43 %
2.	Used data to develop critical insight	46,43 %	75 %	84,28 %
3.	Analyze	37,88 %	60,71 %	77,14 %
4.	Evaluate	28,57 %	53,57 %	67,86 %
5.	Synthesize	40,69 %	82,14 %	89,29 %
Mastery Percentage		42,86 %	71,43 %	82,14 %

Based on Table 4 above, there was an improvement in the critical thinking indicator apply, which rose from 60.71% in the pre-cycle to 96.43% in Cycle II. The improvement became visible when students began to apply mathematical concepts to solve the contextual problems presented. In the pre-cycle, most students still memorized formulas without understanding how to apply them in everyday life. After the teacher implemented the first step of RME, namely understanding the contextual problem, students gained more concrete learning experiences, which enabled them to connect mathematical concepts with the situations they encountered. The use of diagram board media helped students visualize information, making the process of applying concepts easier. According to Jala (2024), concrete media, which in this study is the diagram board, is effective in helping students understand mathematical concepts.

The second indicator, use data to develop critical insight, also improved, from 46.43% to 84.28% in Cycle II. In the RME syntax step of solving contextual problems, students were guided to read, identify, and use the information available in the problem as the basis for determining a problem-solving strategy. At first, some students were not yet able to select relevant data, but in Cycle II they became accustomed to identifying important information before solving problems. The use of the RME learning model can help improve critical thinking skills, one of which is extracting information from the data or problems presented (Wicaksana et al., 2025).

Improvement was also seen in the analyze indicator, from 37.88% to 77.14% in Cycle II. In the RME syntax step of comparing and discussing answers, students were given the opportunity to express their reasoning, compare solution strategies, and find errors in the problem-solving process. These activities encouraged analytical skills because students had to connect concepts, find patterns, and explain the reasoning behind each solution step. According to Maryani et al. (2023), the RME learning model emphasizes the development of processes, one of which is collaborative discussion. Therefore, collaborative discussion helps students improve their analytical skills and social interaction.

Next, the evaluation indicator improved from 28.57% to 67.86% in Cycle II. In the stage of comparing and discussing answers, students learned to evaluate the solution strategies they used and to give reasons for the answers they considered most appropriate. The ability to evaluate developed further in Cycle II because it required students to explain the reasons for choosing a strategy and to recheck their work. This is in line with Maslihah et al. (2025), who stated that the evaluation process plays an important role in improving higher-order thinking skills.

The fifth indicator, synthesize, rose from 40.69% to 89.29% in Cycle II, showing that students were able to correct wrong answers and draw conclusions. The process of formulating conclusions in collaborative learning requires teacher guidance so that students of varying ability levels can connect information. Thus, the stage of concluding together in RME assisted by the diagram board becomes an effective means for students to develop the ability to synthesize information into meaningful mathematical understanding.

The improvement in students' critical thinking skills from the pre-cycle to Cycle II did not happen instantly but resulted from gradual changes in the learning pattern. In the pre-cycle, learning was teacher-centred, so students only received the teacher's explanations without being involved in the thinking process. After the RME model was implemented, the students' role changed to that of active participants who solved problems through their own understanding. This change is the root cause of the improvement in critical thinking skills, because students were no longer required to memorize but were trained to understand, connect, and process information both independently and collaboratively. In addition, the evaluation and reflection conducted at the end of each cycle helped the teacher correct weaknesses in the previous lesson, so that learning in Cycle II became more optimal than in Cycle I.

The diagram board serves to bridge the abstract concepts of pictographs and bar charts with concrete experiences that students can directly feel. This medium allows students not only to view and read ready-made data but also to experience the process of making a chart themselves, from determining the title and writing the data categories to pulling the ribbon according to the data quantities. Through this direct involvement, students come to understand how data are processed into a chart, rather than only knowing the result. The activity of constructing charts manually also trained students to apply concepts (apply) and to use data to develop critical insight (use data to develop critical insight), because students had to think about the relationship between the amount of data and the length or height of the bars to be formed. Furthermore, the visualization produced by this media made it easier for students to enter the analyze and evaluate stages of the RME syntax, because data presented visually are much easier to compare and discuss than data presented only as numbers or text.

Overall, the improvement in critical thinking skills from the pre-cycle to Cycle II shows that applying the Realistic Mathematics Education (RME) model assisted by diagram board media provided a more active, meaningful, and student-centred learning experience. Learning began with a contextual problem, followed by exploration using the diagram board, group discussion, presentation of results, and drawing conclusions together, which was able to develop all of the critical thinking indicators, namely Apply, Use Data to Develop Critical Insight, Analyze, Evaluate, and Synthesize.

Although consistent with previous studies, this study offers novelty in terms of media. It uses a diagram board made of Styrofoam with a ribbon system that is easy to carry because it is lightweight, and it is designed so that students can visualize data directly and thus take part in making charts rather than only reading ready-made ones. In addition, this study measured critical thinking skills using five specific indicators (Apply, Use Data to Develop Critical Insight, Analyze, Evaluate, and Synthesize), which were analyzed separately to observe the development of each indicator rather than only examining the overall critical thinking score. This difference constitutes the new contribution of this study to research on the application of RME in elementary school mathematics learning.

CONCLUSION

This Classroom Action Research (CAR) was conducted in the fourth grade at SD Negeri Bangetayu Kulon in the mathematics subject by applying the Realistic Mathematics Education (RME) learning model assisted by the diagram board media. The results show an improvement in fourth-grade students' mathematical critical thinking skills through the RME model assisted by diagram board media. Before the RME learning model was used (pre-cycle), the mean class score of the 28 students was 64.46, with a mastery percentage of only 42.86%.

After improvements were made in Cycle I and Cycle II using the RME learning model and diagram board media, the results showed an improvement in Cycle I, with a mean class score of 74.28 and a mastery percentage of 71.43%. In Cycle II, the mean class score reached 85.5 with a mastery percentage of 82.14%, which exceeded the 80% threshold and met the criterion for classical mastery. These results demonstrate that applying the RME learning model assisted by diagram board media improved students' critical thinking skills. The students were able to analyze information or problems, evaluate, and find solutions to problems.

DAFTAR PUSTAKA

- Amin, & Sumendap, L. Y. S. (2022). *164 Model Pembelajaran Kontemporer*. Bekasi: Pusat Penerbitan LPPM Universitas Islam 45 Bekasi.
- Greenstein, L. (2012). *Assessing 21st Century Skills : A Guide to Evaluating Mastery and Authentic Learning*. California: Corwin Press.
- Hidayah, N., Kusmaryono, I., & Abdul Basir, M. (2024). Proses Pembelajaran Berdiferensiasi terhadap Peningkatan Kemampuan Berpikir Kritis Pada Materi Operasi Hitung Aljabar. *Cartesian: Jurnal Pendidikan Matematika*, 4(1), 12–25.

<https://doi.org/10.33752/cartesian.v4i1.6326>

- Isrok'atun, & Rosmala, A. (2021). *Model-model Pembelajaran Matematika* (B. S. Fatmawati, Ed.). Jakarta: PT Bumi Aksara.
- Jala, W. (2024). Penggunaan Media Pembelajaran Visual dalam Meningkatkan Pemahaman Konsep Matematika Siswa di Kelas IV SD Inp. Maulafa. *Jurnal Teknologi Pendidikan*, 13(1), 149–162. <https://www.p3i.my.id/index.php/refleksi/article/view/332>
- Kusmaryono, I., Maharani, H. R., & Muhtarom. (2024). *Mempromosikan Pemikiran Kritis melalui Pembelajaran Matematika* (C. Anwar, Ed.). Demak: CV. Yudhistt Fateeh.
- Landina, I. A. P. L., & Agustiana, I. G. A. T. (2022). Meningkatkan Berpikir Kritis Siswa melalui Media Pembelajaran Flipbook berbasis Kasus pada Muatan IPA Kelas V SD. *Mimbar Ilmu*, 27(3), 443–452. <https://doi.org/10.23887/mi.v27i3.52555>
- Liani, A. M., Hamid, A., & Abidin, M. R. (2025). Eksplorasi Strategi Metakognitif untuk Meningkatkan Kemampuan Berpikir Kritis Matematika Siswa. *Jupika: Jurnal Pendidikan Matematika*, 8(1), 91–100. <https://doi.org/https://doi.org/10.37478/jupika.v8i1.5404>
- Maryani, C. S., Fauzi, K. M. A., & Mulyono, M. (2023). Pengembangan Bahan Ajar Berbasis RME untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis dan Self-Efficacy Siswa. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 7(3), 3122–3137. <https://doi.org/10.31004/cendekia.v7i3.2663>
- Maslihah, A., Maula, K., Aziroh, U., & Bashith, A. (2025). Strategi Efektif dalam Evaluasi Penilaian Pembelajaran Berbasis HOTS untuk Meningkatkan Kompetensi Kognitif Siswa Sekolah Dasar. *Jurnal Ilmiah Pendidikan Citra Bakti*, 12(1), 94–106. <https://doi.org/https://doi.org/10.38048/jipcb.v12i1.4774>
- Nanda, I., Sayfullah, H., Pohan, R., Windariyah, D. S., Fakhrurrazi, Khermarinah, Mulasi, S., Warlizasusi, J., Hurit, R. U., Harizahayu, Arianto, D., Wahab, A., Romdloni, Aini, A. N., & Bawa, I. D. G. A. R. (n.d.). *Penelitian Tindakan Kelas untuk Guru Inspiratif* (A. H. Prasetyo, Ed.). Indramayu: CV. Adanu Abimata.
- Nurhaswinda, Pebriana, P. H., & Marta, R. (2025). Penerapan Model Pembelajaran Realistic Mathematics Education untuk Meningkatkan Kemampuan Pemecahan Masalah Matematika. *Innovative: Journal Of Social Science Research*, 5, 3926–3935. <https://doi.org/https://doi.org/10.31004/innovative.v5i3.19524>
- Rahmawati, S. M., Sutarni, N., Rasto, R., & Muhammad, I. (2023). Meningkatkan Kemampuan Berpikir Kritis Siswa melalui Model Contextual Teaching And Learning: Quasi-Eksperimen. *EDUKASIA: Jurnal Pendidikan Dan Pembelajaran*, 4(2), 969–976. <https://doi.org/10.62775/edukasia.v4i2.378>
- Ramadan, Z. H., Putri, M. E., & Nukman, M. (2025). *Pendekatan Pembelajaran Deep Learning di Sekolah Dasar (Teori dan Aplikasi)* (I. Farida & H. Hafidhoh, Eds.). Cirebon: CV Green Publisher Indonesia.
- Sa'o, S., Mei, A., & Naja, F. Y. (2021). Pembelajaran Berdasarkan Masalah Untuk Meningkatkan Hasil Belajar dan Ketrampilan Berpikir Kritis Materi Geometri pada Siswa SMP. *Jupika: Jurnal Pendidikan Matematika*, 4(2), 181–188. <https://doi.org/10.37478/jupika.v4i2.1219>
- Sutomo, & Kusumadewi, R. F. (2026). *Efektivitas Media Komik Digital terhadap Kemandirian*

Belajar Siswa Sekolah Dasar. 11, 104–112.
<https://doi.org/https://doi.org/10.23969/jp.v11i01.42339>

Syafril. (2019). *Statistika Pendidikan*. Yogyakarta: Kencana.

Wicaksana, L., Widiarti, N., & Subali, B. (2025). Kajian Pustaka: Realistic Mathematics Education Terhadap Kemampuan Berpikir Kritis Siswa Sekolah Dasar. *Jurnal Penelitian Pendidikan*, 25(2), 158–173. <https://doi.org/10.31980/caxra.v5i2.2961>

Yurinda, E. F., & Hidayat, A. (2023). Meningkatkan Aktivitas, Keterampilan Berpikir Kritis dan Hasil Belajar pada Pembelajaran PPKN menggunakan Model BINGKA. *Journal of General Education Science*, 2(2), 184–193. <https://doi.org/https://doi.org/10.33578/kpd.v2i2.194>