

Inquiry Learning to Improve Critical Thinking Skills and Student Learning Outcomes

Bonita Hirza¹, Luvi Antari², Rohman³

¹ Universitas Muhammadiyah Palembang, Indonesia; bonitahirza527@gmail.com

² Universitas Muhammadiyah Palembang, Indonesia; luviantari@gmail.com.com

³ Universitas Sjakhyakirty, Palembang, Indonesia; rohman@unisti.ac.id

ARTICLE INFO

Keywords:

inquiry learning;
critical thinking;
student learning outcomes

Article history:

Received 2024-12-22

Revised 2025-01-28

Accepted 2025-07-31

ABSTRACT

Developing students' critical thinking skills and improving cognitive learning outcomes remain essential goals in mathematics education. This study aimed to examine the implementation and effectiveness of the Inquiry Learning model in enhancing students' critical thinking abilities and understanding of prism and pyramid concepts. This research employed a Classroom Action Research (CAR) approach using the Kemmis and McTaggart (1988) spiral model, consisting of four stages: planning, acting, observing, and reflecting. The study was conducted in two cycles involving 27 students of class IX B at MTs Muqimus Sunnah Palembang. The learning process integrated inquiry-based instruction supported by Student Worksheets (LKPD). Findings indicated a significant improvement in students' cognitive learning outcomes. By the end of the second cycle, 81.48% of students achieved the minimum mastery criteria, reflecting increased understanding of geometric concepts. Observational data also revealed enhanced student engagement and active participation. The Inquiry Learning model effectively promoted critical thinking through student-led problem exploration, hypothesis formulation, and data analysis. The success of the Inquiry Learning model was attributed to its student-centered approach, which encouraged active learning and deeper conceptual understanding. Students demonstrated improved reasoning and problem-solving skills as a result of engaging with real learning challenges. The application of the Inquiry Learning model, supported by structured worksheets, effectively improved both critical thinking skills and cognitive learning outcomes in geometry. This model is recommended for broader implementation in similar educational contexts.

This is an open access article under the [CC BY-NC-SA](#) license.



Corresponding Author:

Luvi Antari

Universitas Muhammadiyah Palembang, Indonesia; luviantari@gmail.com

1. INTRODUCTION

The dynamics of education evolve in accordance with the changing times. Education constitutes a process that every individual is obliged to undergo. Within society, schools function as formal institutions entrusted with the responsibility of delivering educational services. (Hidayat & Abdillah, 2019) stated that the purpose of education in schools is to produce competent individuals who are capable of adapting to their social environment. They further explained that education serves to develop knowledge and skills, shape students' character, and prepare them to live independently, pursue higher levels of education, and navigate an ever-changing world with an emphasis on adaptability to shifts and challenges in a dynamic society. We realize that education in schools is a big process that involves many components. Education is also one way to develop students' thinking skills, including creative thinking and creative thinking. In its implementation in schools so far, traditional educational approaches centered on the role of the teacher are more often used in the learning process, where this educational model tends to produce students who are less trained in finding and understanding concepts independently. This becomes one of the obstacles for students in developing their thinking skills.

Thinking is a mental or cognitive process in which individuals process, manipulate and interpret information to gain understanding, find solutions or make decisions. In summary, thinking means utilizing the mind to consider and determine something. The mechanism of the thinking process that will form new mental representations through the transfer of knowledge or information, which includes the involvement of complex processes such as evaluation, reasoning, and problem solving (Ikhsan et al., 2017). Mathematics, as a field of science, has its own framework for thinking. Thinking in mathematics is often referred to as mathematical ability; mathematical ability is divided into several competencies. According to Hendriana and Soemarmo in (Sintawati & Mardati, 2023) mathematical abilities can be divided into five core competencies, namely: understanding of mathematical concepts, ability to solve problems, skills in communicating mathematically, ability to connect various mathematical ideas or concepts, and ability to reason logically and systematically in a mathematical context. The next higher mathematical abilities are critical thinking in mathematics and creative thinking in mathematics.

In mathematics learning, critical thinking is part of higher order thinking skills (HOTS). According to Ennis critical thinking is defined as "reasonable reflective thinking with a focus on making decisions about what to believe or do." That is, critical thinking involves a logical and reflective thinking process before making a decision in dealing with a problem (Ennis, 1985). Sukmadinta conveyed another opinion about critical thinking (Rosmayadi, 2017), which states that critical thinking can be expressed as the ability to reason structurally and systematically to evaluate, solve problems, make decisions, build beliefs, analyze assumptions, and conduct scientific exploration. According to (Ennis, 1985), critical thinking skills include five main groups of indicators. First, providing basic explanations (simple clarification). Second, developing basic skills (basic support). Third, draw conclusions (inference). Fourth, develop further explanations. Fifth, designing experimental strategies, control groups, and tactics (strategies and tactics). Indicators of mathematical critical thinking skills used in this study refer to five stages, namely formulating problems, formulating hypotheses, selecting data and information, recognizing assumptions, and drawing conclusions. The implementation of critical thinking skills covers a variety of subject matter at school, one of which is the implementation of the mathematics learning process.

Critical thinking skills are essential in dealing with problems and challenges in everyday life. One of the goals of mathematics education is to develop students' critical thinking skills. Critical thinking skills are thinking skills that involve cognitive processes and invite students to think according to their abilities or think reflectively about problems. (Juliyantika & Batubara, 2022). The development of critical thinking skills in students serves as a catalyst for enhancing their ability to solve problems effectively, thereby facilitating their comprehension of higher-order questions. According to Sundari in (Halimatus Sa'diyah et al., 2024), a learning process that merely transfers knowledge or information in a one-way manner, without fostering the holistic development of learners, is insufficient to prepare them for the challenges of the 21st-

century generation

The process of learning mathematics in schools should ideally be more focused on abilities that can improve students' critical thinking skills, so that students are accustomed to solving non-routine problems that require deeper and more complex thinking (Utami, 2022). According to Chukwuyenum presented in (Miatun & Khusna, 2020) critical thinking skills are an effective way to improve students' understanding of mathematical concepts, because these skills help in interpreting, analyzing, evaluating, and presenting data in a logical and structured manner. A person's critical thinking skills can also be developed through the application of learning models that are appropriate to the learning conditions that take place. Some learning models that are in accordance with the characteristics of critical thinking are Problem Based Learning (PBL), Project Base Learning (PJBL), Guided Learning (Inquiri), and Cooperative Learning Type Think Share Paint. The selection of learning models is also adjusted to the material to be taught. For flat building material, the selection of the inquiry method is considered the most appropriate for developing critical thinking skills and planting concepts in students.

The inquiry learning model is one of the learning models that involves students in the learning process to find answers to problems independently. According to Hanafiah in (Wicaksana et al., 2022), the inquiry learning model is the involvement of students in a series of learning through analytical and critical thinking in finding independent answers to the problems asked. While Trianto in (Adiqka Putri et al., 2015) states that inquiry is a process that begins with formulating problems, formulating hypotheses, collecting information, analyzing data, and drawing conclusions. In inquiry learning, students do not receive concepts or learning materials directly. Instead, they are encouraged to actively participate in question-and-answer sessions, which aim to stimulate their curiosity as well as train their critical thinking skills in mathematics (Prasetyo & Rosy, 2021). The use of the inquiry learning model is very appropriate to teach subject matter that is analysis and identification, such as mathematics.

Mathematics is a subject taught at all levels of education, from elementary school to university. It is recognized as a deductive science, implying that the process of mathematical reasoning must be inferential in nature. Mathematics does not accept generalizations derived solely from observation (inductive reasoning); rather, it requires conclusions to be established through deductive proof (Sulistiani & Masrukan, 2016). Mathematics lessons in schools are generally hierarchical and characterized by investigation. Many materials in mathematics lessons require in-depth investigation and a gradual thinking process. According to Uno (Partono et al., 2021; Sari & Putri, 2024) states that learning mathematics is a cognitive activity that aims to understand the meaning, interrelationships, and symbols, which are then used in the context of real life. The amount of material that contains symbols and symbols in mathematics lessons makes the level of difficulty more diverse, one of which pertains to the topic of polyhedra, specifically the geometry of pyramids and prisms.

Polyhedra, particularly those with flat faces, constitute a fundamental component of mathematics, specifically within the domain of geometry. Such solids include cubes, rectangular prisms, prisms of various bases, and pyramids. Among these, prisms and pyramids present a relatively higher level of conceptual complexity. According to information obtained by the researchers, students at MTs Muqimus Sunnah Palembang experience considerable difficulty in mastering the concepts related to these solids. This challenge largely stems from the limited opportunities provided for them to explore their understanding through hands-on experimentation with three-dimensional models, resulting in learning experiences that are perceived as less meaningful. Furthermore, the absence of opportunities to cultivate critical thinking skills has led students to become passive and insufficiently trained in acquiring conceptual understanding through processes of discovery and inquiry. Critical thinking in mathematics lessons is very important, as conveyed by Glazer (Rosmaiyadi, 2017). Critical thinking in mathematics is defined as the ability and tendency to integrate prior knowledge, mathematical reasoning, and cognitive strategies to generalize, prove, or evaluate unfamiliar mathematical situations reflectively. Based on this, we can understand why the learning outcomes of students on this material in recent years have been below the expected Learning

Objective Achievement Criteria (KKTP) value of at least 70.

Research involving critical thinking and inquiry learning models we have often encountered, including research (Wasqita et al., 2022) which examines critical thinking in terms of learning styles, then research (Sofyan et al., 2022) and (Nurfauziah & Sari, 2018) also discuss critical thinking. Research on the relationship between students' critical thinking and inquiry-based learning has frequently become an engaging subject of study, as evidenced by the findings of (Kartika & Rakhmawati, 2022), who conducted a literature review on critical thinking and inquiry learning. The distinction between the present study and other research on inquiry learning lies in its specific focus on improving learning outcomes in geometry at MTs Muqimus Sunnah Palembang and examining whether the inquiry learning approach can enhance students' critical thinking skills.

2. METHODS

This study employed the Classroom Action Research (CAR) approach, a subset of action research specifically designed to improve teaching and learning practices within the classroom setting. Action research itself is typically categorized into four types: participatory action research, critical action research, institutional action research, and classroom action research (Susilowati, 2018). CAR is particularly suitable for educational environments, as it allows teachers or researchers to examine and enhance the instructional process in their own classrooms in a structured, reflective, and cyclical manner (Abdussamad, 2021; Rohman et al., 2023).

CAR is defined as a systematic, reflective inquiry conducted by educators in their own teaching environments to address practical issues and improve student learning outcomes (Rohman et al., 2023). It is characterized by iterative cycles of planning, implementation, observation, and reflection. Each cycle is carefully designed and executed in collaboration with relevant stakeholders, typically including teachers, students, and occasionally external observers or facilitators. The core aim of CAR is to improve the professional practice of educators and to address specific learning problems encountered in the classroom (Susilowati, 2018). Through the application of targeted interventions, CAR facilitates the ongoing development of teaching strategies and contributes to the overall quality of education.

The present study was conducted at MTs Muqimus Sunnah Palembang during the even semester of the 2023/2024 academic year. The participants were 27 students from class IX.B. The research followed the Kemmis and McTaggart (1988) model of action research, which is widely recognized for its systematic yet flexible framework. This model consists of a spiral of self-reflective cycles, each comprising four essential stages: planning, acting, observing, and reflecting (Usman et al., n.d.).

In the planning stage, the researcher identified specific problems related to student engagement and performance in mathematics, particularly in understanding polyhedral shapes (pyramids and prisms). Learning objectives were formulated, and an intervention was designed using the inquiry-based learning model. This model includes several sequential phases: student orientation, problem formulation, hypothesis development, data collection, hypothesis testing, and drawing conclusions (Depin et al., 2024). Alongside the inquiry approach, instruments for evaluating critical thinking skills were also prepared. These instruments included observation checklists, learning modules, student worksheets, and an evaluation rubric aligned with critical thinking indicators. The material focus for this study was geometry, specifically polyhedra with flat faces.

During the implementation and observation stage, the planned learning activities were carried out. The researcher facilitated classroom instruction using the inquiry-based model, aiming to foster active student engagement and critical thinking. At the same time, observations were conducted to assess both student responses and the effectiveness of the instructional approach. Data were collected using observation sheets completed by trained observers, who monitored student participation, comprehension, and engagement.

The reflection stage involved a systematic analysis of the observational data and student performance. The researcher evaluated the effectiveness of the implemented strategies and identified areas for improvement. Based on this reflection, revisions were made to the instructional materials and strategies in preparation for the next cycle. This process ensured that each subsequent cycle was informed by data and reflective insights from the previous one (Usman et al., n.d.).

Each research cycle comprised three instructional sessions, with one session dedicated to administering a written test to assess learning outcomes. The iterative design of the study allowed for continuous refinement of instructional practices based on empirical evidence.

The overarching objective of this research was to enhance students' learning outcomes and critical thinking skills in the topic of polyhedra through the integration of the inquiry-based learning model. The study adopted specific success criteria to evaluate the intervention's effectiveness. These criteria included: (1) at least 75% of students scoring ≥ 75 on the end-of-cycle assessment; (2) classroom activities proceeding in accordance with the instructional plan, with a minimum observation score of 75% (considered satisfactory); and (3) positive student attitudes as reflected in questionnaire responses indicating enjoyment and engagement with the learning activities.

This study demonstrates the practical application of the Kemmis and McTaggart (1988) CAR model in a classroom setting and its potential to improve instructional quality and student learning outcomes in mathematics.

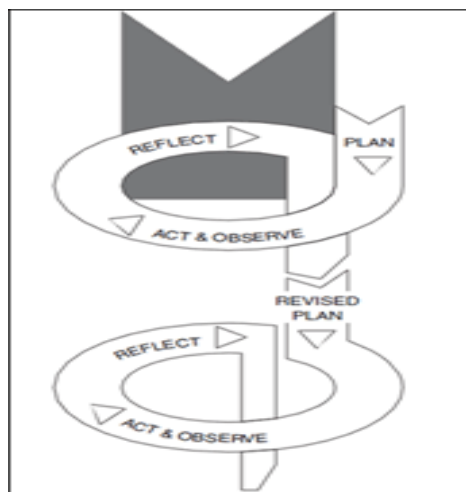


Figure 1. The Spiral Process of Classroom Action Research by Kemmis and McTaggart

3. FINDINGS AND DISCUSSION

The implementation of classroom action was carried out in two cycles, where each cycle consisted of three meetings. Each meeting lasts for two lesson hours. After the three meetings are completed, a test will be given at the end of each cycle.

3.1 Interpretation of Cycle 1 Results

Cycle 1 was carried out based on the rules contained in the implementation of PTK, namely the planning stage, the implementation stage, the observation stage and the reflection stage. In the planning stage, researchers took several steps, which will be used during the implementation stage, namely: (1) compiling a syllabus, (2) preparing teaching modules with an inquiry learning model on Prism material (3) preparing Learner Worksheets (LKPD) as learning aids, (4) compiling observation sheets to observe the activities of researchers and students during the learning process, and (5) preparing evaluation tools for

Prism material which are compiled with critical thinking indicators for the end of cycle 1.

The implementation stage is the stage of teaching and learning activities in the classroom. At this stage, learning is carried out in accordance with the teaching module design that has been prepared during the planning stage. The teaching module is equipped with LKPD, which is prepared using the syntax of inquiry learning, which will be used as a learning tool. At the end of this stage, an evaluation is carried out to measure the extent of the learning outcomes of students, the evaluation is given arranged using critical thinking indicators. The test was conducted at the end of cycle 1.

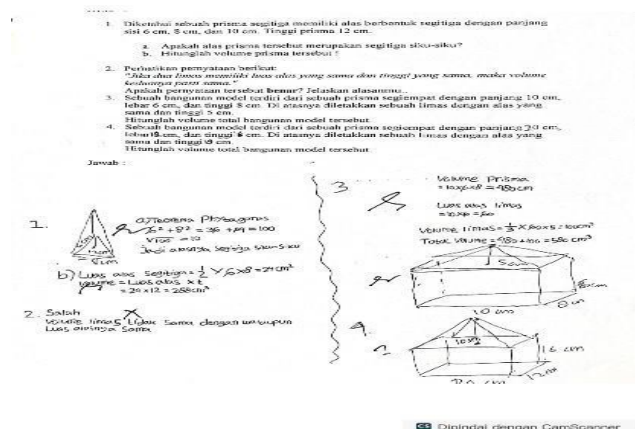


Figure 2. One of the students' answers in the Cycle 1 Test

Furthermore, the observation stage is carried out, this stage runs in harmony with the implementation stage. In this stage, researchers made observations of the ongoing learning process, both on the activities of researchers as teachers and on student activities. Previously, the researcher had prepared an observation sheet which was then given to the observer. During the implementation of the action in cycle I, there were several descriptors that had not been fulfilled, one of which was on the indicator of motivating students, there were descriptors that did not appear, namely paying attention to the interests of students and creating warmth or enthusiasm for students, as described in the results of observations of the following activities of researchers and students.

Tahap	Indikator	deskriptor	pengamat I		pengamat II	
			skor	Catatan	Skor	catatan
Awal	1. Melakukan kegiatan awal tatap muka	a. Menjawab salam b. Berdo'a c. Menyebutkan siswa yang tidak hadir d. Memperhatikan guru	3	a,b,c	3	a,b,c
	2. Memotivasi siswa	a. Siswa berminat mengikuti pembelajaran b. Siswa antusias dalam pembelajaran c. Timbul rasa ingin tahu d. Siswa menerima modul	2	c,d	1	d

Figure 3. One of the descriptors to see student responses in Cycle 1

From the three stages above, it is known that the test in cycle I was attended by all students of class IX B MTs Muqimus Sunnah Palembang, totaling 27 people. Based on the test results, 16 students scored ≥ 75 in accordance with KKTP with a percentage of completeness reaching 59.24%. The following is a table of cycle I results

Table 1. Cycle 1 Test Results

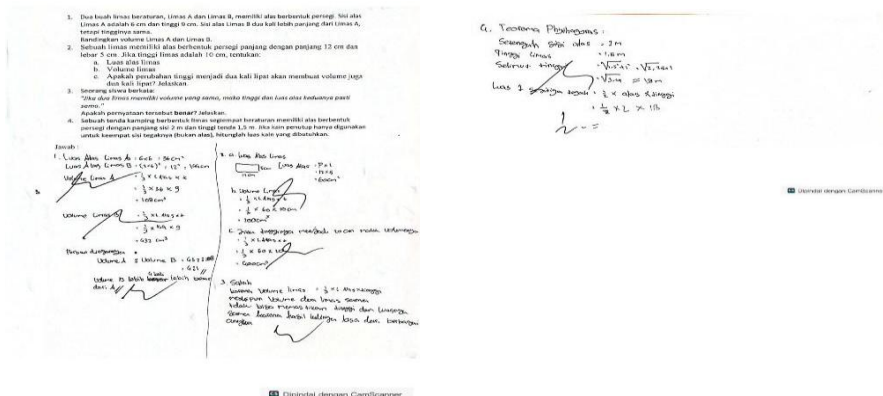
Value	Total	Percentage
≥ 75	16	59.24
< 75	11	40.76
Total	27	100

Data analysis of observation results was carried out using the percentage analysis method. The scores obtained from each indicator were summed up to get the total score. Then, the percentage of the average value is calculated by dividing the total score obtained by the maximum score, then multiplying it by 100%.

Based on the observation results, the average percentage of the implementation of the learning process reached 71.43%. This shows that the level of success of the learning process carried out by researchers has not been achieved. While for the activeness of students, it is known from the 28 descriptors prepared, a score of 19 and 21 was obtained from two observers, in the average percentage of the implementation of the learning process, the result was 73.21%. In the reflection stage, a check was carried out on the shortcomings that occurred in cycle 1, including by correcting deficiencies in the teaching module, in parts that have not shown the inquiry syntax and reviewing the observation section that has not been shown as in the indicator of student motivation. After reflecting on the activities in cycle 1, it shows that the level of success of the learning process by students has not met the criteria set, so it is necessary to do stage 2.

3.2. Interpretation of Cycle 2 Result

The implementation of Cycle 2 was conducted by revisiting and refining the activities from Cycle 1, incorporating several improvements based on the reflections and evaluations from the previous cycle. Key enhancements included revisions to the teaching module and a stronger emphasis on the inquiry learning syntax, particularly during the core instructional activities. The learning process in Cycle 2 continued with the introduction of new material on pyramids (Limas). At the end of this cycle, students were administered another assessment, which, as in the previous cycle, was developed based on critical thinking indicators to evaluate higher-order cognitive skills. Presented below is an example of a student's test result from Cycle 2.

**Figure 4.** Cycle 2 Test Results

After carrying out the stages of activities in cycle 2, the results of 27 students were as follows:

Table 2. Cycle 2 Test Results

Value	Total	Percentage
≥ 75	22	81.48
< 75	6	22.22
Total	27	100

For the observation analysis data in Cycle 2, the average percentage of successful implementation of the learning process reached 87.50%, while the percentage of student activeness reached 85.71%. These figures indicate that both the quality of instructional delivery and student engagement have met the predefined success criteria. The increase in performance from Cycle 1 to Cycle 2 reflects the effectiveness of the revised teaching module and the enhanced application of inquiry-based learning strategies. The high percentage of student activeness suggests that learners were more involved in class discussions, problem-solving tasks, and critical thinking activities. Moreover, the implementation of the learning process with greater fidelity to the planned inquiry syntax contributed to more structured and meaningful classroom interactions. Therefore, these results demonstrate not only the feasibility and practicality of the applied intervention but also its potential to support active learning and cognitive development among students.

4. CONCLUSION

Based on the results and analysis of the study, it can be concluded that the application of the inquiry learning model effectively enhanced students' critical thinking skills and academic achievement in mathematics, particularly in the topic of polyhedral geometry. This improvement is evidenced by a notable increase in the percentage of students achieving mastery on the final assessment, from 59.24% in Cycle I to 81.48% in Cycle II. Observational data further revealed that the implementation of inquiry-based strategies improved the overall quality of instruction, increased student engagement, built self-confidence, and fostered greater enthusiasm for learning. However, a limitation of this study is its relatively small sample size and focus on a single class in one school, which may limit the generalizability of the findings. Therefore, it is recommended that future research involve larger and more diverse student populations, explore the long-term impact of inquiry-based learning on critical thinking, and consider integrating digital tools or interdisciplinary approaches to further enrich student learning experiences.

REFERENCES

- Abdussamad, Z. (2021). Metode Penelitian Kualitatif. In *Sustainability (Switzerland)* (I, Vol. 11, Issue 1). SyakirMedia Press. <https://repository.ung.ac.id/get/karyailmiah/8793/Buku-Metode-Penelitian-Kualitatif.pdf>
- Adiqka Putri, N., . N., & Pantiwati, Y. P. (2015). Perbedaan Model Pembelajaran Open Inquiry Dan Guided Inquiry Berdasarkan Kemandirian Belajar Dan Berfikir Tingkat Tinggi Pada Mata Pelajaran Biologi Kelas 11 Man Tempursari – Ngawi. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 1(1). <https://doi.org/10.22219/jpbi.v1i1.2300>
- Depin, Nurwahid, H., Yohanes Sulla, F., & Barella, Y. (2024). Inquiry Learning: Pengertian, Sintaks Dan Contoh Implementasi Di Kelas. *Indonesian Journal on Education and Learning*, 1(2), 39–43.
- Ennis, R. (1985). *The Logical Basis for Measuring Critical Thinking Skills*. *Educational Leadership*. 43(2).
- Halimatus Sa'diyah, Umalihayati, Ratna Hidayah, Moh Salimi, Laksmi Evasufi Widi Fajari, Mashudi, & Syarifah Aini. (2024). The Effect of Problem Based Learning Model on Critical Thinking Skills in Elementary School: A Meta Analysis Study. *Jurnal Iqra': Kajian Ilmu Pendidikan*, 9(1), 135–160. <https://doi.org/10.25217/ji.v9i1.4456>
- Hidayat, R., & Abdillah. (2019). *Ilmu Pendidikan "Konsep, Teori dan Aplikasinya"* (1st ed.). Penerbit Buku Umum dan Perguruan Tinggi. <http://repository.uinsu.ac.id/8064/>

- Ikhsan, M., Munzir, S., & Fitria, L. (2017). Kemampuan Berpikir Kritis dan Metakognisi Siswa dalam Menyelesaikan Masalah Matematika melalui Pendekatan Problem Solving. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 6(2), 234–245. <https://doi.org/10.24127/ajpm.v6i2.991>
- Juliyantika, T., & Batubara, H. H. (2022). Tren Penelitian Keterampilan Berpikir Kritis pada Jurnal Pendidikan Dasar di Indonesia. *Jurnal Basicedu*, 6(3), 4731–4744. <https://doi.org/10.31004/basicedu.v6i3.2869>
- Kartika, Y. K., & Rakhmawati, F. (2022). Peningkatan Kemampuan Berpikir Kritis Matematis Siswa Menggunakan Model Inquiry Learning. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 6(3), 2515–2525. <https://doi.org/10.31004/cendekia.v6i3.1627>
- Miatun, A., & Khusna, H. (2020). Kemampuan berpikir kritis matematis berdasarkan disposisi matematis. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 9(2), 269–278. <https://doi.org/10.24127/ajpm.v9i2.2703>
- Nurfauziah, P., & Sari, V. T. A. (2018). Penerapan bahan ajar trigonometri dengan model matematika knisley untuk meningkatkan kemampuan berpikir kritis matematik mahasiswa. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 7(3), 356–362. <https://doi.org/10.24127/ajpm.v7i3.1551>
- Partono, P., Wardhani, H. N., Setyowati, N. I., Tsalitsa, A., & Putri, S. N. (2021). Strategi Meningkatkan Kompetensi 4C (Critical Thinking, Creativity, Communication, & Collaborative). *Jurnal Penelitian Ilmu Pendidikan*, 14(1), 41–52. <https://doi.org/10.21831/jpipfip.v14i1.35810>
- Prasetyo, M. B., & Rosy, B. (2021). Model Pembelajaran Inkuiri Sebagai Strategi Mengembangkan Kemampuan Berpikir Kritis Siswa Model Pembelajaran Inkuiri Sebagai Strategi Mengembangkan Kemampuan , 109–120. Ratnasari. *Jurnal Pendidikan Administrasi Perkantoran (JPAP)*, 9(1), 109–120.
- Rohman, Syaifudin, & Antari, L. (2023). Pembelajaran tipe connected dalam meningkatkan hasil belajar matematika di MTs VIII MTs Muqimus Sunnah Palembang. *Delta, Jurnal Ilmiah Pendidikan Matematika*, 11(1), 69–80. <https://jurnal.unikal.ac.id/index.php/Delta/article/view/2639>
- Sari, T., & Putri, J. H. (2024). Pembelajaran Matematika sebagai Wadah Meningkatkan Kualitas Proses Belajar Siswa. *OMEGA: Jurnal Keilmuan Pendidikan Matematika*, 3(2), 73–79. [10.47662/jkpm.v3i2.686](https://doi.org/10.47662/jkpm.v3i2.686)
- Sintawati, M., & Mardati, A. (2023). Kemampuan Berpikir dalam Pembelajaran Matematika. In *Angewandte Chemie International Edition*, 6(11), 951–952. (1st ed.). Penerbit K-Media.
- Sofyan, D., Sugandi, A. I., Linda, L., Sari, D. R., & Bernard, M. (2022). Penerapan strategi react berbantuan geogebra dalam meningkatkan kemampuan berpikir kritis matematis. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 11(3), 1668–. <https://doi.org/10.24127/ajpm.v11i3.4995>
- Sulistiani, E., & Masrukan. (2016). Pentingnya Berpikir Kritis dalam Pembelajaran Matematika untuk Menghadapi Tantangan MEA. *Seminar Nasional Matematika X Universitas Semarang*, 605–612.
- Susilowati, D. (2018). Penelitian Tindakan Kelas (PTK) Solusi Alternatif Problematika Pembelajaran. *Jurnal Ilmiah Edunomika*, 2(01), 36–46. <https://doi.org/10.29040/jie.v2i01.175>
- Usman, J., Sc, M., Pd, M., Zein, H. M., Pd, S. I., & Si, M. (n.d.). *Pengantar Praktik Penelitian Tindakan Kelas (PTK)*. AcehPo Publishing. https://repository.ar-raniry.ac.id/id/eprint/20550/1/BUKU_PRAKTIS_PTK_Ber-ISBN.pdf
- Utami, H. B. (2022). Pentingnya Kemampuan Berpikir Kritis dalam Dunia Pendidikan Matematika. *J-PiMat : Jurnal Pendidikan Matematika*, 4(2), 529–538. <https://doi.org/10.31932/j-pimat.v4i2.2025>
- Wasqita, R., Rahardi, R., & Muksar, M. (2022). Analisis kemampuan berpikir kritis siswa pada materi bangun datar ditinjau dari gaya belajar. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 11(2), 1501. <https://doi.org/10.24127/ajpm.v11i2.5029>
- Wicaksana, G. C., Khoirina, S., Salsabila, Q. A., & Ismawati, R. (2022). Penerapan Model Pembelajaran Inkuiri pada Pembelajaran IPA SMP. *Jurnal Pendidikan IPA*, 11(2), 89–92. <https://doi.org/10.20961/inkuiri.v11i2.57111>