Proceedings of the 3rd UIN Imam Bonjol International Conference on Islamic Education
"Embracing Islamic Education Based Local Wisdom of Malay World on Society 5.0"
Padang, 14 - 15 October 2022
ISBN XXX-XXX-XXXX-XX-X

IMPLEMENTATION OF THE PROBLEM POSING LEARNING MODEL TO CRITICAL THINKING SKILLS OF CLASS V STUDENTS IN MATHEMATICS LEARNING

Sisi Mona Fitri[1*], Media Roza[2], Dorisno[3]
[1,2,3]**Universitas Islam Negeri Imam Bonjol Padang, Indonesia**
[*]Corresponding author: 1814070009.sisimonafitrii@gmail.com

ABSTRACT

This research is motivated by the low mathematical critical thinking ability of students. This is because educators are less able to develop students' thinking skills. Learning is still centered on educators. Educators are less varied in using the learning model. This study aims to determine the differences in students' critical thinking skills between using the Problem Posing learning model and conventional learning models in mathematics learning for class V UPT SDN 09 Labuhan Tanjak, Pesisir Selatan Regency. This type of research is a quasi-experimental research with a posttest only control design. The population taken by all students of class V UPT SDN 09 Labuhan Tanjak, Pesisir Selatan Regency was 40 students. Sampling used is saturated sampling. The sample in this study was class V A as many as 20 students as the experimental class and class V B students as the control class. The research instrument used was a learning outcome test in the form of an essay test. Based on data analysis, obtained tcount = 5.1658 and ttable at a significance level of 5% (α = 2.02439). This means that tcount > ttable so that Ha is accepted and H0 is rejected. So it can be concluded that there is a difference in students' critical thinking skills between using the Problem Posing learning model and the conventional learning model in Mathematics learning for class V SD UPT 09 Labuhan Tanjak, Pesisir Selatan district on the volume material.Where by using the Problem Posing learning model students' thinking skills are better than conventional learning model.

Keywords: Problem Posing, critical thinking sksills

A. INTRODUCTION

Education is one of the crucial factors in supporting the progress of society, nation, and country. It strives to continuously nurture the nation's character through the development of sound mental, intellectual, and personal attributes. This aims to confront the rapid advancements in information technology. (Ike Rasmianti, et al., 2013).

Schools are expected to provide education that can foster students' character, enabling them to think critically, creatively, communicate effectively, and collaborate, allowing students to adapt to the 21st century. This aligns with the 4C competencies of the 21st century that students must possess, namely critical thinking and problem-solving, creativity, communication skills, and the ability to work collaboratively. (Dafid Slamet Setiana and Riawan Yudi Purwoko, 2020).

This is also emphasized by Kivunja, who states that creativity, critical thinking, independence, teamwork, information literacy, communication, and self-directed

ISBN XXX-XXX-XXXX-XX-X

learning are competencies that every individual must master to face the global competition of the 21st century. (Dafid Slamet Setiana and Riawan Yudi Purwoko, 2020).

The changes in the 21st century in the fields of science and technology, as well as the acceleration of information and communication systems, make the world seem within reach. These advancements also provide ease in accessing various information. However, the ability to think critically in evaluating received information is necessary. (Dafid Slamet Setiana and Riawan Yudi Purwoko, 2020).

Steven and Paul state that critical thinking is a disciplined process that intellectually, actively, and skillfully conceptualizes, applies, analyzes, synthesizes, and/or evaluates information gathered from or generated by observation, experience, reflection, reasoning, or communication, as a guide for beliefs and actions. (Muh Tahwil and Lilasari, 2013).

Then, according to Stobaugh, who explains that critical thinking is a deep reflective process in decision-making and problem-solving to analyze situations, evaluate arguments, and draw accurate conclusions. (Mira Azizah, 2018).

Several characteristics of students who are capable of critical thinking are described by Lau as follows: (1) The ability to understand logical relationships between ideas, (2) The ability to formulate ideas succinctly and accurately, (3) The ability to identify, construct, and evaluate arguments, (4) The ability to assess decisions, (5) The ability to evaluate evidence and formulate hypotheses, (6) The ability to detect inconsistencies and common errors in reasoning, (7) The ability to systematically analyze problems, (8) The ability to identify the relevance and significance of ideas, (9) The ability to assess one's beliefs and values, (10) The ability to evaluate an individual's thinking skills. (Mira Azizah, Joko Sulianto, and Nyai Cintang, 2013).

Angelo identified five systematic indicators in critical thinking skills, as follows:

1. Analytical Skills

Analytical skills involve the ability to break down a structure into its components to understand its organization.

2. Synthesis Skills

Synthesis skills entail the ability to combine parts into a new formation or arrangement.

3. Problem-Solving Skills

Problem-solving skills involve the application of concepts to various interpretations. This skill demands a critical understanding of something, and after comprehending the activity, one should be able to capture several main

ISBN XXX-XXX-XXXX-XX-X

thoughts and generate new ideas stemming from the conceptualization of understanding.

4. Summarization Skills

Summarization skills involve breaking down and gradually understanding various aspects to arrive at a new formula.

5. Evaluation Skills

Evaluation skills, according to mature thinking, involve determining the value of something based on various criteria. (Restu Janu Wibowo, 2016).

In the Quran, in Surah Ali-Imran, verses 190-191, Allah also says:

إِنَّ فِي خَلْقِ ٱلسَّمَٰوَٰتِ وَٱلْأَرْضِ وَٱخْتِلَٰفِ ٱلَّيْلِ وَٱلنَّهَارِ لَءَايَٰتٍ لِّأُو۟لِى ٱلْأَلْبَٰبِ ﴿١٩٠﴾
ٱلَّذِينَ يَذْكُرُونَ ٱللَّهَ قِيَٰمًا وَقُعُودًا وَعَلَىٰ جُنُوبِهِمْ وَيَتَفَكَّرُونَ فِى خَلْقِ ٱلسَّمَٰوَٰتِ وَٱلْأَرْضِ رَبَّنَا مَا خَلَقْتَ هَٰذَا بَٰطِلًا سُبْحَٰنَكَ فَقِنَا عَذَابَ ٱلنَّارِ ﴿١٩١﴾

It means: Surely, in the creation of the heavens and the earth, and the alternation of the night and the day, there are signs for those who possess intellect. Those who remember Allah while standing, sitting, and lying on their sides, and reflect upon the creation of the heavens and the earth, saying, "Our Lord, You did not create all of this in vain; exalted are You, so protect us from the punishment of the Fire." (Ali-Imran, verses 190-191)

This passage emphasizes that: the Muslim community should critically contemplate the universe as Allah's creation. Muslims who use their intellectual faculties to observe Allah's creation and remember Allah frequently in all circumstances are aware that nothing created by Allah is in vain (Muhammad Ibrahim Al Hifnawi and Mahmud Hamid Ustman, 2009).

This has a tangible impact on human life, such as the need for enhancing human resources through critical thinking. According to Naisbitt, education is one of the efforts to improve high-quality human resources (Ahmad Yasir Rifa'I et al., 2020).

Currently, the quality of education in Indonesia needs improvement, especially in Mathematics education. Mathematics is one of the branches of knowledge that has many benefits for the development of science and technology. This is because mathematics is the language of science, encourages logical and critical thinking, and is deductive in science (Widha Nur Shanti et al., 2017).

ISBN XXX-XXX-XXXX-XX-X

Mathematics serves as a tool, a mindset, and a body of knowledge. The Ministry of Education and Culture explains that mathematics plays a crucial role in shaping critical, logical, creative thinking, and collaboration skills. Classroom learning should consider students' mathematical thinking abilities as learning outcomes (Ike Rasmianti et al., 2013).

Mathematics is one of the disciplines that can enhance thinking and argumentation skills, contribute to solving everyday problems and the professional world, and support the development of science and technology (Ahmad Susanto, 2013).

The purpose of teaching Mathematics in elementary school is to equip students with logical, analytical, systematic, critical, and creative thinking skills, as well as the ability to cooperate. These skills are necessary so that students can manage and utilize information to survive in today's ever-changing, uncertain, and competitive environment (Remiswal & Dorisno, n.d.).

The objectives of mathematics education in elementary schools (SD/MI) are divided into two goals: (1) General objectives aim to enable students to apply mathematical reasoning in various situations and conditions. (2) Specific objectives aim to improve calculation skills and cultivate students who are disciplined, creative, meticulous, and logically critical. (Yetti Ariani, 2020).

One of the challenges in mathematics education in Indonesia is the low mathematical ability of students. This is evident from the results of research by the Trends in International Mathematics and Science Study (TIMSS) in 2015, which ranked Indonesian students 44th out of 49 countries with a score of 397 in mathematics. This ranking is similar to the results of the previous year, where Indonesia ranked 38th out of 42 countries (Mullis, I. V. S et al., 2016).

In addition to the test and survey results conducted by TIMSS, a program called the Programme for International Student Assessment (PISA) in 2015 ranked Indonesia 63rd out of 69 countries studied (Organization for Economic Co-operation and Development, Programme for International Student Assessment, Annual report, 2015).

These research findings demonstrate that the mathematical abilities of Indonesian students are still relatively low, which could impact their future academic competitiveness on an international scale. This is because students tend to rely solely on teachers without developing their critical thinking skills.

The observed conditions in the classroom include teachers struggling to develop students' thinking abilities, resulting in passive learning processes. The lack of enthusiasm among students to actively ask questions or respond to teachers' inquiries makes the learning process less effective. The focus of learning is still teacher-centered, and teachers often lack variety in their teaching methods when

ISBN XXX-XXX-XXXX-XX-X

delivering the curriculum. Students may struggle to analyze problems given by teachers, leading to difficulties when teachers present evaluation questions that differ from the examples provided to students.

The low level of critical thinking skills among students can have an impact on their mastery of the subject matter, especially in mathematics. The Curriculum Development and Educational Facilities Center of the Research and Development Agency stated that fractions are one of the challenging topics to teach (Heruman, 2017).

Based on the data from the recapitulation of Mathematics Daily Tests for fifth-grade students in UPT SDN 09 Labuhan Tanjak, South Pesisir Regency, on the topic of Operating Addition and Subtraction of Ordinary and Mixed Fractions, it was found that only 8 students, or 20%, achieved scores above the Minimum Mastery Criteria (KKM), while 32 students, or 80%, did not meet the criteria.

Based on interviews conducted with the fifth-grade teachers VA and VB, Ms. Harlina and Ms. Marina Porika, on October 1, 2021, at UPT SDN 09 Labuhan Tanjak, it was revealed that during math lessons, students struggled with calculations, and many students were unable to analyze the problems they were learning. Students found it challenging to solve problems that differed from the examples provided, and they were hesitant to ask questions even when they did not fully understand the material.

If these issues are left unaddressed, the learning objectives will not be achieved. To ensure that the learning process aligns with expectations, teachers must choose an appropriate teaching model to address these challenges.

The model used to enhance students' critical thinking abilities in mathematics education is the Problem Posing learning model. In the Problem Posing model, students are required to think critically during the learning process. They learn to analyze problems and develop confidence in learning mathematics. Problem Posing is a learning model that requires students to formulate their own questions or break down complex problems into simpler questions. According to Sholimin, Problem Posing is a learning model that obliges students to learn by proposing and solving problems independently without the teacher's assistance (Jaya Yanti Nur Istiqomah and Endang Indarini, 2021).

The steps of the Problem Posing learning model are as follows: (1) The teacher explains the lesson to the students, (2) The teacher provides an appropriate number of practice problems, (3) Students are asked to propose 1 or 2 challenging problems, and they must be able to solve them. This task can also be done in groups, (4) The teacher instructs students to present their questions in front of the class. In this case, the teacher can selectively choose students based on the complexity of the questions proposed, (5) The teacher assigns individual homework (Aris Shoimin, 2013).

ISBN XXX-XXX-XXXX-XX-X

Some advantages of the Problem Posing learning model include: (1) fostering critical thinking skills in students, (2) active student participation in learning, (3) identifying differences of opinion among students for healthy discussions, (4) learning to analyze problems, and (5) building students' self-confidence (Aris Shoimin, 2013).

Several research results applying the Problem Posing learning model to enhance critical thinking skills, such as the study conducted by Ulfantri Inaroh titled "The Influence of Using the Problem Posing Learning Model on the Critical Thinking Ability of Mathematics Subjects for Fifth-Grade Students at MI Darul Ulum Ngaliyan Semarang," have shown that students' critical thinking abilities can be improved through the application of the Problem Posing model in the learning process.

In summary, the Problem Posing learning model requires students to formulate their own questions or break down complex problems into simpler questions. This learning model encourages students to be more active in the learning process.

B. METHODS

This study is a Quasi-Experimental research. The research design used in this study is the Posttest Only Control Design, in which the experimental group and the control group are randomly selected and placed in different conditions. A pretest was not conducted, but for all extraneous variables, it was controlled in the control group. (Fenti Hikmawati, 2017).

The population in this study consists of all fifth-grade students at UPT SDN 09 Labuhan Tanjak, totaling 40 individuals. The sampling technique used is saturation sampling, where all members of the population are included as samples. In this study, the sample consists of 20 students from class V A as the experimental group and the students from class V B as the control group.

Table 1. Population Data for Grade V at UPT SDN 09 Labuhan Tanjak

No	Kelas	Jumlah Peserta didik
1.	V A	20 Orang
2.	V B	20 Orang

Source: Fifth-grade teacher at UPT SDN 09 Labuhan Tanjak

The instrument used to collect data in this research is an essay test aimed at determining the difference in critical thinking abilities between the Problem Posing learning model and the conventional learning model. The test items were created based on the established guidelines and with reference to the predefined critical

ISBN XXX-XXX-XXXX-XX-X

thinking indicators. These questions were validated by three validators. After validation, they were pilot tested in different schools, specifically in fifth-grade at SDN 12 Air Sikambing, with a total of 20 questions. Subsequently, item analysis was conducted to determine the validity, reliability, difficulty index, and discrimination power of the questions.

The test was piloted in the fifth-grade at UPT SDN 12 Air Sikambing. The validation of the research instrument involved six test items, all of which were deemed valid and suitable for use in the research.

The results of the question reliability analysis yielded a value of 0.7102041, indicating high reliability. This means that the questions used in the research are highly accurate.

Questions that are considered good fall within the moderate range, with difficulty indices ranging from 0.31 to 0.70. There are six questions in this category, numbered 1 to 6. Based on the discrimination index, three questions were classified as having a fair level of discrimination (questions 1, 2, and 3), while three questions were classified as having poor discrimination (questions 4, 5, and 6).

The data were analyzed using a descriptive approach, preceded by prerequisite tests such as tests for normality, homogeneity, and hypothesis testing using the t-test. The analysis of students' critical thinking abilities in this study followed a descriptive research data analysis framework. Data analysis was conducted quantitatively, examining each part step by step. The hypothesis testing involved analyzing the test results to determine whether there was a difference in the critical thinking abilities of students between using the Problem Posing learning model and the Conventional learning model in fifth-grade Mathematics education at SD UPT 09 Labuhan Tanjak, South Pesisir Regency, specifically on the topic of volume of three-dimensional shapes. The analysis was carried out quantitatively, starting with prerequisite tests such as tests for normality and homogeneity, followed by the analysis of prerequisite tests, and finally, hypothesis testing.

C. RESULTS AND DISCUSSION

Based on the research conducted in the fifth-grade at UPT SDN 09 Labuhan Tanjak, South Pesisir Regency, data and research results from the students were obtained. Before implementing the Problem Posing model in the classroom, students were first informed about the subject matter, which was the topic of "Volume of Three-Dimensional Shapes."

In this Mathematics lesson, students were required to formulate their own questions and provide solutions in groups over the course of five meetings, focusing on the topic of volume of three-dimensional shapes.

ISBN XXX-XXX-XXXX-XX-X

The posttest scores for the experimental group and the control group on the topic of "Volume of Three-Dimensional Shapes" in fifth-grade can be seen in the recapitulation table below:

Table 2. Recapitulation of posttest results for the Volume of Three-Dimensional Shapes

Variabel	***Posttest***	
	Kelas Eksperimen	**Kelas Kontrol**
N	20	20
Nilai Tertinggi	92	80
Nilai Terendah	50	40
Mean/Rata-rata	80,8	60,55
Standar Deviasi	11,60	13,64
Variansi	134,58	186,05

Based on the table above, the experimental class, consisting of 20 students, obtained the highest score of 92 and the lowest score of 50. This resulted in an average score for the experimental class of 80.8, a standard deviation of 11.60, and a variance of 134.58. Meanwhile, the control class, also consisting of 20 students, obtained the highest score of 80 and the lowest score of 40. This resulted in an average score for the control class of 60.55, a standard deviation of 13.64, and a variance of 186.05.

Based on the description of the posttest results in the table above, it can be observed that the critical thinking abilities of students in the experimental class on the topic of volume of three-dimensional shapes were higher compared to the learning outcomes of the control class. For a clearer picture, you can refer to the graph below:

ISBN XXX-XXX-XXXX-XX-X

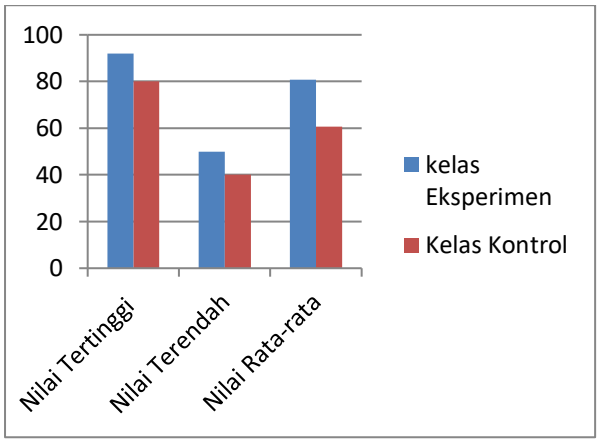

Figure 1. Graphical Comparison of Posttest Results between the Experimental and Control Classes

To determine whether there is a significant difference in critical thinking abilities between using the Problem Posing model and the conventional learning model, a t-test was conducted. Before conducting the t-test, the normality and homogeneity of the test data were assessed.

The normality test aims to determine whether the posttest data is normally distributed or not. Data is considered normally distributed if the significance value is > 0.05. The testing was done using the Liliefors test with the assistance of Microsoft Excel. Based on the Liliefors test, the posttest data for the experimental class yielded Lcalc = 0.188 and Ltable = 0.190 at a significance level of 0.05, which means Lcalc < Ltable, indicating that the posttest data for the experimental class is normally distributed. Similarly, for the control class, Lcalc = 0.184 and Ltable = 0.190 at a significance level of 0.05, indicating that the posttest data for the control class is normally distributed.

The homogeneity test aims to determine whether the posttest data has the same variance or not. Data is considered homogeneous if the significance value is 0.05. The testing was done using the Fisher test for the posttest scores of the experimental and control classes, resulting in Fcalc = 1.38 and Ftable = 2.16, indicating that Fcalc < Ftable, meaning that the critical thinking scores of the students have the same variance.

Since the data is both normally distributed and homogeneous, hypothesis testing was carried out using a t-test to assess the difference in critical thinking abilities between using the Problem Posing model and the conventional model. Based on the t-test conducted, tcalc = 5.165 and ttable = 2.02439 at a significance level of 0.05, so tcalc > ttable (5.1658 > 2.02439), leading to the rejection of the null hypothesis (H0) and the acceptance of the alternative hypothesis (Ha).

ISBN XXX-XXX-XXXX-XX-X

In conclusion, it can be affirmed that there is a significant difference in critical thinking abilities when using the Problem Posing learning model in the mathematics subject of "Volume of Three-Dimensional Shapes" in fifth-grade elementary school. This implies that the Problem Posing learning model is superior to the conventional model.

Furthermore, this conclusion is consistent with the findings of previous research conducted by Ni Md. Arianti, et al. (2019) titled "The Effect of Problem Posing Learning Model Assisted by Semi-Concrete Media on Mathematical Knowledge Competence." Their research showed a significant impact of using the Problem Posing model. Similarly, a study by Putri Permatasari and Rd. Deti Rostika (2017) titled "The Effect of Problem Posing Learning Model with Button Spinner Technique on the Improvement of Mathematical Creative Thinking" also found that the Problem Posing model enhances students' creative thinking abilities.

D. Conclusion

Based on the results of the research conducted, it can be concluded that there is a difference in critical thinking abilities between using the Problem Posing learning model and the conventional learning model for fifth-grade students in Mathematics at UPT SDN 09 Labuhan Tanjak, Pesisir Selatan Regency. This is evident from the average posttest results, where the experimental class had an average posttest score of 80.8, while the control class had an average posttest score of 60.55. This indicates an improvement in critical thinking abilities after the treatment. Data analysis was carried out using a t-test, resulting in tcalc = 5.165 and ttable = 2.02439 at a significance level of 0.05. Therefore, it can be concluded that tcalc > ttable (5.1658 > 2.02439), leading to the rejection of the null hypothesis (H0) and the acceptance of the alternative hypothesis (Ha). This means that there is a significant change in student learning outcomes and abilities. In conclusion, after implementing the Problem Posing learning model, there is an improvement in the critical thinking abilities of fifth-grade students in Mathematics at UPT SDN 09 Labuhan Tanjak, Pesisir Selatan Regency.

E. Reference

Ariani, Y. 2020. *Model Pembelajaran Inovatif.* Yogyakarta: Budi Utama.

Azizah, M., Joko Sulianto, & Nyai Cintang. 2018. Analisis Keterampilan Berpikir Kritis Peserta Didik Sekolah Dasar pada Pembelajaran Matematika Kurikulum 2013. *Jurnal Penelitian Pendidikan, 35(1)*, 61-70.

Heruman. 2007. *Model Pembelajaran Matematika.* Bandung: Remaja Rosdakarya.

Al Hifnawi, Muhammad Ibrahimdan Mahmud Hamid Ustman. 2009. *Tafsir Al-Quran Al Qurtubi*. Jakarta: Pustaka Azzam

ISBN XXX-XXX-XXXX-XX-X

Istiqomah, J. Y., & Endang Indarini. 2021. Meta Analisis Efektivitas Model *Problem Based Learning* dan *Problem Posing* terhadap Kemampuan Berpikir Kritis Peserta Didik Sekolah Dasar pada Pemelajaran Matematika. *Jurnal Cendikia: Jurnal Pendidikan Pendidikan Matematika,5(1)*, 670-681.

Mullis, I., & dkk. 2016. TIMS 2015 International Result in Mathematics Retrieved from Boston College. *TIMSS & PIRLS International Study Center*.

Ni Md Arianti, I. I. 2019. Pengaruh Model Pembelajaran *Problem Posing* Berbantuan Media Semi Konkret terhadap Kompetensi Pengetahuan Matematika. *Jurnal Ilmiah Sekolah Dasar, 3(4)*, 385-393.

Organization for Ekonomic Co-operation and Development. 2015. *Programme for International Students Assassment*, Annual Report.

Permatasari, P., & Rd. Deti Rostika. 2017. Pengaruh Model Pembelajaran *Problem Posing* Teknik Kancing Gemerincing terhadap Peningkatan Kemampuan Berpikir Kreatif Matematis. *Antalogi Upi 5(1)*, 198-212.

Remiswal, D., & Dorisno, D. (n.d.). The Influence Of Contextual Teaching And Learning Approach And Students'gender On Mathematics Understanding At Grade Iv Sdn Alang Lawas, PADANG. *Jurnal PAJAR (Pendidikan Dan Pengajaran)*, *5*(4), 1134–1140.

Rifa'I, *Ahmad* Yasir, dkk. 2020. 2*8 Cara Senang Belajar Matematika.* Magelang: Pustaka Rumah Cinta

Setiana, D. S., & Riawan Yudi Purwuko. 2020. Analisis Kemampuan Berpikir Kritis Ditinjau dari Gaya Belajar Matematika Peserta Didik. *Jurnal Riset Pendidikan Matematika,7(2)*, 163-177.

Shoimin, Aris. 2016. 68 Model Pembelajaran Inovatif dalam Kurikulum 2013. Yogyakarta: Ar-Ruzz Media

Shanti, W. N., Dyahsih Alin Sholihah, & Adhetia Martyanti. 2017. Meningkatkan Kemampuan Berpikir Kritis melalui *Problem Posing*. *LITERASI (Jurnal Ilmu Pendidikan),8(1)*, 48-58.

Sugiyono. 2017. *Metode Penelitian Kuantitatif, Kualitatif, dan R&D.* Bandung: Alfabeta.

Susanto, A. 2013. *Teori Belajar dan Pembelajaran di Sekolah Dasar.* Jakarta: Kencana.

Tawil, M., & Liliasari. 2013. *Berpikir Kompleks dan Implementasinya dalam Pembelajaran IPA.* Makasar: Badan Penerbit Universitas Negeri Makasar.