

The effectiveness of the Inquiry Model and Gender towards Critical Thinking Skills in the Mathematics Learning of Elementary School Students

Afriya Mahdalena¹, Yaswinda², Hendra Syarifudin³, Firman⁴

¹ Universitas Negeri Padang, Indonesia; afriyamahdalena97@gmail.com

² Universitas Negeri Padang, Indonesia; Yaswinda@fip.unp.ac.id

³ Universitas Negeri Padang, Indonesia; firmanmahmud25@yhoo.co.id

⁴ Universitas Negeri Padang, Indonesia; hendrasy@yhoo.com

ARTICLE INFO

Keywords:

Inquiry Model;
Gender;
Critical Thinking Ability Math
Learning

Article history:

Received 2021-11-17

Revised 2022-03-22

Accepted 2022-12-15

ABSTRACT

Students gain knowledge only from the teacher's explanation and student books, so students have not been able to develop their critical thinking skills became the aims for this research to 1) explain the differences in critical thinking abilities of experimental and conventional group students; 2) the differences in critical thinking abilities of male and female students, and 3) interaction using mathematics learning model on students' critical thinking skills. The type of research used is the factorial design treatment by level 2x2 methods. In both classes, samples were applied with different treatments. The population is all second-grade students of SDN Sungai Geringging. Sampling was done by using the multistage random sampling technique. The data analysis technique used descriptive statistics to analyze and to describe the research data, and the inferential descriptive to analyze with a two-way ANOVA test. The research resulted that there are (1) differences in the critical thinking abilities of the experimental group students with the conventional group students of class II SD In Sungai Geringging; (2) differences in the critical thinking abilities of male and female students of class II SD, and (3) there is an interaction using the mathematical inquiry learning model on students' critical thinking skills of class II SD in Sungai Geringging.

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



Corresponding Author:

Afriya Mahdalena

Universitas Negeri Padang, Indonesia; afriyamahdalena97@gmail.com

1. INTRODUCTION

Etymologically mathematics comes from Greek, namely *mathema*, which means knowledge. The word has a relationship with *mathein* and *mathenein*, meaning to think. In general, mathematics is a scientific discipline that is obtained by reasoning. In general, life is a problem that must be solved. Mathematics is a skill that requires reasoning in solving a problem presented. Mathematics requires

the ability to think and be creative in solving a problem. The ability to think comes from curiosity and imagination found in individuals from an early age (Hamdani, 2011). (Vargas, 2018) critical thinking is a stage that has the goal of presenting a reasonable decision (Abidin, 2012). Based on several opinions from the experts, Iis Holisin, (2007) explains that mathematics learning is an effort to help students construct mathematical concepts or principles with their abilities through the internalization process so that the concepts or principles are rebuilt. Learning mathematics is an effort that helps students find specific facts, skills, concepts, principles, and rules. Umar, (2012) explains that mathematics is formed due to human thinking related to ideas, processes, and reasoning.

Ahmad, (2013) explains that mathematics is a human activity and must be associated with reality. Thus, mathematics is a logical way of thinking presented in numbers, spaces, and forms with existing rules that cannot be separated from the human being. In essence, mathematics cannot be separated from everyday life. All the problems of life that require careful and thorough solutions must inevitably turn to mathematics. Mathematics Learning is an effort to facilitate, encourage, and support students learning Mathematics. Learning mathematics at the elementary school level is one of the studies that are always interesting because of the differences in characteristics, especially between the nature of students and the nature of mathematics.

Mathematics is a discipline of knowledge based on knowledge and technology. Mathematics is a discipline of knowledge that is required to be applied at the level of education. In mathematics lessons, students are required to be able to solve problems using reasoning, creative and critical thinking (Yusrina & Haerul, 2021). Mathematics is a discipline of knowledge that can develop individual thinking skills in solving problems found (Meylinda & Surya, 2017). Susanto stated that mathematics is a discipline of knowledge that is structured deductively to educate and teach logical thinking because mathematics is a discipline of knowledge that contains ideas and improves individual thinking skills in solving problems (Wartono et al., 2018). Mathematics needs to be mastered by every student in the future, including elementary school students. Many research results prove that learning mathematics can improve students' ability to think creatively and logically and develop skills when solving problems (Farida et al., 2019). These abilities are indispensable in everyday life and are useful in dealing with technological advances (Tresnawati et al., 2017). Based on this description, mathematics is needed at every level of schooling, especially in elementary school. Their success when studying in elementary school will allow them also to succeed when studying mathematics at the next level of education (Mahanal et al., 2019).

According to Widodo, (2017), problem-solving skills are the basis of a person's ability to solve a problem involving critical thinking, logic, and systematic. Kim & Grunig, (2017) stated that "problem-solving ability is the basic skill of identifying a problem and taking steps to resolve the problem." In other words, problem-solving skills are inferior to basic skills for individuals in identifying and solving problems that include individual thinking (Susanti et al., 2017). Achievements in student problem-solving skills that can be reviewed based on problem-solving indicators. Understanding problem-solving includes identifying data (Hadi & Radiyatul, 2014). Planning in selecting learning strategies (Permendikbud, 2014). The application of strategies in problem-solving (NCTM, 2000). Explanation and integration of problem-based learning, which includes a re-examination of answers (Yustianingsih et al., 2017).

According to Santrock in Adinda, (2016), thinking is a series of activities involving transformation and manipulation in memory to form an alternative problem solving, critical thinking, reasoning, and concept. According to (Assegaff & Sontani, 2016), critical thinking can direct children's character, values, and good attitudes, such as making children not give up easily, skeptical, responsible, and thorough. For this reason, the ability to think critically must be stimulated by educators from an early age. According to Ennis in Ristiasari et al., (2012), critical thinking is a reflective thinking activity focusing on believing what one should do. Critical thinking also takes a person's action to believe in something from what he sees. Lestari et al., (2017) stated that thinking ability is the ability to use the mind in criticizing, analyzing, deciding, and considering doing

something carefully and correctly based on references and other considerations. Maximizing the potential of children's thinking can be integrated into learning activities because it can help children become critical thinkers. Children's ability to think critically is an activity to collect various information and other knowledge already possessed by children to conclude (Wingsi, 2020).

Based on the previous statement, the second-grade elementary school students in Nagari Malai III Koto Kec. Sungai Geringging, through observation, has low critical thinking skills. This fact is influenced by the model used by the teacher in teaching that has not been seen, and in the learning process, the conditions and situations that allow students to carry out critical thinking processes have not yet been created. During the learning process, students gain knowledge from the teacher's explanation, the material studied is only in student books, and the questions given to students do not facilitate students to develop good critical abilities.

Students' low mathematics learning outcomes cannot be separated from how the learning process has taken place so far. One of the factors that influence the success of the learning process is the model used in the learning process itself. After the learning hours ended, the researcher conducted interviews with the two-class teachers concerned. From the interviews, it is known that the second-grade teachers of SDN Sungai Geringging have never done learning by applying innovative learning models because senior teachers have years of experience teaching with this lecture model.

According to researchers, this problem should not be ignored. Then researchers look for solutions by wanting to carry out innovative learning. In this innovative learning model, the teacher's role is not only as a transformer but as a facilitator, motivator, and evaluator. Innovative learning has a constructivist learning principle where students build their knowledge through interaction with their environment as a learning resource. Therefore, researchers set one alternative problem solving which is expected to improve the quality of learning, which includes teacher skills, student activities, and student learning outcomes. The alternative solution to this problem is using the inquiry model of learning mathematics in class II SDN Sungai Geringging.

With this inquiry model, students are encouraged through their active involvement with concepts and principles, and teachers help students have experiences and conduct experiments that enable them to discover principles for themselves so that learning is more meaningful. Inquiry model learning is a model for developing active student learning by discovering and investigating for themselves so that the results obtained by students are more meaningful and last longer in their memory because they are directly involved in the learning process itself.

Learning with this inquiry model, students will get better communication skills about mathematics and be more interested in mathematics if they are actively involved in making the discovery themselves (Nursalam, 2016 & Fallis, 2013), Applying the suitable inquiry model in the learning process will significantly affect the quality of education (Juniati & Widiyana, 2017). In the field of education, especially mathematics learning, many studies have investigated various learning methods to determine their effect on students' abilities and skills, one of which is inquiry. Inquiry is a series of learning activities that involve students' skills optimally to seek and investigate systematically, critically, logically, and analytically to build their understanding with confidence (Setiadi et al., 2021).

In addition, there are several advantages of the inquiry learning model where students are actively involved in making assumptions, investigating, collecting some data to prove assumptions, and communicating the evidence obtained with friends and teachers to get clear and precise conclusions. The existence of opportunities for students to express ideas and mindsets in solving problems listed in learning activities using this inquiry model also has an impact on students' self-confidence in the learning process so that students have more confidence in their abilities and train students to use their critical thinking skills (Amijaya et al, 2018).

Based on the above definition, the researcher applies this inquiry learning model with the aim that students can understand and be able to analyze, and be able to solve various problems related to learning mathematics, especially in learning to apply concepts in everyday life. By using the inquiry

model, it is also hoped that students will become more active and be able to develop their ideas, and it is also hoped that they can train students to think critically.

Halpern, (1998) says that differences between women do exist. However, the proportion is only a little; women show better performance in arts and language, reading comprehension, and written and oral communication, while men appear to be slightly superior in Mathematics and mathematical reasoning. So when learning activities in class are in progress, several problems are encountered; namely, female students tend to be able to mention in detail the information related to the problem in question to make it easier to work on the existing questions, unlike the case with male students, where male students tend not to mention in detail the information related to the problem in the question. Female students working on the questions will be more detailed in explaining the solution to the problem than male students. Rushton's research Nofrialdi et al., (2018) explains that differences in intelligence levels cause differences in the learning achievement of men and women.

Therefore, to improve critical thinking skills, it is necessary to use an interesting learning model. Previous research that has been carried out, for example research conducted by Christina & Kristin, (2016) the results of the study show that the application of the Inquiry model is effective in increasing critical thinking creativity. In this study obtained learning outcomes that improve learning outcomes. Furthermore, research conducted by Nurfitriyani, (2022), the results showed that the students' critical thinking skills significantly improved on environmental pollution material. There is a significant comparison of the percentage scores, students have been given the opportunity to predict things that will happen in advance. Female students tend to have higher enthusiasm than male students. This can be seen in the ongoing learning session. Furthermore, further research conducted by Azizah, (2022) the results showed that there was an effect of the problem based learning model on students' critical thinking skills. The results of the study prove that there is an influence from the use of problem based learning learning models on students' critical thinking skills.

Based on this phenomenon, can it be said that the use of a learning model is more appropriate for certain students? Thus, it can be said that there is a relationship between the learning model used and the gender differences of students and their critical thinking in the mathematics learning process. Therefore, research will be conducted under the title "The effectiveness of the Inquiry Model and Gender towards Critical Thinking Skills in the mathematics learning in Grade 2 of Elementary School Students".

2. METHODS

This study uses a quantitative approach in the form of a factorial design. It was appointed to investigate whether giving different treatments to each group is an effect. Using this method, the researcher gave a treatment to a group of subjects. The treatment is intended to determine the effect after a group of subjects is given treatment.

The research time was carried out in the even semester of the 2021/2022 academic year. This research was conducted from October 11 to November 1, 2021. The research design is a factorial experimental design, and this design is used following the objectives to be achieved. The following is a table of experimental factorial designs.

Table 1. Factorial Experimental Design Model

Critical Thinking Ability	Inquiry Model A1	Conventional Model A2
High Critical Thinking Ability B1	A1B1	A2B1
Low Critical Thinking Ability B2	A1B2	A2B2

1. Population

This study's population or target is all SDN class II Nagari Malai Kec. Sungai Geringging odd semester 2021/2022, which has 40 students and is divided into experimental and control learning groups.

Table 2. Number of Students in Nagari Malai III Koto, Kec. Sungai Geringging

Name of School	Number	Note
SDN 19 Sungai Geringging	20	Present
SDN 07 Sungai Geringging	20	Present
Total	40	

2. Sample

The statement is interpreted that the sample is part of the research object that represents the population generated by the sampling technique procedure. For the research to be more focused, this research was conducted on a representative sample of the population. In this study, the sampling technique was carried out using a multistage random sampling technique.

The type of data in primary data research is data directly obtained from the results of tests or evaluations conducted by researchers. The research instrument is a data collection tool used in research. The data collection tool used is in the form of a final test on the implementation of conventional inquiry and implementation. The arranged test is an essay-shaped test that contains indicators of critical thinking skills in solving mathematical problems. The test serves as a measuring tool to measure students' mathematical critical thinking skills.

Content validity is determined based on the assessment and consideration of several experts such as UNP. Furthermore, for the assessment, a validation sheet that has been prepared previously is given. Assessed problem-solving test questions that contain indicators of critical thinking skills.

Table 3. Grid of Testing Instruments Questions

Question Points	Critical Thinking Indicator	Question Indicator	Cognitive level	Question Number
1	1. Interpretation	students determine the characteristics of two-dimensional figure (plane figure)	c3	2
	2. Analysis			
	3. Evaluation			
	4. Inference			
2	1. Interpretation	students make geometry from two-dimensional figure (plane figure)	c6	5
	2. Analysis			
	3. Evaluation			
	4. Inference			
3	1. Interpretation	Students match up the two-dimensional figure (plane figure)	c1	6
	2. Analysis			
	3. Evaluation			
	4. Inference			

The test questions contain indicators of critical thinking skills, and as class II teacher at SD Nagari Malai III Koto Kec. Sungai Geringging assessed that the test questions contained indicators of critical thinking skills.

Calculating the score of students' mathematical critical thinking skills is used to obtain information about students' critical thinking skills. Students' critical thinking ability is assessed from the final test, which contains indicators of critical thinking ability by applying an inquiry strategy.

The validity test is carried out to determine how much the measurement results accurately reflect the facts or actual conditions of what is being measured.

3. FINDINGS AND DISCUSSION

The results of students' critical thinking skills in the Inquiry Model group for high critical thinking skills and low critical thinking skills (A1) show that the respondent's data at SDN 19 Sungai Geringging using the inquiry model obtained the highest score of 100, the lowest score of 55, the average 80.75, the median score is 82.5, the mode score is 85, and the standard deviation is 12,489. Then the summary description of the group data is presented in the following frequency chart:

This distribution chart is obtained through research on excel data processing. The frequency distribution of SD critical thinking scores is given as follows.

Table 4. Inquiry Model A1

No	Class Interval			Median	Lower limit	Upper Limit	F. Absolute	F. Cumulative	F. Relative
1	55	-	63	59	54,5	63,5	2	2	10,0%
2	64	-	72	68	63,5	72,5	3	5	15,0%
3	73	-	81	77	72,5	81,5	5	10	25,0%
4	82	-	90	86	81,5	90,5	6	16	30,0%
5	91	-	100	95,5	91	101	4	20	20,0%
Total							20	53	100%

Based on the table above, it can be seen that the students' critical thinking scores were given using the inquiry model in 5 class intervals. The highest percentage found in the interval 82-90 was 30.0%, while the lowest in the interval 55-63 was 10.0%.

The histogram of the frequency distribution of critical thinking scores in the group given the inquiry model as a whole is depicted in the chart:

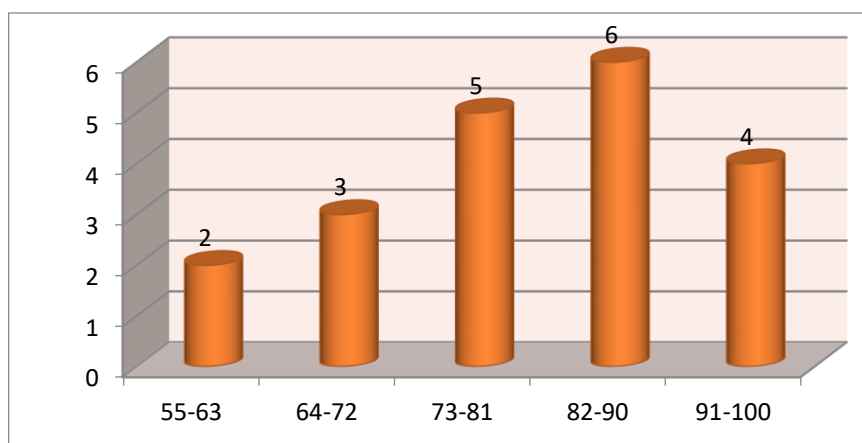


Figure 3. Histogram of Critical Thinking Score Frequency in Elementary School Groups of Students Given the Inquiry Model A1

Results of Students' Critical Thinking Ability in the Conventional Model Group Overall with High Critical Thinking Ability and Low Critical Thinking Ability (A2)

From the results of excel data processing, it has been concluded that the respondent's data at SDN 07 Sungai Geringging using the conventional model obtained the highest score of 95, the lowest score of 50, the average of 70.75, the median score of 867.5, the mode score of 80, and the standard deviation of 14,534 then a summary of the frequency distribution as follows:

Table 5. Frequency Distribution of Critical Thinking Scores in Elementary School Groups of Students Given the Conventional Model A2

No	Class Interval	Median	Lower limit	Upper Limit	F. Absolute	F. Cumulative	F. Relative
1	50 - 58	54	49,5	58,5	5	5	25,0%
2	59 - 67	63	58,5	67,5	5	10	25,0%
3	68 - 76	72	67,5	76,5	1	11	5,0%
4	77 - 85	81	76,5	85,5	6	17	30,0%
5	86 - 95	90,5	86	96	3	20	15,0%
Total					20	63	100%

The chart shows that the score of students' critical thinking is given using a conventional model of 5 intervals. The highest percentage found in the interval class 77-85 was 30.0%, while the score based on the lowest percentage found in the interval class 68-76 was 5.0%.

Based on the histogram of the frequency distribution of critical thinking scores to groups based on the conventional model, is illustrated in the following chart:

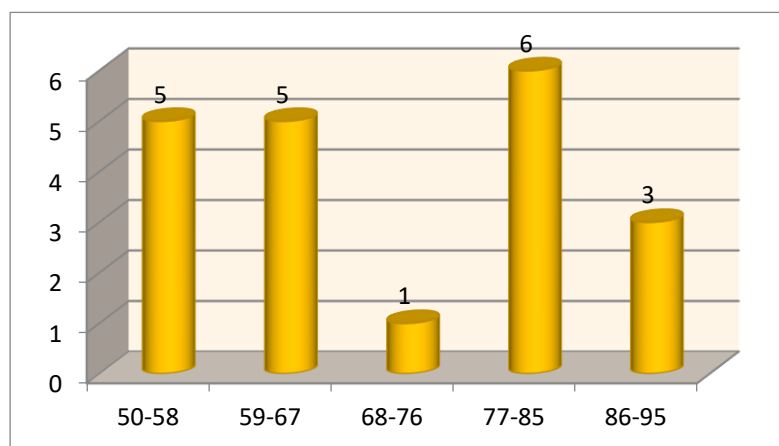


Figure 4. Histogram of the Frequency of Critical Thinking Scores in Elementary School Groups of Students Given the Conventional Model A2

Results of the Critical Thinking Ability of Female Students in the Overall Group with High Critical Thinking Ability (B1)

From the research data, it has been concluded that the high critical thinking data obtained the highest score of 100, the lowest score of 70, the average of 87.25, the median score of 87.5, the mode score of 85, and the standard deviation of 7.159. Then the summary description of the group data is illustrated in the following chart:

Table 6. Frequency Distribution of High Critical Thinking Score B1

No	Class Interval	Median	Lower limit	Upper Limit	F. Absolute	F. Cumulative	F. Relative
1	70 - 75	72,5	69,5	75,5	1	1	5,0%
2	76 - 81	78,5	75,5	81,5	4	5	20,0%
3	82 - 87	84,5	81,5	87,5	5	10	25,0%
4	88 - 93	90,5	87,5	93,5	5	15	25,0%
5	94 - 100	97	93,5	100,5	5	20	25,0%
Total					20	51	100%

From the chart, it can be seen that the students' critical thinking scores for 5 class intervals. The percentage of 94-100 is 25.0%, while the low percentage score is 70-75, which is 5.0%.

Based on the frequency distribution histogram, the highest score of critical thinking towards the group as a whole can be seen in the picture.

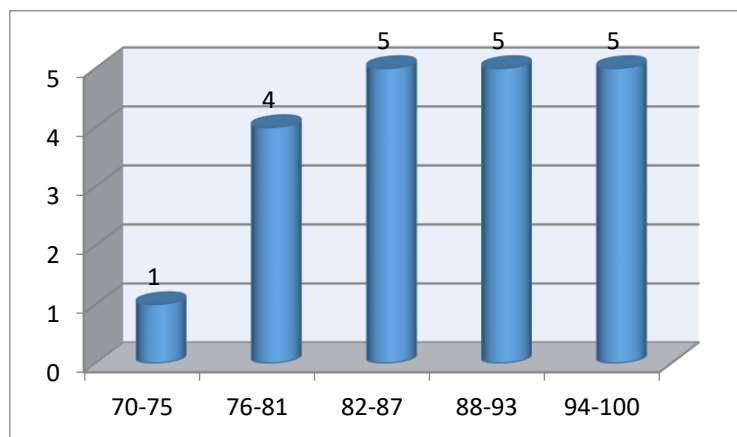


Figure 5. Histogram of the Critical Thinking Score Frequency of the Group of Students Given High B1

Results of the Critical Thinking Ability of Female Students in the Overall Group with Low Critical Thinking Ability (B2)

From the research data, it has been concluded that the high critical thinking data obtained the highest score of 80, the lowest score of 50, the average 64.25, the median score of 65, the mode score of 65, and the standard deviation of 9.497. The summary of the description of the group data is illustrated in the following chart:

Table 7. Frequency Distribution of Low Critical Thinking Score B2

No	Class Interval	Median	Lower limit	Upper Limit	F. Absolute	F. Cumulative	F. Relative
1	50 - 55	52,5	49,5	55,5	6	6	30,0%
2	56 - 61	58,5	55,5	61,5	3	9	15,0%
3	62 - 67	64,5	61,5	67,5	4	13	20,0%
4	68 - 73	70,5	67,5	73,5	2	15	10,0%
5	74 - 80	77	73,5	80,5	5	20	25,0%
Total					20	63	100%

From the chart, it is illustrated that students think critically. The 5 classes with the highest percentage interval are in the 74-80 intervals, which is 25.0%, and the lowest percentage score is 68-73, which is 10.0%.

From the frequency distribution histogram, the highest critical thinking score in the group is depicted in the chart.

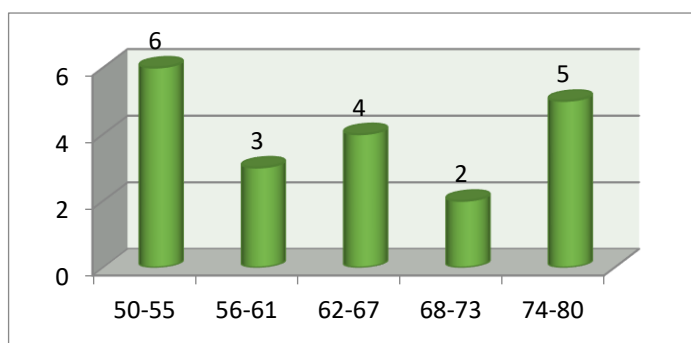


Figure 6. Histogram of the Frequency of Critical Thinking Scores of Students Given Low B2

Results of the Critical Thinking Ability Group Using Inquiry in the High Critical Thinking Ability Group (A1B1)

Based on the research data, it has been concluded that the high critical thinking data obtained the highest score of 100, the lowest score of 85; a summary of the description of grouped data is illustrated in the following chart:

Table 8. Frequency Distribution of Critical Thinking Scores Using the High Inquiry Model (A1B1)

No	Class Interval	Median	Lower limit	Upper Limit	F. Absolute	F. Cumulative	F. Relative
1	85 - 88	86,5	84,5	88,5	3	3	15,0%
2	89 - 92	90,5	88,5	92,5	3	6	15,0%
3	93 - 96	94,5	92,5	96,5	3	9	15,0%
4	97 - 100	98,5	96,5	100,5	1	10	5,0%
Total					10	28	50%

Based on the table, it can be seen that the students' critical thinking scores are in 5 class intervals. The highest percentage was found in the 93-96 interval, 15,0%, while the lowest was found in the 97-100 interval, that is 5,0%. From the histogram of the frequency distribution of critical thinking scores in the highest group, it is illustrated in the chart.

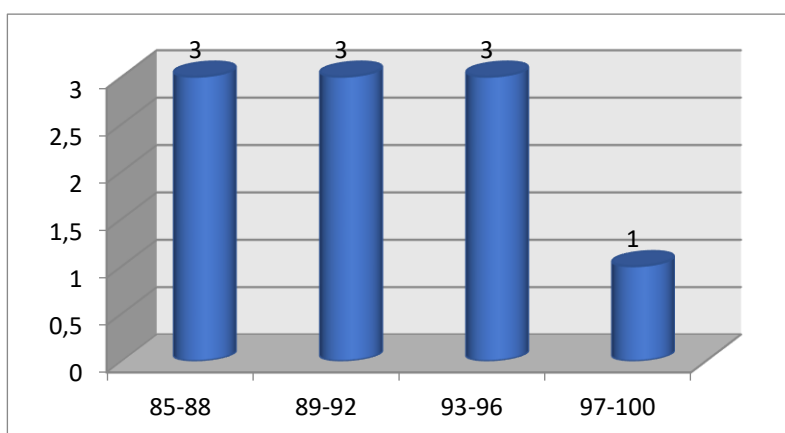


Figure 7. Histogram of the Critical Thinking Score Frequency of the Inquiry Model Student Group Given High A1B1

Results of the Critical Thinking Ability Group Using Inquiry in the Low Critical Thinking Ability Group (A1B2)

Based on the research data, it has been concluded that the low critical thinking data obtained the highest score of 80, the lowest score of 55, the summary description is illustrated in the following chart:

Table 9. Frequency Distribution of Critical Thinking Score Using Low Inquiry Model (A1B2)

No	Class Interval	Median	Lower limit	Upper Limit	F. Absolute	F. Cumulative	F. Relative
1	55 - 61	58	54,5	61,5	2	2	10,0%
2	62 - 68	65	61,5	68,5	1	3	5,0%
3	69 - 75	72	68,5	75,5	5	8	25,0%
4	76 - 82	79	75,5	82,5	2	10	10,0%
Total					10	23	50%

Based on the table, it can be seen that the students' critical thinking scores in five class intervals. The highest percentage is in the interval class 69-75 at 25.0%, while the score with the lowest percentage is in the interval class 62-68 at 5.0%. The histogram of the frequency distribution of critical thinking scores in the highest group can be seen in the figure.

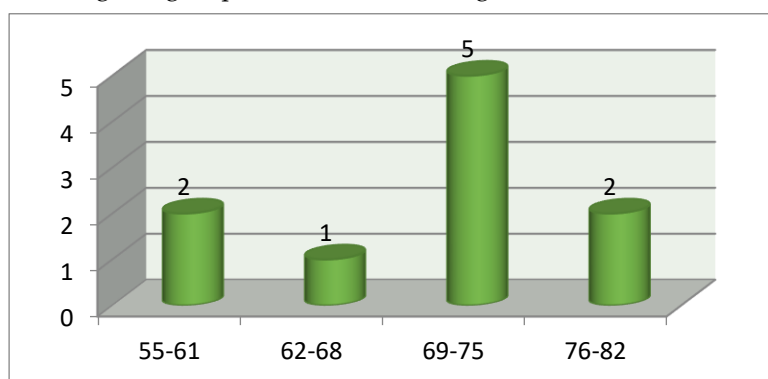


Figure 8. Histogram of the Frequency of Critical Thinking Scores of Inquiry Model Students Given Low A1B2

Results of the Critical Thinking Ability Group Using Conventional on Higher Critical Thinking Ability (A2B1)

Based on the data processing of the research results, it has been concluded that the low thinking data found the highest score of 95, the lowest score of 70, the summary description is illustrated in the following chart.

Table 10. Frequency Distribution of Critical Thinking Scores Using the High Conventional Model (A2B1)

No	Class Interval	Median	Lower limit	Upper Limit	F. Absolute	F. Cumulative	F. Relative
1	70 - 76	73	69,5	76,5	1	1	5,0%
2	77 - 83	80	76,5	83,5	4	5	20,0%
3	84 - 90	87	83,5	90,5	4	9	20,0%
4	91 - 97	94	90,5	97,5	1	10	5,0%
Total					10	25	50%

Based on the table, it can be seen that the students' critical thinking scores are in 5 class intervals. The highest percentage found in the interval 91-97 is 20.0%, while the lowest score found in the interval 91-87 is 5.0%.

The following chart illustrates the frequency distribution of critical thinking scores to groups from the histogram.

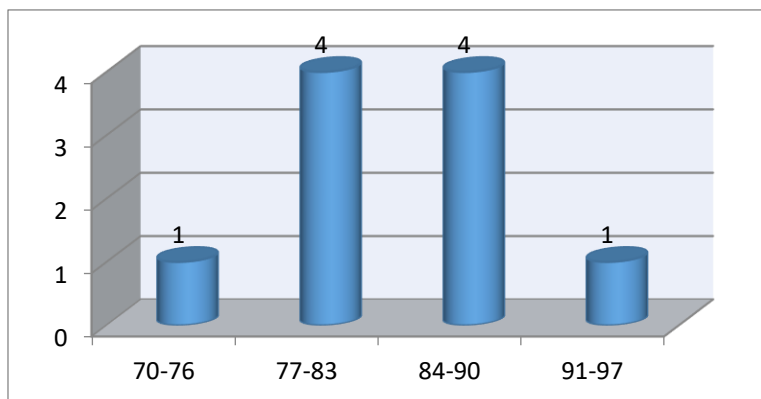


Figure 9. Histogram of the Critical Thinking Score Frequency of the Conventional Model Student Group Given High A2B1

Results of the Critical Thinking Ability Group Using Conventional in the Low Critical Thinking Ability Group (A2B2)

Based on the research data, it has been concluded that the low critical thinking data obtained a score of 65, the lowest score of 50. A summary description of the group data is presented in the chart below.

Table 11. Frequency Distribution of Critical Thinking Score Using Low Inquiry Model (A2B2)

No	Class Interval	Median	Lower limit	Upper Limit	F. Absolute	F. Cumulative	F. Relative
1	50 - 53	51,5	49,5	53,5	2	2	10,0%
2	54 - 57	55,5	53,5	57,5	3	5	15,0%
3	58 - 61	59,5	57,5	61,5	2	7	10,0%
4	62 - 65	63,5	61,5	65,5	3	10	15,0%
Total					10	24	50%

Based on the table above, it can be seen that students' critical thinking scores in 5 class intervals. The percentage of 62-65 is 15.0%, while the low percentage value in 50-53 is 10.0%.

The hypothesis in this study was carried out using analysis of the two-way variance taken in the row as an attribute variable and the interaction impact of critical thinking skills of second-grade students at SDN Nagari Malai. A summary of ANOVA acquisition is illustrated in the following chart.

Table 12. Summary of Two-Way ANOVA Calculation Results

Variant Source	JK	db	RJK	F _{count}	F _{table}		Conclusion
					$\alpha = 0,05$	$\alpha = 0,01$	
Among A	1.000	1	1.000	22,154	4,11	7,39	Significant
Among B	5.290	1	5.290	117,194	4,11	7,39	Significant
Interaction A x B	62,5	1	62,5	11,385	4,11	7,39	Significant
Within	1.625	36	451,390	-	-	-	-
Total	237.500	40	-	-	-	-	-

The analysis (ANOVA) found hypothesis testing, which can be explained as follows:

Main Influence

1. Among A (Learning Model)

It was found that $F_{\text{count}} > F_{\text{table}}$ ($22.154 > 7.39$), then H_0 was rejected, and H_1 was accepted. There was a difference between group A1 and group A2, at a significant level of 0.01.

2. Inter B (Critical Thinking / Gender)

It was found that $F_{\text{arithmetic}} > F_{\text{table}}$ ($117.194 > 7.39$), then H_0 was rejected, and H_1 was accepted. There was a difference between group B1 and group B2, at a significant level of 0.01.

Effect of Interaction A x B

Obtained $F_{\text{count}} < F_{\text{table}}$ ($11,385 < 7,39$), then H_0 is accepted, communication is found that there is factor A with factor B on critical thinking skills in men and women.

From the analysis obtained, it can be stated that there are differences that have characteristics. Therefore, an experiment must be carried out using t. The following is a recapitulation of the obtained experimental t in the chart below:

Table 13. Recapitulation of T-Test Calculation Results of Critical Thinking Ability of SDN Malai

Group	N	Mean Difference	T_{count}	Sig. (p)	t_{table}	Conclusion
A1B1 – A2B1	10	7,5	2,704	0,015	2,101	Significant
A1B2 – A2B2	10	12,5	3,883	0,001	2,101	Significant

The conclusion is $t_{\text{arithmetic}} > t_{\text{table}}$ ($2.704 > 2.101$), then H_0 is rejected, and H_1 is accepted, while as the difference between groups A1B1 and A2B1.

From the data obtained, it can be concluded that the hypothesis experiment is

1. First Hypothesis

Critical thinking skills using the inquiry model are higher than conventional ones. From the ANOVA obtained, it can be seen that $F_{\text{count}} = 22.154 > F_{\text{table}} = 4.11$, then H_0 is rejected, and the experiment H_1 is accepted, meaning that there are differences which indicate that the difference between the critical thinking skills of the inquiry model and the conventional group is found.

2. Women's critical thinking skills are higher than men

The analysis obtained in the follow-up experiment with higher critical thinking abilities of women and men using the inquiry model, then the calculation of the $t_{\text{count}} > t_{\text{table}}$ ($2.704 > 2.101$) was obtained, H_0 was rejected, and H_1 was accepted, the difference between the A1B1 group and the A2B1 group was found.

3. Hypothesis three

The AXB interaction ANOVA shows that H_0 is rejected, $F_{\text{count}} < F_{\text{table}}$ ($11,385 > 7,39$), then H_0 is accepted, then there is an interaction between factor A and factor B in the critical thinking skills of men and women.

After analyzing the data using the analytical approach (ANAVA) and continuing with the t-test, the discussion of the research results will focus on the four hypotheses that have been tested for truth, namely as follows.

Discussion

The Critical thinking ability of experimental group students with conventional group students of class II SD at Nagari Malai III Koto Sungai Geringging District.

Based on the output of data processing and calculations that have been described previously, it shows that there is still a significant difference, conventional critical thinking skills at SDN 07 Sungai Geringging with the group given an inquiry model at SDN 19 Sungai Geringging in learning mathematics, so that it can generalize to the population based on two-way ANOVA. it is stated that to

optimize the critical thinking skills of elementary school students at SDN 19 Sungai Geringgong, the inquiry model is more optimally used compared to the conventional model because there are significant differences. In the group given the inquiry model using $x = 80.75$ and in the conventional group $x = 70.75$, the average difference proves that the inquiry model has an effect on students' critical thinking skills. this proves that

The results of research by Masitoh, (2016), show that the application of guided inquiry learning examples can increase the percentage of achievement of critical thinking indicators. Among them, 89.84% in interpretation, 53.13% in analysis, 75.7% in reasoning, 94.53% in interpretation, 82.03% in evaluation, & 92.97% in self-discipline. The percentage of scores is higher than using a class that does not use the example of inquiry learning. The inquiry-based learning model has an impact on students' critical thinking. The application of conventional learning examples in the control class was not synchronous using the teaching method, and homogeneous students' critical thinking scores in the experimental class were higher than those in the control class. Consistently using Masitoh's findings. Simanjuntak et al., (2019) This shows that the proportion of students in classes that apply guided inquiry learning examples is 81.44%, higher based on 75.97% of students in classes that apply conventional learning examples using lecture mode.

Based on the description above, whether viewed from the perspective of learning theory or form of expression, inquiry-based learning has a clear effect on improving students' critical thinking skills.

The critical thinking ability of male and female students in the experimental group with conventional class II SD at Nagari Malai III Koto, Sungai Geringgong District.

Based on the results of data processing and calculations that have been described, it is evident that there is a clear difference in critical thinking skills, male and female critical thinking skills, women are quite good from men's critical thinking abilities, as evidenced by the addition of an inquiry model as already described. , this is strengthened by the average difference data, namely the critical thinking ability of women $x = 87.25$ higher than male critical thinking skills $x = 64.25$. Furthermore, the results of the t test analysis show that the calculation of the t value t count $>$ t table ($3.883 > 2.101$), then H_0 is rejected and H_1 is accepted, the result is that there is a clear difference between the A1B2 group and the A2B2 group.

The gender factor was used because there were suspicions of differences in achievement between male and female students. He revealed that gender indirectly influences the formation of behavior and learning motivation (Hoang, 2008). In his journal Raymond, (2006) revealed in his journal that men use all their innate characteristics differently from women. These differences are thought to have an impact on all aspects of life.

Based on the description above, both from a theoretical point of view and from the presentation of learning, it is evident that there is a difference between male and female students' critical thinking skills.

The Interaction using mathematics learning model on students' critical thinking skills in the experimental group with the conventional.

The results of testing the second hypothesis ANOVA two-way inquiry model proved that there is an interaction effect of gender critical thinking skills using the mathematical learning model, while critical thinking skills depend on gender and female students' critical thinking is quite high than male students and so is the inquiry model and conventional. Nugraha & Pujiastuti, (2019) explain that although the proportion is small, differences between women do exist, with women performing better in language and art, reading comprehension, and written and oral communication, while men seem to be slightly better at math and mathematical reasoning.

According to Kusmiyati, the Anacova test is a combination based on a comparison test (ANOVA) and a correlation test (regression). Analysis of variance (Analysis of Variation) was used to test the comparison of critical thinking between experimental class students and control class students

based on the treatment given using the applied inquiry learning example. Regression tests are used to predict students' critical thinking from their prior knowledge. The results of the study's anacova test showed disparities and interactions. There is a critical thinking gap between the experimental class and the control class, and there is still a linear interaction between the pretest using students' critical thinking after receiving treatment. students' critical thinking.

4. CONCLUSION

Based on the explanation of the research results, it concludes that the critical thinking skills using the inquiry model are higher than conventional ones and the ANOVA calculation obtained is $F_{\text{count}} = 22.154 > F_{\text{table}} = 4.11$. Therefore H_0 is rejected, and the alternative experiment H_1 is accepted, meaning that there is a difference that suggests it was found that there were differences in critical thinking skills in the inquiry model group with the conventional group. The calculation of the analysis of the t experiment is to compare the critical thinking skills of women and men who are higher using the inquiry model, so the calculation $t_{\text{count}} > t_{\text{table}}$ ($2,704 > 2,101$), H_0 is rejected, and H_1 is accepted, the difference between the A1B1 group and the A2B1 group is obtained. The analysis obtained from the t experiment is to compare the thinking ability of lower women and lower men using a conventional model, so the calculation of the value of $t_{\text{t arithmetic}} > t_{\text{table}}$ ($3.883 > 2.101$), then H_0 is rejected, and H_1 is accepted, the difference between Group A1B2 and group A2B2 is obtained. Found that the AXB score indicates that H_0 is rejected based on $F_{\text{count}} > F_{\text{table}}$ ($11,385 > 7,39$), then H_0 is accepted, then there is an interaction of factor A with factor B on critical thinking skills in boys and girls.

The study limits the variables of the inquiry model, gender, mathematics learning. Each of these variables is given more limitations. In the independent variable, namely the inquiry model, this research limits the treatment of the inquiry model to the experimental class and the conventional model to the control class, then the variable can be used, namely learning mathematics, one of the internal factors that affect the results of students' critical thinking skills into two types of high critical thinking skills and critical thinking ability, the last variable attribute is male gender and ability to think critically in mathematics learning. Suggestions for researchers who are interested in continuing this problem, are as much as possible to control independent variables and tighten external validity so that it is more maximal.

REFERENCES

- Abidin, Z. (2012). Intuisi Siswa Madrasah Ibtidaiyah (Mi) Dalam Pemecahan Masalah Matematika Divergen. *Madrasah*, 2(1), 66–75. <https://doi.org/10.18860/jt.v0i0.1442>
- Adinda, A. (2016). Berfikir Kritis dalam Pembelajaran Matematika. In *Logaritma: Jurnal Ilmu-ilmu Pendidikan* (Vol. 4, Issue 01, pp. 125–138).
- Ahmad, S. (2013). Teori Belajar Dan Pembelajaran Di Sekolah Dasar. In *Jakarta : Kencana Media Group*.
- Amijaya, L. S., Ramdani, A., & Merta, I. W. (2018). Effect of Guided Inquiry Learning Model Towards Student Learning Outcomes and Critical Thinking Ability. *J. Pijar MIPA*, 13(2), 94–99.
- Arikunto. (2010). Prosedur Penelitian Suatu Pendekatan Praktik. In *Jakarta: Rineka Cipta*.
- Assegaff, A., & Sontani, U. T. (2016). Upaya Meningkatkan Kemampuan Berfikir Analitis Melalui Model Problem Based Learning (Pbl). *Jurnal Pendidikan Manajemen Perkantoran*, 1(1), 38. <https://doi.org/10.17509/jpm.v1i1.3263>
- Azizah, L. N. (2022). Penerapan Model Pembelajaran Inkuiri Terbimbing Untuk Meningkatkan Keterampilan Berpikir Kritis Siswa Ditinjau Dari Gender Pada Materi Pencemaran Lingkungan. *PENSA E-JURNAL : PENDIDIKAN SAINS*, 10(1), 161–166.
- Christina, L. V., & Kristin, F. (2016). Efektivitas Model Pembelajaran Tipe Group Investigation (Gi) Dan Cooperative Integrated Reading and Composition (Circ) Dalam Meningkatkan Kreativitas Berpikir Kritis Dan Hasil Belajar Ips Siswa Kelas 4. *Scholaria : Jurnal Pendidikan Dan Kebudayaan*, 6(3), 217. <https://doi.org/10.24246/j.scholaria.2016.v6.i3.p217-230>

- Farida, N., Hasanudin, H., & Suryadinata, N. (2019). Problem Based Learning (Pbl) – Qr-Code Dalam Peningkatan Hasil Belajar Matematika Peserta Didik. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 8(1), 225–236. <https://doi.org/10.24127/ajpm.v8i1.1894>
- Hadi, S., & Radiyatul, R. (2014). Metode Pemecahan Masalah Menurut Polya untuk Mengembangkan Kemampuan Siswa dalam Pemecahan Masalah Matematis di Sekolah Menengah Pertama. *EDU-MAT: Jurnal Pendidikan Matematika*, 2(1), 53–61. <https://doi.org/10.20527/edumat.v2i1.603>
- Halpern. (1998). Teaching critical thinking for transfer across domains. Dispositions, skills, structure training, and metacognitive monitoring. In *The American psychologist* (pp. 225–230).
- Iis Holisin. (2007). Pembelajaran Matematika Realistik (PMR). *Didaktis*, 3(3), 1–68. <http://journal.um-surabaya.ac.id/index.php/didaktis/article/viewFile/255/199>
- Juniati, N. W., & Widiana, I. W. (2017). Penerapan Model Pembelajaran Inkuiri Untuk Meningkatkan Hasil Belajar Ipa. *Journal of Education Action Research*, 1(2), 122. <https://doi.org/10.23887/jear.v1i2.12045>
- Kim, J., & Grunig, J. (2017). Situational theory of problem solving: Working measures. *International Academic Journal*, 8(2), 1–27. www.researchgate.net/publication/321082647_Situational_Theory_of_Problem_Solving_-_Working_Measures
- Lestari, D. D., Ansori, I., Karyadi, B., Studi, P., Biologi, P., & Bengkulu, U. (2017). Penerapan Model Pbm Untuk Meningkatkan Kinerja Dan Kemampuan Berpikir Kritis. *Jurnal Pendidikan Dan Pembelajaran Biologi*, 1(1), 46–54.
- Mahanal, S., Zubaidah, S., Sumiati, I. D., Sari, T. M., & Ismirawati, N. (2019). RICOSRE: A learning model to develop critical thinking skills for students with different academic abilities. *International Journal of Instruction*, 12(2), 417–434. <https://doi.org/10.29333/iji.2019.12227a>
- Masitoh, S. (2016). Peningkatan Hasil Belajar Ips Melalui Strategi Inquiry Discovery Learning Di Kelas Iv Sdn Kecamatan Cikarang Utara Kabupaten Bekasi. *Jurnal Pendidikan*, 4(2).
- Meylinda, D., & Surya, E. (2017). Kemampuan koneksi dalam pembelajaran matematika di sekolah. *Jurnal Pendidikan Matematika*, December, 1–10.
- NCTM. (2000). Principles and Standards for School Mathematics. In *United States of America: The National Council of Teachers of Mathematics, Inc.*
- Nofrialdi, I., Maison, M., & Muslim, M. (2018). Tingkat Kecemasan Matematika Siswa SMA Negeri 2 Kerinci Kelas X MIA Sebelum Menghadapi Tes Matematika Berdasarkan Gender dan Hubungannya dengan Hasil Belajar. *Edumatika: Jurnal Riset Pendidikan Matematika*, 1(2), 11. <https://doi.org/10.32939/ejrpm.v1i2.248>
- Nugraha, T. H., & Pujiastuti, H. (2019). Analisis Kemampuan Komunikasi Matematis Siswa Berdasarkan Perbedaan Gender. *Edumatika: Jurnal Pendidikan Matematika*, 9(1), 1–7. <https://doi.org/10.22437/edumatika.v9i1.5880>
- Nurfitriyani, Muhammad Makki, H. (2022). Analisis Kemampuan Berpikir Kritis Pada Mata Pelajaran Matematika : Studi Pembelajaran Menggunakan Model Problem Based Learning (PBL). *Journal of Classroom Action*, 4(2). <https://doi.org/10.29303/jcar.v4i3.1845>
- Nursalam, 2016, metode penelitian, & Fallis, A. . (2013). 濟無No Title No Title. *Journal of Chemical Information and Modeling*, 53(9), 1689–1699.
- Permendikbud. (2014). Peraturan Menteri Pendidikan dan Kebudayaan Nomor 58 Tahun 2014 Tentang Kurikulum 2013 Sekolah Menengah Pertama/Madrasah Tsanawiyah. In *tentang Kurikulum 2013 Sekolah Menengah Pertama (SMP) / Madrasah Tsanawiyah (MTs)* (p. 51).
- Raymond, C. (2006). Perbedaan Gender terhadap Motivasi Belajar Siswa. In *Penerbit Erlangga, Jakarta*.
- Ristiasari, T., Priyono, B., Sukaesih, S., & Biologi, J. (2012). Model Pembelajaran Problem Solving Dengan Mind Mapping Terhadap Kemampuan Berpikir Kritis Siswa. *J.Biol.Educ*, 1(3), 50229. <http://journal.unnes.ac.id/sju/index.php/ujeb>
- Setiadi, I., Irhasyurna, Y., & Kusasi, M. (2021). Pengaruh Pembelajaran Model Inkuiri Berbantuan Media Video Pada Hasil Belajar Di Tingkat Sekolah Menengah Pertama. *Journal of Banua Science*

- Education*, 1(2), 51–54. <https://doi.org/10.20527/jbse.v1i2.16>
- Simanjuntak, M. P., Marpaung, N., Panggabean, B. M., Purba, C., Simanjuntak, M. P., & Marpaung, N. (2019). Lembar Kerja Siswa Berbasis Masalah Berbantuan Simulasi Komputer Terhadap Keterampilan Berpikir Kritis Siswa. *Jurnal Pendidikan*, 8(2), 126–134.
- Sugiyono. (2016). Sugiyono. In *Metode Penelitian Kuantitatif, Kualitatif dan R&D* (p. 13).
- Susanti, S., Musdi, E., & Syarifuddin, H. (2017). Pengembangan Perangkat Pembelajaran Matematika Berbasis Penemuan Terbimbing untuk Meningkatkan Kemampuan Pemecahan Masalah Matematis Materi Statistika. *JNPM (Jurnal Nasional Pendidikan Matematika)*, 1(2), 305. <https://doi.org/10.33603/jnpm.v1i2.561>
- Tresnawati, T., Hidayat, W., & Rohaeti, E. E. (2017). Kemampuan Berpikir Kritis Matematis Dan Kepercayaan Diri Siswa Sma. *Symmetry: Pasundan Journal of Research in Mathematics Learning and Education*, 2, 116–122. <https://doi.org/10.23969/symmetry.v2i2.616>
- Umar, W. (2012). Membangun Kemampuan Komunikasi Matematis Dalam Pembelajaran Matematika. *Infinity Journal*, 1(1), 1. <https://doi.org/10.22460/infinity.v1i1.2>
- Vargas, C. (2018). *13th International Congress on Mathematical Education Hamburg , 24-31 July 2016 CRITICAL THINKING AND PROBLEM SOLVING*. July 2016.
- Wartono, W., Hudha, M. N., & Batlolona, J. R. (2018). How are the physics critical thinking skills of the students taught by using inquiry-discovery through empirical and theorethical overview? *Eurasia Journal of Mathematics, Science and Technology Education*, 14(2), 691–697. <https://doi.org/10.12973/ejmste/80632>
- Widodo, S. A. (2017). Development of Teaching Materials Algebraic Equation To Improve Problem Solving. *Infinity Journal*, 6(1), 59. <https://doi.org/10.22460/infinity.v6i1.239>
- Wingsi, M. S. (2020). Analisis Percobaan Sains terkait Lingkungan terhadap Kemampuan Berpikir Kritis Anak di Taman Kanak-kanak. *Jurnal Pendidikan Tambusai*, 4, 1228–1236.
- Yusrina, & Haerul. (2021). Analisis Problematika Pembelajaran Bahasa dan Sastra Indonesia Berbasis Digital di Masa Pandemi Covid-19. *Semantik*, 10(1), 24–31. <https://doi.org/10.22460/semantik.v10i1.p25-32>
- Yustianingsih, R., Syarifuddin, H., & Yerizon, Y. (2017). Pengembangan Perangkat Pembelajaran Matematika Berbasis Problem Based Learning (PBL) untuk Meningkatkan Kemampuan Pemecahan Masalah Peserta Didik Kelas VIII. *JNPM (Jurnal Nasional Pendidikan Matematika)*, 1(2), 258. <https://doi.org/10.33603/jnpm.v1i2.563>
- Yusuf, A. M. (2013). Metode Penelitian Kualitatif, Kuantitatif dan Penelitian Gabungan. In *Jakarta: Renika Cipta*.