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The Effect of Realistic Mathematics Approach on Emotional Intelligence and Mathematical Communication Ability of Grade V Students

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Abstract

This research method uses a quantitative approach and the type of research is a quasi-experiment. The research design used is a quasi-experiment with a 2 x 2 factorial with a 2-way analysis of variance (ANOVA) technique. This test validation sheet consists of three components, namely content, construction, and language use. The data analysis technique used in this study is the inferential statistical technique. Hypothesis testing in this study was carried out using the analysis of variance (ANOVA) test with a 2 x 3 test and a significance level of 0.05. Before the ANOVA test was carried out, the analysis requirements test was first carried out, namely the normality test and the data homogeneity test. This study is a quasi-experimental study by comparing the mathematical communication skills of students taught with a realistic mathematical approach compared to the mathematical communication skills of students taught with ordinary learning. In addition, this study also looks at the comparison of students' mathematical communication skills based on the level of emotional intelligence possessed by students, while the data on students' emotional intelligence was obtained through an emotional intelligence questionnaire given during the study.

Keywords: Realistic Mathematics, emotional, communication

Introduction

Education is an important part of human life and the success or failure of a country depends greatly on its education system. Because through education, citizens can be educated and develop their individuality for a better future. According to Law Number 20 of 2003, education is a learning process that allows students to actively develop religious and spiritual strength, self-discipline, individuality, intelligence, and noble moral and ability potential, which is a conscious and deliberate effort to create an atmosphere and process.

Mathematics is one of the compulsory subjects in formal education and occupies a very important position and role in the world of education. Mathematics as a science plays a very important role in guiding human life towards a better direction (Suratno, 2016:76). There are many reasons why students should learn mathematics. Mathematics should be taught to students for the following reasons (Eviyanti, Surya, Syahputra, 2017:139). a) Mathematics is used all the time in everyday life. b) All subjects require appropriate mathematical knowledge. c) Become a safe, concise and clear means of communication. d) Can be used to present information in various ways. e) Improve logical thinking skills, accuracy and spatial awareness. f) Provide the ability to solve difficult problems. However, according to Marpaung and Syahputa (2016:56), in reality students in this field are often afraid to solve mathematical problems, especially historical problems. This shows that

students' mathematical problem-solving abilities are still quite low, this of course affects their mathematical thinking abilities.

Ironically, many people consider mathematics as a difficult, abstract (both are true), boring, and scary subject where there is only one answer to each question. This vision is further strengthened when mathematics is taught as a finished product and ready to use (formulas, logarithms). As a result, students become less interested in studying mathematics and find it more difficult to absorb mathematical content. However, on the other hand, mathematics is an important subject in human life, even in the current era of technology and digital, mathematics plays a role in almost all aspects (Dalimunthe, et al., 2020; Kandaga, 2024). Mathematics is easy to understand, but children need continuous practice in order to be able to quickly solve problems carefully and completely. Practical reality shows that students' mathematical communication skills are still weak and teachers have not been able to improve their mathematical communication skills. Through communication, students can convey their ideas to teachers and other students. This means that students' mathematical communication skills need to be further improved. Mathematical communication refers to students' ability to express mathematical ideas orally and in writing. Mathematical communication is effective when teachers create situations where students can listen and speak actively.

Mathematics learning not only develops the cognitive domain, but also develops the emotional domain, such as emotional intelligence. Barriyyah (2019) states that emotional intelligence is social intelligence, related to the ability to understand one's own emotions and the emotions of others. Emotional intelligence is an important factor that contributes to students' academic success.

A student's communication skills and emotional intelligence are very important in the learning process. Therefore, teachers must be able to facilitate learning by using learning models that can improve students' mathematical communication skills and academic independence. One way teachers can improve students' mathematical communication and emotional intelligence is by using the Real Mathematics Method (RMM). Gumanambo (2016:144) the application of the RMS method is an effort to improve students' mathematical communication skills and emotional intelligence. A practical mathematics learning approach can be one of many learning options that can involve students to be active, collaborate, discuss and debate with classmates so that they can explore mathematical concepts themselves by presenting problems that are close to students' lives.

Methods

This research method uses a quantitative approach and the type of research is a quasi-experiment. The research design used is a quasi-experiment with a 2 x 2 factorial with a 2-way analysis of variance (ANOVA) technique. This test validation sheet consists of three components, namely content, construction, and language use. The data analysis technique used in this study is the inferential statistical technique. Hypothesis testing in this study was carried out using the analysis of variance (ANOVA) test with a 2 x 3 test and a significance level of 0.05. Before the ANOVA test was carried out, the analysis requirements test was first carried out, namely the normality test and the data homogeneity test.

Results and Discussions

1. Results

This study is a quasi-experimental study by comparing the mathematical communication skills of students taught with a realistic mathematical approach compared to the mathematical communication skills of students taught with ordinary learning. In addition, this study also looks at the comparison of students' mathematical communication skills based on the level of emotional intelligence possessed by students, while the data on students' emotional intelligence was obtained through an emotional intelligence questionnaire given during the study. Based on the analysis design, the frequency distribution of the data presented includes the following:

1) Pre-test of mathematical communication skills of experimental class students

The following presents pre-test data on students' mathematical communication skills in the experimental class.

Table 1 .
Pre-test of Mathematical Communication Skills of Experimental Class Students

Interval Class	Frequency	Percentage
50 – 54	2	7
55 – 59	2	7
60 – 64	7	26
65 – 69	4	15
70 – 74	7	26
75 – 80	3	11
Jumlah	25	100

Based on the table, it is obtained that the lowest value obtained by students is 50 while the highest value is 80 with an average value of 64.50; the median is 6.00; and the mode is 60; standard deviation is 7.68; and the variance is 59.

2) Pre-test of mathematical communication skills of control class students

The following presents pre-test data on students' mathematical communication skills in the control class.

Table 2.
Pre-Test of Mathematical Communication Skills of Control Class Students

Interval Class	Frequency	Percentage
50 – 55	3	13
56 – 60	3	13
61 – 70	14	58
71 – 75	2	8
76 – 80	1	4
81 – 85	1	4
Jumlah	24	100

Based on the table, it is obtained that the lowest value obtained by students is 50 while the highest value is 80 with the average obtained being 66; the median is 65.00; and the mode is 65; the standard deviation is 8.40; and the variance is 64.58

3) Description of emotional intelligence of experimental class students

The following presents the frequency distribution of students' emotional intelligence in the experimental class.

Table 3.
Frequency Distribution of Students' Emotional Intelligence in the Experimental Class

	Interval Class	Frequency	Percentage
KE Tinggi	72-77	2	17
	78-83	2	17
	84-89	4	33

	90-95	2	17
KE Rendah	51-53	3	20
	54-56	4	27
	57-59	6	40
	60-62	2	13

Based on the table, it can be seen that of the 25 students in the experimental class, there are 10 students who have high emotional intelligence and 15 students who have low emotional intelligence.

4) Description of emotional intelligence of control class students

Table 4.
Frequency Distribution of Students' Emotional Intelligence in the Control Class

	Interval Class	Frequency	Percentage
KE Tinggi	72-77	2	15
	78-83	4	31
	84-89	6	46
	90-95	1	8
KE Rendah	44-48	2	17
	49-53	3	25
	54-58	5	42
	59-63	2	17
Jumlah		25	100

Based on the table, it can be seen that of the 25 students in the control class, there are 13 students who have high emotional intelligence and 12 students who have low emotional intelligence.

5) Post-test of mathematical communication skills of students taught using a realistic mathematical approach.

The frequency distribution of mathematical communication ability scores of students taught using a realistic mathematics approach is presented in the following table.

Table 5.
Frequency Distribution of Mathematical Communication Skills of Students Taught with a Realistic Mathematics Approach

Interval Class	Frequency	Percentage
73-78	3	11
79-84	9	33
85-90	4	15
91-96	5	19
97-102	3	11
102-107	1	4

From the table, the frequency distribution of mathematical communication skills of students taught with a realistic mathematical approach can be seen that 8 students or 30% of 25

students have mathematical communication skills below average, namely 82 (the average result of the Post-test of mathematical communication skills of students in the experimental class and control class). While 17 or 68% of other students have mathematical communication skills above average.

6) Post-test of mathematical communication skills of students taught with conventional learning

The frequency distribution of mathematical communication ability scores of students taught with regular learning is presented in the following table.

Table 6.
Frequency Distribution of Mathematical Communication Skills of Students Taught with the Direct Intercation Approach

Interval Class	Frequency	Percentage
63-68	3	11
69-74	5	19
75-79	4	15
80-84	9	33
85-89	2	7
90-94	2	7
Jumlah	25	100

From the table, the frequency distribution of mathematical communication skills of students taught with ordinary learning can be seen that 9 students or 33% of 25 students have mathematical communication skills below average. While 5 or 19% of other students have mathematical communication skills above average.

7) Mathematical communication skills of students with high emotional intelligence

The frequency distribution of mathematical communication skills of students with high emotional intelligence is presented in the following table.

Table 7.
\Frequency Distribution of Mathematical Communication Skills of Students with High Emotional Intelligence

Interval Class	Frequency	Percentage
67-72	3	13
73-78	3	13
79-84	6	26
85-90	3	13
91-96	5	22
97-102	3	13
Jumlah	23	100

From the table, it can be seen that 23 students have high emotional intelligence from the total sample of 50 students. Based on table 7, it can be seen that 6 students or 26% of the 23 students have below average mathematical communication skills. While 5 or 22% of other students have above average mathematical communication skills.

8) Mathematical communication skills of students who have low emotional intelligence

The frequency distribution of mathematical communication ability scores of students with low emotional intelligence is presented in the following table.

Table 8.
Frequency Distribution of Mathematical Communication Skills of Students with Low Emotional Intelligence

Interval Class	Frequency	Percentage
63-68	2	7
69-74	3	11
75-80	9	33
81-86	7	26
87-92	4	15
93-98	2	7
Jumlah	27	100

From the table, it can be seen that 27 students have low emotional intelligence from the total sample. Based on table 8, it can be seen that 9 students or 33% of the 27 students have below average mathematical communication skills. While 7 or 15% of other students have above average mathematical communication skills.

9) The mathematical communication skills of students who are taught with a realistic mathematical approach and have high emotional intelligence

The frequency distribution of mathematical communication ability scores of students who were taught using a realistic mathematical approach and had high emotional intelligence is presented in the following table.

Table 9.
Frequency Distribution of Mathematical Communication Skills of Students Taught with a Realistic Mathematical Approach and Having High Emotional Intelligence

Interval Class	Frequency	Percentage
66-70	2	20
71-75	1	10
76-80	5	50
81-85	2	20
86-90	0	0
Jumlah	10	100

From the table, it can be seen that 10 students out of 25 students in the experimental class have high emotional intelligence. Based on statistical calculations, it can be seen that all students who are taught with a realistic mathematical approach and have high emotional intelligence have above average mathematical communication skills.

10) The mathematical communication skills of students who are taught with a realistic mathematical approach and have low emotional intelligence

The frequency distribution of mathematical communication ability scores of students who were taught using a realistic mathematical approach and had low emotional intelligence is presented in the following table.

Table 10.
Frequency Distribution of Mathematical Communication Skills of Students Taught with a Realistic Mathematical Approach and Having Low Emotional Intelligence

Interval Class	Frequency	Percentage
50-52	4	29
53-55	4	29
56-58	5	36
59-61	1	7
61-63	0	0
Jumlah	14	100

From Table 10, it can be seen that 5 students or 36% of the 14 students have below average mathematical communication skills. Meanwhile, 1 or 7% of the other students have above average mathematical communication skills.

11) The mathematical communication skills of students who are taught with ordinary learning and have high emotional intelligence

The frequency distribution of mathematical communication ability scores of students who are taught with ordinary learning and have high emotional intelligence is presented in the following table.

Table 11.
Frequency Distribution of Mathematical Communication Skills of Students Taught with the Direct Intercation Approach and Having High Emotional Intelligence

Interval Class	Frequency	Percentage
77-93	8	67
94-110	1	8
111-127	2	17
128-144	0	0
145-161	1	8
Jumlah	12	100

From the table it is known that 12 students out of 25 students in the control class have high emotional intelligence. Based on statistical calculations it can also be seen that 8 students or 67% of 13 students have below average mathematical communication skills. While 1 or 8% of other students have above average mathematical communication skills.

12) The mathematical communication abilities of students who are taught with ordinary learning and have low emotional intelligence

The frequency distribution of mathematical communication ability scores of students who are taught with ordinary learning and have low emotional intelligence is presented as follows.

Table 12.
Frequency Distribution of Mathematical Communication Skills of Students Taught with the Direct Intercation Approach and Having Low Emotional Intelligence

Interval Class	Frequency	Percentage
43-49	7	54
50-56	2	15
57-63	1	8
64-70	1	8
71-77	2	15
Jumlah	13	100

From the table, it can be seen that 13 students out of 25 students in the control class have low emotional intelligence. Based on statistical calculations, it can also be seen that 7 students or 54% of the 13 students have below average mathematical communication skills. While 2 or 15% of other students have above average mathematical communication skills.

Next, data analysis was carried out, including normality tests, homogeneity tests, hypothesis tests and Tukey tests.

1) Normality Test

Table 13.
Results of Pre-test Data Normality Test

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Residual for Mathematical Communication Ability	0,130	50	0,033	0,959	50	0,078

Table 14.
Results of Post Test Data Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Residual for Mathematical Communication Ability	0,117	50	0,084	0,968	50	0,191

2) Homogeneity Test

Table 15.
Pre-test Data Homogeneity Test
Test of Homogenity of Variances

Levene Statistic	df1	df2	Sig.
3,346	1	48	0,074

Table 16.
Post-test Data Homogeneity Test

Levene Statistic	df1	df2	Sig.
1,633	1	48	0,207

3) Hypothesis Test

Table 17.
SPSS Output Results of ANOVA Calculation

Tests of Between-Subjects Effects					
Dependent Variable: Communication Matematis					
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	7867.690[a]	1	7867,690	124,746	0,000
Intercept	548636,490	1	548636,490	8698,907	0,000
Pendekatan Matematika	7867,690	1	7867,690	124,746	0,000
Kecerdasan Emosional	399,136	1	399,136	9,707	0,003
Pendekatan Matematika * Kecerdasan Emosional	458,534	1	458,534	11,152	0,002
Error	2901,610	48	60,450		
Total	215550,000	50			
Corrected Total	2998,000	49			
a. R Squared = .560 (Adjusted R Squared = .556)					

Table 18.
Comparison of Mathematical Communication Ability Based on Emotional Intelligence

Pendekatan Pembelajaran	Kecerdasan Emosional	Mean	Std. Deviation	95% Confidence Interval for Mean	
				Lower Bound	Upper Bound
Matematika Realistik	Tinggi	64,40	7,681	1,536	61,23
	Rendah	66,00	8,036	1,607	62,68
Pembelajaran biasa	Tinggi	86,36	7,745	1,549	83,16
	Rendah	79,52	6,947	1,389	76,65

4) Tukey's test

Table 19.
SPSS Output Tukey Test Results

(I) Pendekatan Pembelajaran	(J) Kecerdasan Emosional	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Matematika	Matematika	-18.760*	2,325	0	-24,84	-12,68

Realistik-Kecerdasan Emosional tinggi	Realistik-Kecerdasan Emosional rendah					
	Pembelajaran biasa- Kecerdasan Emosional tinggi	-0,8	2,325	0,986	-6,88	5,28
	Pembelajaran biasa -Kecerdasan Emosional rendah	-26.600*	2,325	0	-32,68	-20,52
Matematika Realistik-Kecerdasan Emosional rendah	Matematika Realistik-Kecerdasan Emosional tinggi	18.760*	2,325	0	12,68	24,84
	Pembelajaran biasa -Kecerdasan Emosional tinggi	17.960*	2,325	0	11,88	24,04
	Pembelajaran biasa -Kecerdasan Emosional rendah	-7.840*	2,325	0,006	-13,92	-1,76
Pembelajaran biasa - Kecerdasan Emosional tinggi	Matematika Realistik-Kecerdasan Emosional tinggi	0,8	2,325	0,986	-5,28	6,88
	Matematika Realistik-Kecerdasan Emosional rendah	-17.960*	2,325	0	-24,04	-11,88
	Pembelajaran biasa-Kecerdasan Emosional rendah	-25.800*	2,325	0	-31,88	-19,72
Pembelajaran biasa – Kecerdasan Emosional rendah	Matematika Realistik-Kecerdasan Emosional tinggi	26.600*	2,325	0	20,52	32,68
	Matematika Realistik-Kecerdasan Emosional rendah	7.840*	2,325	0,006	1,76	13,92
	Pembelajaran biasa -Kecerdasan Emosional tinggi	25.800*	2,325	0	19,72	31,88

Tuckey test calculation is used to see whether or not there is a difference in the average mathematical communication ability of students in each group. The decision-making criteria for further testing are :

If the sig. value < 0.05 then there is a difference between the two groups.

If the sig. value > 0.05 then there is no difference between the two groups.

2. Discussion

1) Differences in Students' Mathematical Communication Skills Taught with a Realistic Mathematics Approach Compared to a Conventional Learning Approach

The realistic mathematics approach focuses on linking mathematical concepts to real situations that are relevant to students. This approach utilizes everyday life contexts to facilitate a deeper understanding of mathematical concepts (Zulkardi et al., 2021). Students who are taught with this approach tend to have better mathematical communication skills because this approach encourages them to explain and articulate their thinking processes through mathematical representations, both verbally and visually.

In contrast, the conventional learning approach, which is oriented towards direct instruction, places more emphasis on explicit delivery of material by teachers and direct interaction between teachers and students. Although effective in transferring knowledge quickly, this approach can limit students in exploring mathematical ideas independently (Hamid et al., 2021; Anggiana, et al., 2022).

The results of this study support that the realistic mathematics approach is superior in improving students' mathematical communication skills compared to the usual learning approach, especially because this approach integrates elements of exploration, collaboration, and real-context applications in mathematics learning.

2) Differences in Mathematical Communication Abilities of Students with High Emotional Intelligence Compared to Students with Low Emotional Intelligence

Emotional intelligence plays a significant role in the learning process, including in mastering mathematical communication. Students with high emotional intelligence have the ability to manage emotions, motivate themselves, and interact with the social environment positively (Goleman, in Wahyuni & Hermawan, 2022; Darta, et al., 2021). This allows them to more easily understand complex mathematical tasks, collaborate with peers, and receive and provide constructive feedback.

In contrast, students with low emotional intelligence tend to have difficulty managing academic stress and interacting effectively. This condition can hinder their ability to understand abstract concepts and actively participate in class discussions (Prasetyo et al., 2021).

This study confirms that high emotional intelligence contributes significantly to students' mathematical communication skills. This is due to students' ability to understand and articulate mathematical ideas more effectively through good emotional management.

3) Interaction Between Realistic Mathematical Approach and Emotional Intelligence on Students' Mathematical Communication Skills

The interaction between the realistic mathematics learning approach and emotional intelligence shows significant dynamics in influencing students' mathematical communication skills. The realistic mathematics approach, which emphasizes the relationship between mathematical concepts and real-world situations, provides opportunities for students to develop critical and creative thinking skills. In this context, students with high emotional intelligence are able to utilize this approach optimally. They tend to be more involved in the learning process, because they are able to manage challenges well, collaborate effectively with peers, and understand the meaning of the mathematical activities carried out (Zulkardi et al., 2021).

In contrast, students with low emotional intelligence may face obstacles in making the most of this approach. They tend to need more intensive support from teachers to manage the stress that arises during the learning process. In this situation, teaching strategies that combine a realistic mathematics approach with explicit guidance can help improve students' mathematical communication skills (Rahmatullah et al., 2021).

The results of this study also show that students with high emotional intelligence who are taught using a realistic mathematics approach have a more significant advantage compared to students who are taught using a conventional learning approach. This is due to their ability to manage emotions, understand complex instructions, and establish social interactions that support learning. On the other hand, a conventional learning approach tends to be more effective for students with low emotional intelligence, because it provides a more directed learning structure and minimizes uncertainty during the learning process (Prasetyo et al., 2021).

This finding supports the argument that the interaction between learning methods and individual characteristics, such as emotional intelligence, is very important in improving learning outcomes. As stated by Wahyuni and Hermawan (2022), a learning approach that is responsive to students' emotional needs can improve teaching effectiveness and learning outcomes.

Therefore, it is important for educators to design adaptive learning strategies, which not only consider the approach used but also the emotional characteristics of students. Such an approach can produce significant positive impacts in improving students' mathematical communication skills, especially when they are faced with complex tasks that require deep understanding and effective expression of mathematical ideas.

Conclusion

Based on the results of the analysis carried out, the conclusions that can be drawn are as follows: 1) The results of the study showed that the realistic mathematics approach had a better influence compared to ordinary learning in improving students' mathematical communication skills. Students who were guided with this approach were better able to express mathematical ideas orally and in writing, and were more effective in understanding and solving mathematical problems; 2) 2. A realistic mathematical approach also has a positive impact on students' emotional intelligence. Compared to regular learning, students who receive learning with this approach show a better level of emotional intelligence, which is reflected in aspects of emotional regulation, empathy, and the ability to manage stress when facing mathematical problems; 3) There is a significant interaction between the learning approach and students' initial mathematical abilities. Students with high initial abilities gain greater benefits from the realistic mathematics approach compared to regular learning, while students with lower initial abilities also experience increased understanding, although at different levels; 4) 4. In addition, there is an interaction between the learning approach and initial mathematical abilities on students' emotional intelligence. The realistic mathematics approach specifically provides a positive influence on students with various levels of initial abilities, especially in increasing self-confidence, resilience to academic challenges, and social skills in communicating mathematically.

Thus, the realistic mathematics approach is proven to be more effective than conventional learning in improving both students' mathematical communication skills and emotional intelligence. In addition, the interaction between the learning approach and early mathematical abilities shows that this approach can be adapted to support students' academic and emotional development more optimally.

References

Anggiana, A. D., Kandaga, T., & Hermawan, V. (2022). Analysis of mathematical literacy increase and learning independence through problem-based learning. International Conference on Health Science, Green Economics, Educational Review and Technology, London, UK. 159–166. https://doi.org/10.54443/ihert.v4i.157

Baroody, AJ. (1993). Problem Solving, Reasoning. And Communicating, K-8. Helping Children think Mathematically. New York: Macmillan Publishing Company.

Dalimunthe, S. A., Darta, D., Kandaga, T., & Hermawan, V. (2020). Analisis kemampuan berpikir kritis matematis melalui model learning cycle 7E di sekolah menengah. Symmetry: Pasundan Journal of Research in Mathematics Learning and Education, 5(2), 169-177. https://doi.org/10.23969/symmetry.v5i2.3263

Darta, Saputra, J., Eliyarti, W., Putra, B. Y. G., & and Kandaga, T. (2021). Improvement of the Ability of Representation, Reasoning, and Self-Efficacy of Prospective Mathematics Teacher Students by Using Learning with A Scientific Approach. Journal of Physics: Conference Series, 1776 012002. https://doi.org/10.1088/1742-6596/1776/1/012002

Eviyanti, C., Surya, E., & Syahputra, E. (2017). Improving the Students'Mathematical Problem Solving Ability by Applying Problem Based Learning Model in VII Grade at SMPN 1 Banda Aceh Indonesia. International Journal of Novel Research in Education and Learning. Vol. 4 pp: 138-144

Gumanambo, N., Sukayasa., & Gandung, S. (2016). Penerapan Pendekatan Matematika Realistik Untuk Meningkatkan Hasil Belajar Siswa Pada Materi Penjumlahan Dan Pengurangan Bentuk Aljabar Di Kelas VII SMPN 9 Palu. Jurnal Elektronik Pendidikan Matematika Tadulako, Vol 4, No 1, September 2016. pp 143-155

Goleman, D. (2016). Emotional Intelligence: Kecerdasan Emosional (Alih Bahasa: T. Hermaya). Jakarta: PT Gramedia Pustaka Utama.

Kandaga, T. (2024). Pemahaman Konsep Matematika Siswa MTs dalam Model Discovery Learning Berbantuan Aplikasi Quizizz. Kognitif: Jurnal Riset HOTS Pendidikan Matematika, 4(1), 57–67. https://doi.org/10.51574/kognitif.v4i1.1221

Marpaung, R., Syahputra, E. (2016). Student's Mathematics Representation And The alternative Solution., Proceeding og the 1st Annual International seminar on Transformative Education and Educational Leadership (AISTEEL). Vol.1

Napitupulu, E. (2017). Analyzing the teaching and Learning of Mathematical Reasonig Skills in Secondary School. Asian Social Science. Vol 13, No. 12. pp 50-52

Rahmawati, D. (2015). Keefektifan Pembelajaran Dengan Pendekatan Pendidikan Matematika Realistik Pada Kemampuan Pemecahan Masalah Pokok Bahasan Segiempat Di Mts Negeri 1 Palembang. Jurnal Pendidikan Matematika JPM RAFA Vol. 1, No.1, September 2015. pp 225-238

Saragih, S.,& Habeahan, W. (2014). The Improving of Problem Solving Ability and Student's Creativity Mathematical by using Problem Based Learning In SMP Negeri 2 Siantar. Journal of Education and Practice. Vol 5, No.35. pp 35-45

Sarbiyono. (2016). Penerapan Pendidikan Matematika Realistic Terhadap Kemampuan Pemecahan Masalah Matematis Siswa. Jurnal Review Pembelajaran Matemtika. Vol.No.2, Desember 2016. pp 163-173

Siregar, N. (2017). Persepsi siswa pada pelajaran matematika: studi pendahuluan pada siswa yang menyenangi game. Prosiding Temu Ilmiah X Ikatan Psikologi Perkembangan Indonesia. 22-24 Agustus 2017, Hotel Grasia, Semarang. Pp 224-234

Suratno, J. (2016). The Development of Students Worksheet Using GeoGebra Assisted Problem-Based Learning And Its Effect on Ability of Mathematical Discovery of junior High Students. Prioceeding of 3rd International Conference on research, Implementation and Education of Mathematics and Science. Yogyakarta 16-17 May 2016

Surya, E,. & Syahputra, E. (2017). Improving High-level Thinking Skills by Development Of Learning PBL Approach on the Learning Mathematics for senior High School Student. Canadian Center Of science and Education. 10 (8). pp 12-20

Wahyudin. (2012). Filsafat dan Model-Model Pembelajaran Matematika. Bandung: Mandiri.

Wasriono, dkk. (2015). Pengembangan Perangkat Pembelajaran Berbantuan Autograph untuk Meningkatkan Pemahaman Konsep Matematik Siswa SMK Melalui Model Pemahaman Penemuan Terbimbing. Jurnal Paradikma. Volume 8, No.3 pp 75-84

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