

THE INFLUENCE OF THE REALISTIC MATHEMATICS EDUCATION LEARNING APPROACH ON THE CRITICAL THINKING SKILLS OF FIFTH GRADE ELEMENTARY SCHOOL STUDENTS IN MATHEMATICS LEARNING

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ABSTRACT

The Realistic Mathematics Education approach is able to make students more active, creative, critical thinkers, and brave in expressing opinions and is able to create more creative and enjoyable mathematics learning conditions. The reality that occurs in learning activities at the elementary school level, most teachers have not explored the open nature used as a learning medium in delivering material. The Realistic Mathematics Education (RME) learning approach is a solution to this problem. This study aims to determine the effect of the realistic mathematics education learning approach on critical thinking skills of fifth grade elementary school students in mathematics learning. The research design used is experimental research. The population used fifth grade students of SDN 1 Blimbingsari and SDN 2 Blimbingsari. The sampling technique used is simple random sampling. The instruments used are pretest and posttest questions. The normality test was carried out using the Shapiro-Wilk statistical test, the results obtained showed that the data were normally distributed (>0.05). Based on the results of the homogeneity test, homogeneous results were obtained. Based on the results of the independent sample test, the results obtained were Sig. (2-tailed) of $0.000 < 0.05$, it can be concluded that there is a significant influence of the learning approach using RME on the critical thinking skills of fifth grade elementary school students in learning mathematics about the volume of geometric shapes.

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INTRODUCTION

Learning activities carried out based on the curriculum in an educational institution to achieve an educational goal are a process in a learning. The intended educational goal is to lead students to become complete human beings so that there are changes in intellectual, moral, and social behavior so that they grow into independent human beings and social beings (Sudjana, 2020). Students must be able to interact with the learning environment managed by the teacher in the learning process to achieve these educational goals. The use of various learning approaches aims to help the process of understanding mathematics to be of high quality (Turgut, 2021). Mathematics lessons are important and must be taught at all levels of education, which can support students' future success (Aunio et al., 2021).

Article 8 of the Teacher Law Number 14 of 2005 states that a teacher must have educational qualifications, be physically and mentally healthy, and have the competence to realize the goals of national education (INDONESIA, n.d.). Based on what is meant in the article, teachers must be competent in pedagogical, personality, social, and professional aspects obtained from teacher professional education. One of the core abilities that must be mastered by a teacher is pedagogical competence, which is the competence to develop a curriculum related to the subject matter being taught and be able to carry out development activities in teaching (educating). The professional ability of teachers is actively developing the subject matter being taught and can implement information and communication technology to carry out self-development and communication. Based on these abilities, it can be concluded that the teacher's ability to realize an interesting learning model and be able to compile innovative teaching materials in the form of print, audio, audio-visual media, and interactive teaching materials that are adapted to the development and growth period of students so as to improve their critical thinking skills.

Critical thinking is a competency possessed by students for problem solving and accurate decision-making (Benyamin et al., 2021). According to Anugraheni (2020), critical thinking is a systematic thinking activity involving various perspectives, formulating hypotheses, gathering information, drawing conclusions, and making decisions that result in collaborative action to find solutions to given problems. Meanwhile, according to Azizah et al., (2018), critical thinking is a thinking process by analyzing factual information and problems in a specific and systematic way and using strategies to solve problems through identifying and reviewing the information obtained. Critical thinking skills are skills in analyzing problems that are carried out systematically by asking specific questions for problem solving and reflecting on problems until they are able to make a decision (Wahono et al., 2022). It is mandatory for students to have critical thinking skills because students who have critical thinking skills have the competence to solve given problems (Kurniawati & Ekayanti, 2020). Based on the explanation above, it can be concluded that critical thinking skills are a person's skills in solving problems systematically by analyzing and identifying problems so that they are able to solve and reflect and make the right decision.

The reality that occurs in learning activities at the elementary school level, most teachers have not explored the outdoors used as a learning medium in delivering material even though there are many learning media provided as aids during the learning process. Although research on the Realistic Mathematics Education (RME) approach has been extensively conducted, there are several research gaps that underlie the urgency of this research, namely: 1) Most previous research on RME has focused more on improving general cognitive learning outcomes or problem-solving abilities. There is still limited research that specifically examines its impact on critical thinking skills in fifth-grade elementary school students, especially in the context of certain mathematical materials that require high abstraction but remain relevant to students' real environments. 2) Mathematics learning is often still textual and mechanistic (memorizing formulas), which results in low critical thinking skills in students when facing non-routine problems. There is a gap between the curriculum demands that require students to have Higher Order Thinking Skills (HOTS) and the fact that teachers still have difficulty integrating the real environment into a systematic mathematical logic structure. 3) Many previous studies are only descriptive-qualitative. This research is present to provide stronger empirical evidence through an experimental design, in order to statistically validate the effectiveness of RME in stimulating critical thinking components such as analytical, evaluation, and inference skills in elementary school students. Mathematics learning with the RME approach, although quite well known, but the reality of research conducted is often more done at higher levels of education, and research at the elementary school level related to the influence of RME on critical thinking skills of elementary school students still has gaps and is very little done, this is

a novelty in the research to be carried out. In addition, in Banyuwangi, especially at the elementary school level, the implementation of the RME approach that utilizes the surrounding environment as a support and learning media has not been explored optimally.

The Realistic Mathematics Education (RME) learning approach is an approach that involves real conditions with student experiences in learning mathematics (Chisara et al., 2019). The RME approach that combines with students' real conditions will help students focus on problems that require critical thinking (Akbas & Alan, 2022). Students are given the opportunity to discover and construct mathematical knowledge and concepts through the RME approach based on realistic problems given by the teacher. The RME approach emphasizes the importance of real contexts in constructing mathematical knowledge by students independently so that the knowledge gained becomes more meaningful (Astuti, 2018). The RME approach has been empirically proven to facilitate students' mathematics learning (Domínguez-González & Delgado-Martín, 2022). The research conducted by NURAENI & UMBARA (2019) aims to determine the differences in the improvement of students' mathematical literacy competencies by implementing RME learning based on Adobe Flash Professional CS6 based on students' initial, middle, and lower mathematical abilities. Based on the research data, the null hypothesis is rejected because the significance value is > 0.05 , so it can be concluded that there are significant differences in the improvement of mathematical literacy competencies of students with high, middle, and low abilities.

The results of observations on mathematics learning conducted by researchers, especially fifth grade students of SDN 1 Blimbingsari and SDN 2 Blimbingsari, Blimbingsari District, showed that students' critical thinking skills were low in mathematics lessons. Based on the results of the mathematics test on the discussion of the volume of geometric shapes from the data at SDN 1 Blimbingsari and SDN 2 Blimbingsari, the test results on the discussion of the volume of geometric shapes were below the specified KKM value so that special treatment in the form of research was needed to prove that the RME approach was able to improve students' critical thinking skills, which was proud, especially since the position of open nature media became one of the efforts in improving the relationship process between teachers and students, fellow students, and student interaction with the surrounding environment. The surrounding environment has a primary function as a learning aid that can support the use of learning media by teachers optimally. The thinking process is a person's activity when facing a problem. The thinking process in students occurs when facing a problem that involves various sensations, students begin to capture writing, images and sounds then students experience a process of understanding through reading, listening, and understanding according to the directions contained in the question.

Handayani (2020) in her research stated that low critical thinking skills were the background of her research. Learning using RME is an alternative to addressing students' low critical thinking skills. The purpose of this study was to determine the effect of using RME in learning on elementary school students' mathematical critical thinking skills. The quasi-experimental method used in this study with a non-equivalent groups pretest-posttest design. The subjects used in this study were fifth-grade elementary school students. Critical thinking skills were measured using test questions. Based on the results of the study using uij-t analysis, it shows that there is a significant effect of RME learning on students' mathematical critical thinking skills. The design of learning activities containing problem solving must be well prepared to provide stimuli for students to think critically and encourage conscious thinking in solving problems (Puspita et al., 2020). This study also produces a hypothesis that there is an effect in the use of RME on students' critical thinking skills.

The literacy actions that the researcher carried out on several journals that the researcher read and by conducting observations at two institutions, namely SDN 1 Blimbingsari and SDN 2 Blimbingsari, Blimbingsari District, as well as through interviews with several students and teachers in both schools, obtained information that in mathematics learning on the subject of spatial figures, the results obtained by grade V students were in the less category. The learning outcomes about the material received by students and the lack of development of students' critical thinking about the learning material delivered, namely about the volume of spatial figures, especially cuboids and cubes. The teaching method of teachers in each school tends to be monotonous, namely with a lecture model where students experience confusion about the theory presented at that time.

A teacher must have an approach that is able to build motivation and creativity of his students by utilizing various sources in our environment. Wahyuni et al., (2023) explained that the application of the RME approach to junior high school students by providing learning that starts from realistic problems is able to make students more active in critical thinking including analyzing and solving problems. In line with this research, research conducted by Isnaini & Aini (2024) concluded that the RME model is effective in improving critical thinking skills of fifth grade elementary school students. Based on the literature study, it can be concluded that mathematics learning that maximizes the use of the surrounding environment as a learning medium will be able to improve students' critical thinking skills, the RME approach is one approach to the teaching and learning process that optimizes the surrounding environment as a learning resource related to mathematics subject matter. Based on this study, the researcher is interested in conducting research related to the implementation of learning with the RME approach, this is the reason the researcher raised the title "The Effect of the Realistic Mathematical Education Learning Approach on Critical Thinking Skills of Fifth Grade Elementary School Students in Mathematics Learning".

METHOD

The design used in this study is experimental research, according to Sugiyono (2013) who stated that the experimental method is a research method that is part of the quantitative method which has its own characteristics, namely the presence of a control class. Experimental research divides the subjects into two classes, namely the experimental class group which is given treatment or treatment of the role-playing learning model and the control class which is not given treatment in the sense that learning is carried out as usual, the quantitative approach used in this study. Quantitative research is research that uses a lot of numerical data calculations starting from data collection, analyzing or interpreting data, and when presenting research results. The type of research used is a quasi-experimental or quasi-experimental design.

Table 1. Research design

Group	Pre-test	Treatment	Post-test
Experiment	O ₁	X ₁	O ₃
Control	O ₂	X ₂	O ₄

This study used two class groups consisting of: (1) an experimental class that used the Realistic Mathematic Education approach, (2) a control class that used the lecture learning model. The aim of this study was to determine the influence of the learning approach using Realistic Mathematic Education in mathematics learning that makes maximum use of natural media.

This study used a population of fifth-grade students at SDN 1 Blimbingsari and SDN 2 Blimbingsari. Sampling was carried out using a simple random sampling technique by drawing lots between the two classes. A homogeneity test was carried out before the drawing steps were carried out in both classes. The results of the homogeneity test can be conveyed that both classes meet the requirements because the Sig. value of students' critical thinking skills is 0.191 each, where the significance value is more than 0.05 (> 0.05) so that it can be concluded that the data is normally distributed and homogeneous and then a drawing can be carried out to determine the experimental class and the control class. The results of the drawing for the two classes, it was decided that class V SDN 1 Blimbingsari was the experimental class and SDN 2 Blimbingsari was the control class.

Data collection used a test procedure, in the form of a critical thinking skills test given through a pre-test to both classes before the treatment was administered to both classes. The pre-test aimed to determine students' critical thinking skills. Next, the treatment was carried out using the RME approach in the experimental class and the lecture method in the control class, as is usually done by teachers in daily learning. The final test was conducted after both classes had completed the learning process. The results of the pre-test and post-test were used to compare the results of the experimental class and the control class in determining the effect of the RME approach.

Validity testing was conducted on the instrument before data collection using SPSS 23.00 for Windows. A test item is considered valid if $r_{hitung} > r_{tabel}$, and vice versa. The following table presents the validation data for the students' critical thinking skills test items.

Table 2. Results of the Validity Test of Critical Thinking Skills Test Questions
Correlations

		TOTAL
P01	Pearson Correlation	.376*
P02	Pearson Correlation	.376*
P03	Pearson Correlation	.426*
P04	Pearson Correlation	.376*
P05	Pearson Correlation	.394*
P06	Pearson Correlation	.384*
P07	Pearson Correlation	.479**
P08	Pearson Correlation	.451*
P09	Pearson Correlation	.376*
P10	Pearson Correlation	.384*
	Pearson Correlation	1
TOTAL	Sig. (2-tailed)	
	N	28

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Source from: SPSS 23.00 data processing for windows

Based on Table 2, the validity test results of the critical thinking skills test questions tested using SPSS 23.00 for Windows and given to 28 students showed valid results for all test items. This valid result is because each item's Pearson correlation value obtained is above R_{table} , which is 0.374. Therefore, the test questions used to measure students' critical thinking skills can be declared valid.

Reliability tests were also calculated using SPSS 23.00 for test items measuring critical thinking skills. The reliability calculations were based on Cronbach's Alpha values, which are presented in the table below.

Table 3. Results of the Reliability Test of Critical Thinking Skills Test Questions

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.425	.424	10

Source from: SPSS 23.00 data processing for windows.

The value obtained in table 3.8 can be explained that based on the calculation results of Cronbach's Alpha which obtained a value of 0.425, the students' critical thinking skills test questions were declared reliable because the value was more than the R_{table} value of 0.424 so that the R_{count} value $> R_{table}$ and the instrument was proven to be reliable.

RESULT AND DISCUSSION

The research activities were conducted on fifth-grade elementary school students at two schools, namely SDN 1 Blimbingsari with 28 students and SDN 2 Blimbingsari with 26 fifth-grade students. Learning in this study was conducted three times to obtain research data which was then analyzed. SDN 1 Blimbingsari as an experimental class was given treatment using the RME approach. SDN 2 Blimbingsari as a control class and learning was carried out as usual. The research was conducted from January 4 to March 25, 2024, the implementation schedule was in accordance with the learning schedules contained in each institution

The influence of the RME approach on students' critical thinking skills Based on the results of the independent sample test, the Sig. (2-tailed) value on equal variances assumed obtained a value of 0.000, the acquisition was >0.05 and in addition, based on the average post-test value of critical thinking skills carried out in the experimental class, the value was 77.8571 while the average value obtained by the control class was 57.3077. The average difference between the two classes was 20.5494. Therefore, the research decision can be taken to reject H_0 and accept H_1 in the sense that there is a significant influence of the mathematics learning approach using RME on critical thinking skills in mathematics learning for the volume of geometric shapes for fifth grade elementary school students.

Based on the process during the research, it was found that, the use of the RME approach in learning student activity during learning is increasing, this is because students get new things when using media around them where they know the benefits of these objects in solving mathematics learning problems. Students become more active and enthusiastic in participating in learning, who previously felt mathematics lessons were difficult to understand, by using learning media around them it really helps in understanding mathematical concepts and implementing them easily. Based on these findings, it can be concluded that the advantages of implementing the RME approach in learning include (1) mathematics learning becomes more meaningful and relevant, (2) students are more helped in understanding mathematical concepts to be more contextual, (3) and increasing student involvement and students' social skills are increasingly developing. Critical thinking skills are enhanced through RME because this approach facilitates students' progressive mathematization. The real-world problems presented compel students to engage in in-depth analysis, while the open discussion space provides opportunities for students to evaluate and reflect on various solution strategies. Thus, students become not only arithmetic practitioners but also critical thinkers in validating the validity of mathematical arguments.

Although learning mathematics with the RME approach is quite well known, the reality is that research is often carried out at higher levels of education as explained in the introduction above. Meanwhile, research at the elementary school level related to the influence of RME on critical thinking skills of elementary school students still has gaps and is very little done, this is a novelty in the research that will be carried out. In addition, in Banyuwangi, especially at the elementary school level, the implementation of the RME approach that utilizes the surrounding environment as a support and learning media has not been explored optimally.

The impact of learning using the RME approach on critical thinking skills can be assessed by first conducting several prerequisite tests, including normality and homogeneity tests. The following presents the results of the normality test for the impact of the RME learning approach on students' critical thinking skills in Table 3 below.

Table 4. Results of RME Normality Test on Critical Thinking Skills

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
CRITICAL THINKING SKILLS RESULTS OF THE EXPERIMENTAL CLASS	.204	26	.007	.918	26	.040
CONTROL CLASS	.164	26	.072	.934	26	.098

a. Lilliefors Significance Correction

Source from: SPSS 23.00 data processing for windows

The results of the normality test based on the results in table 3 are explained that the results shown in the Shapiro-Wilk statistical test obtained in the experimental class a significance value of 0.040 and the significance value in the control class obtained a value of 0.98 so that based on the obtained significance value, it can be concluded that the critical thinking skills of students in both classes can be stated that the data is normally distributed because the results are more than 0.05 (>0.05) and further tests can be carried out, namely the homogeneity test.

Testing on the critical thinking skills variable, the results of the homogeneity test in this study are shown in table 4 below.

Table 5. Results of the RME Homogeneity Test on Critical Thinking Skills
Test of Homogeneity of Variances

		Levene	df1	df2	Sig.
		Statistic			
CRITICAL THINKING SKILLS RESULTS	Based on Mean	1.723	1	52	.195
	Based on Median	1.372	1	52	.247
	Based on Median and with adjusted df	1.372	1	51.094	.247
	Based on trimmed mean	1.601	1	52	.211

Source from: SPSS 23.00 data processing for windows

The results in Table 4 above can be explained that the significance value in the Based on Mean column is at 0.195 and the value obtained is >0.05 and it can be stated that the data on students' critical thinking skills are declared homogeneous and further testing can be carried out to determine the effect of the RME learning approach on students' critical thinking skills by conducting an independent sample test. The results of this test are presented in Table 5 below.

Table 6. Results of Independent Sample Test RME on Skills
Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
CRITICAL THINKING SKILL OUTCOMES	Equal variances assumed	1.723	.195	5.943	52	.000	20.549	3.458	13.610	27.488
	Equal variances not assumed			5.896	48.152	.000	20.549	3.485	13.542	27.557

Source from: SPSS 23.00 data processing for windows

Sig. Value (2-tailed) Based on table 5, it can be explained that the Sig. value (2-tailed) on equal variances assumed in the independent sample test table obtained a value of 0.000, where the value is <0.05 , so the research decision can be taken to reject H_0 and H_1 is accepted in the sense that there is a significant influence of the learning approach using RME on students' critical thinking skills in mathematics learning with spatial geometry material for fifth grade elementary school students.

The effect of learning with the RME approach on students' critical thinking skills based on the independent sample test results of the Sig. (2-tailed) value in the equal variances column assumed the value obtained was 0.000, the result was <0.05 besides that based on the average post-test value of critical thinking skills in the experimental class obtained a value of 77.8571 and in the control class obtained a value of 57.3077. The average difference between the two classes was 20.5494. So it can be taken the decision of the study to reject H_0 and H_1 is accepted in the sense that there is a significant influence of the learning approach using RME on students' critical thinking skills in mathematics learning with the material of the volume of geometric shapes of grade V elementary school students. The findings in this study are supported by research conducted by Wahyuni et al., (2023) which examined the effect of the

RME approach on students' critical thinking skills after conducting a hypothesis test using an independent sample test. The t-test results were 3,323 and a significance level of 0.427. The results obtained were >0.05 so that the research conducted can be concluded that students' critical thinking skills carried out using the RME approach in the mathematics learning process are greater when compared to conventional learning using lectures.

Students' mathematical critical thinking skills experienced a significant increase with the use of RME in mathematics learning when compared to students whose learning used lecture and conventional methods, because in the process, learning that applied the RME approach was more active and effective when compared to conventional learning (Oktaviani et al., 2018). The RME approach is able to improve the quality of learning, provide meaningful and permanent learning, and help students think positively in viewing mathematics lessons (Kutluca & Gündüz, 2022).

CONCLUSION

Based on the analysis of the pre-test data of critical thinking skills, the results of the Shapiro Wilk test on the normality test in the experimental class produced a Sig. value of 0.40 and for the Sig. value of the control class the value obtained was 0.98 so that it can be concluded that both classes are normally distributed. The results of the homogeneity test of critical thinking skills in the experimental class and the control class the Sig. value obtained was 0.195 so that the data obtained was declared homogeneous. Based on the discussion of the results of the independent sample test the Sig. value (2-tailed) obtained was 0.000 the value obtained was <0.05 this acquisition is in accordance with the basis for decision making, it can be concluded that H_0 is rejected and H_1 is accepted which means that there is a significant influence of the learning approach using RME on the critical thinking skills of fifth grade elementary school students. However, the researcher is aware of the limitations in this study, especially in the limited scope of locations in one school and the relatively small sample size, so that generalization of the research results needs to be done carefully. As a recommendation for further research, the researcher suggests that research be developed on broader subjects, different grade levels, and the integration of RME with other variables such as numeracy literacy or learning independence in order to enrich the scientific knowledge of basic education.

Researchers recommend that elementary school teachers implement the RME approach in mathematics learning because it involves real objects and environments, making learning more meaningful and enjoyable. For future researchers to replicate the study with a wider and more diverse population, both in schools with different characteristics and at varying student cognitive levels, in order to test the consistency of the effectiveness of the RME approach in improving critical thinking skills more generally, as well as exploring the influence of RME on critical thinking skills integrated with other variables, such as learning motivation, numeracy literacy, or mathematical disposition, to see the extent to which this approach is able to form a comprehensive student profile.

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