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Enhancing Creative Thinking in Circle Topics through the Realistic Mathematics Learning Approach

Subriadi Hasibuan[1], Cẩm Thơ Chu[2], Wessam A. Godh[3]
[1]Madrasah Tsanawiyah. Al-Ittihadiyah, Sumatera Utara, Indonesia
[2]The Vietnam National Institute of Educational Sciences, Ba Dinh, Hanoi, Vietnam
[3]Department of Mathematics, Faculty of Education, Ain Shams University, Egypt

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ABSTRACT

Purpose of the study: This study aims to describe the influence of the Realistic Mathematics learning approach on Students' Creative Thinking Ability in Mathematics in terms of students' mathematics learning achievement, describe the influence of expository learning on students' creative thinking ability and describe the better influence of the 2 learning models applied by looking at the achievements achieved by students.

Methodology: This research is a quantitative research and the method used in this research is quasi experiment. The research was conducted at Madrasah Tsanawiyah Al-Ittihadiyah (Mamiyai). The population was all students of class VIII and sampling using cluster random sampling where class VIII-5 as the experimental class and class VIII-1 as the control class.

Main Findings: The realistic mathematics learning approach has a good effect on students' creative thinking skills. Expository learning has less effect on students' creative thinking skills. The effect of realistic mathematics learning is better than expository learning.

Novelty/Originality of this study: This study provides a new contribution in understanding how a contextual approach can enhance students' creative thinking skills through the exploration of geometric concepts relevant to everyday life.

Corresponding Author:
Subriadi Hasibuan,
Madrasah Tsanawiyah. Al-Ittihadiyah, Jl.Karya Jaya Gg.Karya VIII No. 7 A Medan, Sumatera Utara, Indonesia
Email: hsbsubraadii001@gmail.com

1. INTRODUCTION

Education has an important role for life in the world and the hereafter. With education will have more knowledge. Education is very important both for yourself, the nation, and the people around you [1]-[3]. One of the important educational sciences is mathematics. Mathematics is a branch of exact science and is systematically organized. Learning mathematics is also a process of building students' understanding of facts, concepts, principles, and skills according to their abilities [4]-[6], teachers or lecturers deliver the material, students with their respective potentials construct their understanding of facts, concepts, principles and skills [7]-[9].

The main problem in learning mathematics is how to connect facts that students have seen or experienced in everyday life with mathematical concepts [10]-[12], so that it becomes meaningful knowledge for the students being taught. Learning that is done in schools is generally only based on teachers where this learning process needs to be changed [13], teachers should be able to use a learning approach that emphasizes the process of full student

involvement to understand the material being studied and relate it to everyday life so that students will be more creative and smart in exploring their knowledge [14]-[16].

The approach is very important in the learning process. The use of inappropriate learning approaches will result in students becoming lazy and less responsive to the learning given by the teacher [17]. Students tend to be uninterested in the materials presented by the teacher, and make an excuse that the learning itself is not interesting so that students do not focus on learning [18]. Learning without an approach will also result in learning objectives not being achieved as desired [19], therefore the approach used is an effort to plan real activities so that learning objectives are achieved optimally. So a teacher must be good at choosing the approaches used according to the subject matter being delivered [20].

This problem has many possible solutions. Mathematics learning will be better understood if it is associated with the context of real life where students can easily understand the material by relating it to their daily lives in order to achieve learning goals [21],[22]. Here of course there is a learning approach that is appropriate or suitable for the teaching and learning process where the author chooses one of the Realistic Mathematics Learning Approach approaches. The author feels that this Realistic Mathematics Learning approach is very appropriate when juxtaposed with real life.

Realistic mathematics learning is learning that combines theoretical concepts that must be the same or balanced with the reality of life [23],[24]. In other words, concepts must be able to be realized in life and life as a real fact of life itself. With this learning approach, students will be more focused on thinking where they not only know about basic theories but students will also relate these problems to their daily lives [25],[26].

With this Realistic Mathematics Learning approach, it will influence the level of student creativity in the teaching and learning process [27],[28] because here students will play more of a role in the learning process and students will show or give examples that they have linked to their daily life experiences. So with this approach, students not only focus on the explanation given by the teacher, but students can also think or express opinions about what they know.

Gap analysis between previous research conducted by Yaniawati et al [29] with the current research, namely Previous research emphasized the use of e-learning in resource-based mathematics learning to improve students' creative thinking skills and self-confidence. This study focuses more on the influence of technology and learning independence through access to digital resources. On the other hand, the current study highlights a realistic mathematics approach that links mathematical concepts to everyday life contexts in the topic of circles. The main difference is that the current study emphasizes direct involvement and relevance of the material to students' realities without direct involvement of technology. This gap indicates an opportunity to further explore how contextual approaches in mathematics learning can be compared or combined with technology-based approaches to improve students' creativity.

This study has novelty in its approach that connects mathematical concepts, especially on the topic of circles, with everyday situations that are relevant to students. By utilizing a realistic mathematical approach, this study targets improving students' creative thinking skills through more meaningful and applicable learning. The urgency of this study lies in the need for a learning method that not only makes students understand the theory but also able to think creatively in solving real problems. In the midst of the development of the world that requires creative and analytical thinking skills, this approach has the potential to make mathematics more interesting and relevant, so that it can improve the quality of learning and students' skills in applying mathematical concepts in their lives.

Based on the description above, the purpose of this study is to describe the influence of the Realistic Mathematics learning approach on Students' Creative Thinking Ability in Mathematics in terms of students' mathematics learning achievement, to describe the influence of expository learning on students' creative thinking ability and to describe the better influence of the 2 learning models applied by looking at the achievements achieved by students.

2. RESEARCH METHOD

2.1. Types of research

This type of research is experimental research. In other words, this experimental research examines whether or not there is an influence of the Realistic Mathematics Learning approach on students' creative thinking abilities [30]. This type of research uses a Pre-Test and Post-Test research design to determine students' initial and final abilities. This research is included in experimental research in all experimental research types (quasi-experimental).

2.2. Population and Sample

Population is a generalization area consisting of objects/subjects that have certain quantities and characteristics that are applied by researchers to be studied and then conclusions are drawn [31]-[33]. The population in this study were all students of class VIII at Madrasah Tsanawiyah Al-Ittihadiyah (Mamiyai) Medan

Area District. The sample is part of the population that is the object of research. The sample was taken randomly in the study using the cluster random sampling technique, namely by drawing lots from all classes VIII. After drawing lots, the first result was obtained, namely class VIII-5 totaling 20 people and the second result was class VIII-1 totaling 23 people who were divided into experimental classes and control classes.

2.3. Data Collection Tools

The research instrument used was an initial test instrument (Pre-test) of students' mathematical creative thinking abilities in the form of descriptions. The description test was compiled based on the concept of a creative thinking test that meets the indicators of fluent, flexible, sensitive, and detailed thinking. This test was given to 20 students outside the population to see the validity and reliability.

2.4. Data Analysis Techniques

This study uses quantitative analysis, which is an analysis technique whose analysis is carried out with mathematical calculations (because it is related to numbers) namely the results of creative thinking ability tests given to students. The data that has been collected from both the control class and the experimental class are processed and analyzed to be able to show the influence of the use of the RME approach on students' creative thinking abilities. To determine the influence of the Realistic Mathematics Education approach on students' creative thinking abilities, a hypothesis test is carried out using the t-test. The requirement for hypothesis testing is that the data is first tested by the population using the normality test and the homogeneity test.

2.5. Research Procedure

This research is an experimental research that aims to test the effect of the Realistic Mathematics Education (RME) approach on students' creative thinking skills. The research design uses Pre-Test and Post-Test to measure students' initial and final abilities. The research population includes all students of grade VIII at Madrasah Tsanawiyah Al-Ittihadiyah, with samples selected randomly through cluster random sampling techniques, resulting in two classes VIII designated as experimental classes and control classes. The data collection instrument is a descriptive test that measures students' creative thinking skills based on indicators of fluency, flexibility, sensitivity, and detail. Data analysis is carried out quantitatively with mathematical calculations, and hypothesis testing using the t-test is carried out to see the effect of the RME approach on students' creative thinking skills. Before the hypothesis test, the data is tested for normality and homogeneity.

3. RESULTS AND DISCUSSION

3.1. Description of Pre-test Data on Students' Creative Thinking Ability in Mathematics in Experimental and Control Classes

The following is a description of each group that can be described based on the results of the central tendency statistical analysis as seen in the summary of the pre-test values as follows:

Pre-Test Data of Students' Creative Thinking Ability in Mathematics in the Experimental Class (K_1 X_1)

Based on the data obtained from the results of the initial ability of creative thinking in mathematics of students in the experimental class, the frequency distribution data can be described as follows: the average value (X) is 44; Variance = 485.7895; Standard Deviation (SD) = 22.04063; Maximum value = 75; minimum value = 10 with a range of values (Range) = 65.

The meaning of the above variance results is that the ability to think creatively in mathematics taught with Expository Learning has very diverse or different values between one student and another. Quantitatively, it can be seen in the following table:

Table 1. Pre-test data of students' creative thinking abilities in mathematics in the experimental class (K_1 X_1)

Class	Value Interval	F	Fr
1	9.5 – 22.5	3	15
2	22.5 – 35.5	6	30
3	35.5 – 48.5	4	20
4	48.5 – 61.5	2	10
5	61.5 – 74.5	2	10
6	74.5 – 87.5	3	5
Amount		23	100

Furthermore, the assessment category of creative thinking ability data for students taught using realistic mathematics learning can be seen in the following table:

Table 2. Categories of Assessment of Students' Creative Thinking Ability in Mathematics Taught with Realistic Mathematics Learning (K_1 X_1)

No	Value Interval	Number of Students	Percentage	Assessment Category
1	0 ≤ SKBK < 45	13	65%	Very Poor
2	45 ≤ SKBK < 65	2	10%	Poor
3	65 ≤ SKBK < 75	5	25%	Enough
4	75 ≤ SKBK < 90	0	0%	Good
5	90 ≤ SKBK < 100	0	0%	Very Good

From the table above, the mathematical creative thinking ability of students taught with realistic mathematics learning shows that: the number of students who obtained the very poor category was 13 people or 65%, those who obtained the poor category were 2 people or 10%, those who obtained sufficient scores were 5 people or 25%, those who obtained the good category were none or 0%, and those who obtained the very good category were none or 0%.

Pre-test Results Data on Students' Creative Thinking Ability in Mathematics in the Control Class (K_1 X_2)

Based on the data obtained from the results of the initial ability of creative thinking in mathematics of control class students, the frequency distribution data can be described as follows: the average value (X) is 41.08696; Variance = 295.3557; Standard Deviation (SD) = 17.18592; Maximum value = 65; minimum value = 5 with a range of values (Range) = 60.

The meaning of the above variance results is that the ability to think creatively in mathematics taught with Expository Learning has very diverse or different values between one student and another. Quantitatively, it can be seen in the following table:

Table 3. Pre-test Results Data of Students' Creative Thinking Ability in Mathematics in the Control Class (K_1 X_2)

Class	Value Interval	F	Fr
1	4.5 – 15.5	3	13
2	15.5 – 26.5	1	4
3	26.5 – 37.5	6	26
4	37.5 – 48.5	4	17
5	48.5 – 59.5	4	17
6	59.5 – 70.5	5	22
Amount		23	100

Furthermore, the assessment category of creative thinking ability data for students taught using Expository learning can be seen in the following table:

Table 4. Categories of Assessment of Students' Creative Thinking Ability in Mathematics Taught Using Expository Learning (K_1 X_2)

No	Value Interval	Number of Students	Percentage	Assessment Category
1	0 ≤ SKBK < 45	14	60.86%	Very Poor
2	45 ≤ SKBK < 65	9	39.13%	Poor
3	65 ≤ SKBK < 75	0	0%	Enough
4	75 ≤ SKBK < 90	0	0%	Good
5	90 ≤ SKBK < 100	0	0%	Very Good

From the table above, the creative thinking ability of students in mathematics taught with expository learning shows that: the number of students who received a very poor category was 14 people or 60.86%, those who received a poor category were 9 people or 39.13%, those who received a sufficient score were none or 0%, those who received a good category were none or 0%, and those who received a very good category were none or 0%.

After the results of the pre-test were obtained, the researcher then treated the experimental class by providing teaching using a realistic mathematics learning approach and the control class was not given treatment or only used regular teaching (Expository). After the treatment was carried out, the researcher gave a post-test of creative mathematical thinking skills to each class. Furthermore, in summary, the results of the study of students' creative mathematical thinking skills taught using a realistic mathematics learning approach and expository learning can be described as seen in the table below:

Table 5. Post-test Results of Students' Creative Thinking Ability in Mathematics in Experimental and Control Classes

Statistics Source	X_1 (Experiment)	X_2 (Control)
K (Creative Thinking Ability))	n = 20 $\Sigma X = 1550$ $\Sigma X^2 = 124050$ Sd = 14.37285 Var = 206.5789 Mean = 77.5	n = 23 $\Sigma X = 1125$ $\Sigma X^2 = 63075$ Sd = 19.12617 Var = 365.8103 Mean = 48.91304

3.2. Post-test data description of students' creative thinking abilities in mathematics in the experimental and control classes

The description of each group can be described based on the results of the central tendency statistical analysis as seen in the summary of posttest values as follows:

Post Test Data of Students' Creative Thinking Ability in Mathematics in the Experimental Class (K_2 X_1)

Based on the data obtained from the results of the post-test of the creative thinking ability of students in the experimental class, the frequency distribution data can be described as follows: the average value (X) is 1550; Variance = 206.5789; Standard Deviation (SD) = 14.37285; Maximum value = 95; minimum value = 50 with a range of values (Range) = 45.

The meaning of the above variance results is that the ability to think creatively in mathematics taught with the Realistic Mathematics Learning Approach has very diverse or different values between one student and another. Quantitatively, it can be seen in the following table:

Table 6. Post-Test Data of Students' Creative Thinking Ability in Mathematics in the Experimental Class (K_2 X_1)

Class	Value Interval	F	Fr
1	49.5 – 58.5	3	15
2	58.5 – 67.5	1	5
3	67.5 – 76.5	5	25
4	76.5 – 85.5	5	25
5	85.5 – 94.5	2	10
6	94.5 – 103.5	4	20
Amount		20	100

Furthermore, the assessment category of creative thinking ability data for students taught using realistic mathematics learning can be seen in the following table:

Table 7. Categories of Assessment of Students' Creative Thinking Ability in Mathematics Taught with Realistic Mathematics Learning (K_2 X_1)

No	Value Interval	Number of Students	Percentage	Assessment Category
1	$0 \leq$ SKBK < 45	14	60.86%	Very Poor
2	$45 \leq$ SKBK < 65	9	39.13%	Poor
3	$65 \leq$ SKBK < 75	0	0%	Enough
4	$75 \leq$ SKBK < 90	0	0%	Good
5	$90 \leq$ SKBK < 100	0	0%	Very Good

From the table above, the creative thinking ability of students in mathematics taught with realistic mathematics learning shows that: the number of students who received a very poor category was none or 0%, those who received a poor category were 4 people or 20%, those who received a sufficient score were 5 people or 25%, those who received a good category were 7 people or 35%, and those who received a very good category were 4 people or 25%.

Post-test Results Data of Students' Creative Thinking Ability in Mathematics in the Control Class (K_2 X_1)

Based on the data obtained from the results of the posttest of creative thinking in mathematics of control class students, the frequency distribution data can be described as follows: the average value (X) is 48.91304; Variance = 365.8103; Standard Deviation (SD) = 19.12617; Maximum value = 75; minimum value = 10 with a range of values (Range) = 65.

The meaning of the above variance results is that the ability to think creatively in mathematics taught with Expository Learning has very diverse or different values between one student and another. Quantitatively, it can be seen in the following table.:

Table 8. Post Test Data of Students' Creative Thinking Ability in Mathematics in the Control Class (K_2 X_2)

Class	Value Interval	F	Fr
1	9.5 – 21.5	3	13
2	21.5 – 33.5	2	9
3	33.5 – 45.5	6	26
4	45.5 – 56.5	2	9
5	56.5 – 68.5	6	26
6	68.5 – 80.5	4	17
Amount		23	100

Furthermore, the assessment category of creative thinking ability data for students taught using expository learning can be seen in the following table:

Table 9. Categories of Assessment of Students' Creative Thinking Ability in Mathematics Taught Using Expository Learning (K_2 X_2)

No	Value Interval	Number of Students	Percentage	Assessment Category
1	$0 \leq$ SKBK < 45	11	47.83%	Very Poor
2	$45 \leq$ SKBK < 65	8	34.78%	Poor
3	$65 \leq$ SKBK < 75	4	17.39%	Enough
4	$75 \leq$ SKBK < 90	0	0%	Good
5	$90 \leq$ SKBK < 100	0	0%	Very Good

From the table above, the creative thinking ability of students in mathematics taught with expository learning shows that: the number of students who received a very poor category was 11 people or 47.83%, those who received a poor category were 8 people or 34.78%, those who received a sufficient score were 4 people or 17.39%, those who received a good category were none or 0%, and those who received a very good category were none or 0%.

3.3. Description of the Difference in Pre-test and Post-test Data on Students' Creative Thinking Abilities in the Control Class and Experimental Class

The difference in the average pre-test and post-test of students' creative thinking ability in mathematics taught with a realistic mathematics learning approach is 33.5. The difference in the average pre-test and post-test of students' creative thinking ability in mathematics taught with expository learning is 7.82. Based on the difference in the results of the students' pre-test and post-test, it can be seen that there is a difference in the average pre-test and post-test of students' creative thinking ability in mathematics taught with expository learning with the difference in the average pre-test and post-test of students' creative thinking ability in mathematics taught with a realistic mathematics learning approach. The difference in the average pre-test and post-test of students' creative thinking ability in mathematics taught with a realistic mathematics learning approach is higher than the difference in the average pre-test and post-test of students' creative thinking ability in mathematics taught with expository learning.

3.4. Results of Normality Test with Lilliefors Analysis Technique

Table 10. Normality Test with Lilliefors Analysis Technique

Group	L-count	L-table α=0.05	Conclusion
Experiment (KX_1)	0.175	0.198	Normal
Control (KX_2)	0.114	0.184	Normal

Based on the results of the normality test calculation for the sample on the results of students' creative thinking ability in mathematics taught with realistic mathematics learning (KX1), the L-count value = 0.175 with an L-table value = 0.198 Because L-count <L-table, namely 0.175 <0.198, it can be concluded that the null hypothesis is accepted. So it can be said that the sample on the creative thinking ability in mathematics of students taught with realistic mathematics learning comes from a normally distributed population. Based on the results of the normality test calculation for the sample on the results of students' creative thinking ability in mathematics taught with expository learning (KX2), the L-count value = 0.114 with an L-table value = 0.184 Because L-count <L-table, namely 0.114 <0.184, it can be concluded that the null hypothesis is accepted. So it can be said that the sample on the ability to understand mathematical concepts of students taught with expository learning comes from a normally distributed population.

3.5. Homogeneity Test Results for Sample Groups (KX_1 dan KX_2)

Table 11. Results of Homogeneity Test for Sample Groups (KX_1 dan KX_2)

Variable	db	1/db	si2	db.si2	log(si2)	db.log si2	X^2 count	X^2 table	Decision
Experiment (KX_1)	19	0.052	206.5789	3925	2.315	43.98664	1.620	3.481	Homogen
Control (KX_2)	22	0.045	365.8103	8047.826	2.563	56.39163			Homogen

Based on the table of homogeneity test results above, it can be concluded that all sample groups come from a homogeneous population..

3.6. Results of One Way Analysis of Variance Testing

Table 12. Results of One Way Analysis of Variance Testing

Source of Variance	Sum of Squares	Degrees of Freedom	Average Sum of Squares	F-count	F-table
Between Groups (A)	8742.29	1	8742.29		
Within Group (D)	11972.83	43	292.0201	29.937	3.214
Total	20715.1161	44	9034.3103		

From the summary of the table above, it is said that by using one-way variance analysis, the f-count> f-table where the calculation results are 29.937> 3.214. So it can be concluded that Ho is rejected and Ha is accepted. In this study, there is a difference in the creative thinking abilities of students who are taught with realistic mathematics learning and Expository learning. Based on the results of the study, the realistic mathematics learning approach is more influential than Expository learning, which is clearly seen from the difference in the average value of the creative thinking abilities of students who are taught with realistic mathematics learning and Expository learning.

This is because learning using realistic mathematics learning creates activities that stimulate students' curiosity, namely by providing problems related to students' daily lives, group work, making works or reports and presenting them. With these activities, realistic mathematics learning is liked by students so that students are more motivated to follow the learning process..

Meanwhile, expository learning is direct learning that is more dominated by the teacher, which causes students to listen, pay attention and memorize more than discovering a concept themselves, so that students find it difficult to understand the material being taught and are only active in listening to the teacher's explanation and then writing down in a book what the teacher said.

This research has the potential to provide a positive impact by improving students' creative thinking skills in mathematics, especially on the topic of circles, through an approach that is relevant to everyday life. The impact is that students not only understand mathematical concepts theoretically but can also apply them in real situations, which ultimately increases their interest and motivation to learn. However, this study has several limitations, including the potential difficulty in implementing a realistic approach in classes with limited resources or limited learning time. In addition, the diversity of students' life contexts is also a challenge, because this approach requires an understanding of the different backgrounds and environments of students so that the material really feels relevant and applicable to them.

4. CONCLUSION

The realistic mathematics learning approach has a better effect on students' creative thinking skills compared to expository learning. This can be seen from the results of the study that there is a significant difference between students' creative thinking skills taught with realistic mathematics learning and expository learning. This can be seen through the average post-test scores obtained by students in the experimental and control classes, respectively, which are 77.5 and 48.91. Further research is recommended to explore the application of the realistic mathematics approach to topics other than circles and examine its impact on other aspects of creative thinking skills.

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