

DEVELOPING THE ABILITY OF ELEMENTARY STUDENTS METAPHORICAL THINKING THE CITARUM THROUGH THE REALISTIC MATHEMATICS EDUCATION APPROACH

Sukma Murni¹, Sylvia Rabbani², Heris Hendriana³

¹ Institut Keguruan dan Ilmu Pendidikan Siliwangi

² Institut Keguruan dan Ilmu Pendidikan Siliwangi

³ Institut Keguruan dan Ilmu Pendidikan Siliwangi

sukma_murni@ikipsiliwangi.ac.id, sylviarabbani@ikipsiliwangi.ac.id, herishen@yahoo.com

Abstract

This study aims to determine the development of mathematical Metaphorical Thinking capabilities of Bantaran Citarum Elementary School students through a Realistic Mathematics Education (RME) approach better than those using ordinary learning. The method used in this study was a quasi-experimental method carried out in one of the elementary schools in Dayeuh Kolot Subdistrict, Bandung Regency. Data collection uses the results of pretest and posttest mathematical Metaphorical Thinking abilities. To get the research data, the instrument was used in the form of a mathematical Metaphorical Thinking ability test. Data analysis is done quantitatively, quantitative analysis is carried out on the ability of Metaphorical Thinking. In calculating data processing using Microsoft Excel and SPSS 23. The results showed that the development of mathematical Metaphorical Thinking capabilities which learning using the RME approach was better than those using ordinary learning.

Keywords: Metaphorical Thinking, Realistic Mathematics Education.

Abstrak

Penelitian ini bertujuan untuk untuk mengetahui pengembangan kemampuan *Metaphorical Thinking* matematik Siswa SD Bantaran Citarum melalui pendekatan *Realistic Mathematics Education* (RME) lebih baik daripada yang menggunakan pembelajaran biasa. Metode yang digunakan dalam penelitian ini adalah metode kuasi eksperimen yang dilaksanakan di salah satu SD di Kecamatan Dayeuh Kolot, Kabupaten Bandung. Pengumpulan data menggunakan hasil pretes dan postes kemampuan *Metaphorical Thinking* matematik. Untuk mendapatkan data hasil penelitian digunakan instrumen berupa tes kemampuan *Metaphorical Thinking* matematik. Analisis data dilakukan secara kuantitatif, analisis kuantitatif dilakukan terhadap kemampuan *Metaphorical Thinking*. Dalam perhitungan pengolahan data menggunakan program *microsoft excel* dan *SPSS 23*. Hasil penelitian menunjukkan bahwa pengembangan kemampuan *Metaphorical Thinking* matematik yang pembelajarannya menggunakan pendekatan RME lebih baik daripada yang menggunakan pembelajaran biasa.

Kata kunci: Metaphorical Thinking, Realistic Mathematics Education.

INTRODUCTION

This research is motivated by previous research carried out by Hendriana (2009) on Metaphorical Thinking in improving a mathematical ability, Pure (2017) about improving a mathematical ability through learning with the Realistic Mathematics Education approach. From the results of these studies, it can be concluded that the Realistic Mathematics Education (RME) approach can be used in the learning process to improve various aspects and skills in the era of industrial revolution 4.0. Wardani (2018) says that teachers are required to create a

smart education where teachers must create learning that aims to improve the quality of life of long-learning students.

One innovative learning that can improve the quality of life long learning is the RME approach. However, from previous studies, there has been no use of the RME approach as teaching material for the development of mathematical Metaphorical Thinking capabilities. IKIP Siliwangi is one of the campuses under the auspices of Siliwangi KODAM III Foundation, which has a program to create Harum Citarum. As a university that is engaged in the field of education, the participation of Siliwangi IKIP is to improve the quality of education in the Citarum Watershed School. Therefore, the title of this research is Developing the Capability of Mathematical Metaphorical Thinking of Bantaran Citarum Elementary School Students through the Realistic Mathematics Education Approach.

Based on the background of the problem above, the purpose of this study is to find out the development of mathematical Metaphorical Thinking abilities of Elementary School Students of Bantaran Citarum Elementary School through the RME approach better than those using ordinary learning.

The Capability of Metaphorical Thinking

In his research, Hendriana (2016: 95) defines metaphorical thinking or metaphoric thinking as a thought process for understanding and communicating abstract concepts in mathematics into more concrete things by comparing 2 different things. According to Sunito (2013: 63), there are four stages in the learning process using a metaphor, namely:

1. Connection (connection): Connect two or more things that have a purpose to understand something. In this event, various forms of comparison are used, namely metaphors, analogies, stories, legends, symbols, and hypotheses.
2. Discovery (discovery): An invention involves observation and experience. The teacher can describe the related subject matter will be directed, what goals will be achieved after the connection is made, and in the direction in which students are invited to think and have the experience to feel that a lesson is beneficial for him.
3. Creation (invention): An invention requires a process of connecting something with other things, and also requires observations that can produce a product.
4. Application (application): Application is an activity that leads to a product that is the result of thought and can also be in the real form, namely a product.

Realistic Mathematics Education Approach

Zulkarnain (Murni, 2017) said that RME also emphasized to bring mathematics to teaching meaningfully by linking it in real-life, realistic life. Students are presented with contextual problems, namely problems related to realistic situations. Realistic words here are intended as a situation that can be imagined by students or describe situations in the real world.

According to Treffers and Gravemeijer (Chotimah, 2014: 18), RME has the characteristics of steps,

a. Use of Context

The learning process begins with student involvement in solving contextual problems.

b. Vertical Instrument

The concept of the mathematical idea is reconstructed by students through vertical instrument models, which move from informal procedures to formal forms.

c. Student Contributions

d. Students actively construct their own mathematical materials based on the facilities and learning environment provided by the teacher, and actively solve problems in their own ways.

e. Interactive Activities

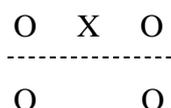
Learning activities are interactive, allowing communication and negotiation between students.

f. Related Topics

Learning a mathematical material related to various mathematical topics in an integrated manner.

METHOD

The research method used is the quasi-experimental method. With the research design as follows:



Information:

O: Pretest and posttest ability of students' metaphorical thinking.

X: Treatment in the form of an RME approach

---: Sampling is not random

The population in this study were all fifth-grade elementary school students in Dayeuh Kolot District. The sample in the study were fifth-grade elementary school students in Dayeuh Kolot, taken two classes namely as a control class and experiment. The location in this study is in the District of Dayeuh Kolot, Regency of Bandung.

RESULTS AND DISCUSSION

Results

The normality test used in this study was the Kolmogorov-Smirnov test. The hypothesis:

H_0 : Data is normally distributed.

H_1 : Data is not normally distributed.

The test criteria are if the value is sig. > 0.05, the data is normally distributed. The following is a table of results of normality tests using SPSS 23 software,

Table. 1
Pretest Data Normality Test The Capability of Mathematical Metaphorical Thinking

Class	Statistic	df	Sig.
Control	0,146	31	0.093
Experiment	0.398	31	0.000

Based on the Table. 1 according to the testing criteria, for the control class sample is normally distributed, while the experimental class sample is not normally distributed.

Based on the results of the normality test, it was found that one class came from a sample that was not normally distributed, so the difference test was two averages for the data pretest ability of metaphorical thinking using the Mann-Whitney test. In this study the Mann-Whitney test used is Monte Carlo with the following hypothesis:

$H_0: \mu_1 = \mu_2$

$H_1: \mu_1 \neq \mu_2$

Criteria testing: if the value is sig. > 0.05 then H_0 is accepted. The following is a table of test results using SPSS 23 software,

Table. 2
Test the Difference of Two averages Pretest Data Capability of Metaphorical Thinking

Class	Sig.	Interpretation
Control	0,839	H_0 accepted
Experiment		

Based on the Table. 2 according to the testing criteria, H0 is accepted, meaning that there is no difference in the initial ability of mathematical metaphorical thinking of students between classes using the RME approach and the class using ordinary learning. This shows that both the experimental class and the control class do not know about statistical material.

Similar to testing the normality of pretest data, testing the posttest data in this study also used the Kolmogorov-Smirnov test. The following is a table of test results using SPSS 23 software,

Table. 3
Test the Normality of Posttest Data The Capability of Metaphorical Thinking

Class	Statistic	df	Sig.
Control	0,155	31	0.057
Experiment	0.158	31	0.047

Based on the Table. 3 according to the testing criteria, for the control class sample is normally distributed, while the experimental class sample is not normally distributed.

Based on the results of the normality test, one class is not normally distributed. Then the next step is to test the two average differences for the posttest data using the non-parametric test, the Mann-Whitney test. With the hypothesis as follows:

$$H_0: \mu_1 = \mu_2$$

$$H_1: \mu_1 > \mu_2$$

Because the difference test in the two average posttests is a one-sided hypothesis test, the test criteria are accepted H0. The Mann-Whitney test used in this study is Monte Carlo Sig. (1-tailed). Based on the results of testing using SPSS 23 software, the following results are obtained:

Table. 4
Test the Difference of Two averages Posttest Data Capability of Metaphorical Thinking

Class	Sig.	Interpretation
Control	0,000	H ₀ rejected
Experiment		

Based on the Table. 4 this means that after learning, the achievement of developing the ability of mathematical metaphorical thinking students who use the RME approach is better than those using ordinary learning.

Discussion

At the beginning of the study, students in the class using RME learning and classes using ordinary learning were given the pretest of the ability of mathematical metaphorical thinking. The result is that the average value of the students in the experimental class and the

control class is not too different, with the average pretest of the experimental class and the control class still relatively very low. This means that there is no difference between the initial ability of the ability of mathematical thinking metaphorical students in the experimental class and the control class. This shows that students in the experimental class and the control class do not know much or know the material to be given, so the basic abilities are the same.

At the last meeting of the study, students in the experimental class and control class were given posttest with the intention of knowing the students' final ability after learning. The posttest results showed that the ability of mathematical metaphorical thinking of students in the experimental class who obtained the RME approach learning obtained a higher level of achievement and development compared to the control class that had regular learning. The average posttest results of the experimental class students are in the moderate category while for the control class the average posttest results are in the moderate category too. But the posttest results of students using RME learning were greater than the class using ordinary learning. This shows that the achievement of developing the ability of mathematical metaphorical thinking with the RME approach is better than that of ordinary learning.

Based on the results of the significance test the difference in the two averages shows that after learning, the achievement of developing the ability of mathematical thinking metaphorical in the experimental class using the RME approach learning is better than the control class that uses ordinary learning. This is because when learning with RME instruction students are required to be more active, creative, and critical in modeling problems, finding solutions to problems, so that when students are given other problems in the form of mathematical questions, these students are used to dealing with mathematical thinking problems

CONCLUSION

Based on data analysis, the development of mathematical Metaphorical Thinking capabilities of Bantaran Citarum Elementary School students through the RME approach is better than those that use ordinary learning.

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