Implementation of realistic mathematics education learning model with outdoor approach in elementary school: Study of presenting and processing data

S Haji* and Y Yumiati

Program Studi Pendidikan Matematika, Universitas Bengkulu, Jl. WR Supratman, Kota Bengkulu 38122, Indonesia

*salehhaji@unib.ac.id

Abstract. This research was aimed to implement Realistic Mathematics Education learning model with outdoor approach in elementary school at Bengkulu. The method used in this research was quasi-experiment. The research design used was pre-test post-test group design. Sample of the research were 94 students taken from 5th grade elementary students in Bengkulu. The instrument used about presenting and processing data was 4 items. Data was analysed qualitatively and quantitatively. The result from the research shows that Realistic Mathematics Education learning model with outdoor approach in elementary school students may improve student’s understanding ability about mathematics concept for high level school by 0.45; for medium level school by 0.41; and for low level school by 0.27. Meanwhile, the achievement of students’ mathematics concept understanding in elementary school for high level school is 77.31; for medium level school is 73.92; and for low level school is 57.86. The implication of research result is that the use of Realistic Mathematics Education learning model with outdoor approach is needed to improve the mathematics concept understanding of elementary school students.

1. Introduction

Realistic Mathematics Education as a learning model may improve critical thinking ability and emotional intelligence [1] and concept understanding about linear function [2]. Outdoor learning can make students enjoy learning, because outdoor learning will provide the best environment for students to learn [3].

Realistic Mathematics Education model with outdoor learning approach, each of them have their own advantages. The advantage of Realistic Mathematics Education model is to give students opportunity to do mathematics activity through finding activity (reinvention). While outdoor approach provides opportunity for students to connect mathematics with daily life [4].

Presentation and Data Processing Material are the materials on mathematics in grade 5 elementary school. This material is related to daily life. So that the implementation of the Realistic Mathematics Education model and outdoor learning approach is very appropriate.

The problems to be solved in this research are:

- Does Realistic Mathematics Education model with Outdoor Learning Approach can improve students concept understanding ability about presenting and processing data?
• How is the achievement of students’ mathematics concept understanding ability about presenting and processing data?

Realistic Mathematics Education model is a learning model that see mathematics as a human activity [5]. Mathematics must be connected to reality and mathematics as a human activity [6]. De Lange [7] says that the principles of Realistic Mathematics Education learning model are: 1. the use of contexts, the use of models, 3. the use of student’s own productions and constructions, 4. the interactive character of the teaching process, dan 5. the intertwining of various learning strands.

The Realistic Mathematics Education learning model can be done inside the classroom or outside the classroom. Outdoor mathematics learning is mathematics learning activities that are carried out outside the classroom [8]. According to Stevens & Scott [9], students who study outside of school have wider opportunities to understand various mathematical objects related to the environment around. The implementation of learning that is done outside the classroom is called the Realistic Mathematics Education learning model with an outdoor approach. This combined learning, will make learning more effective to improve students’ abilities in mathematics.

The syntax of the RME learning model with an Outdoor approach consists of: 1) Introduction; 2) Core activities; 3) Closing. In the introduction section, the teacher organizes a conducive classroom atmosphere, conducts apperception, conveys learning objectives, conveys learning methods and activities outside the classroom, forms student groups, conveys topic material to be learned, and conveys contextual problems that must be solved by students. The core section contains learning activities as follows: the teacher invites students outside the classroom, students solve contextual problems through observing real objects of daily life, measuring, counting, drawing, manipulating, discussing, interviewing, playing, reflecting, and discovering. The teacher guides and facilitates student activities outside the classroom. In the closing section, students present their findings in solving contextual problems and subject matter that they get during activities outside the classroom. Students make conclusions about the findings of the subject matter as well as the results of contextual problem solving. The teacher solidifies and aligns the results of contextual problem solving and the subject matter findings obtained by students. The teacher gives the stabilization questions of the material newly obtained by students and provides some explanations of the topic about the material for the next meeting.

2. Methods

The types of this research is quasi-experiment. The research population is 5th grade elementary students at Bengkulu city. The sample are 94 5th grade elementary students, which come from: 35 5th grade students of SDN 5 (high level school), 38 5th grade students of SDN 20 (medium level school), and 21 5th grade students of SDN 72 (low level school). The sampling method used was purposive sampling. The research instrument was in the form of essay test about “Presenting and Processing Data”.

Design of experiment in R & D research is as follow:

\[
\begin{align*}
& R \quad O_1 \quad x \quad O_2 \\
& R \quad O_1 \quad O_2
\end{align*}
\]

Note:

$O_1 = \text{Pre-test}$

$O_2 = \text{Post-test}$

$x = \text{Realistic Mathematics Education Learning Model with Outdoor Approach}$

One-way ANAVA was used to analyse the data which is to test the hypotheses about impact of Realistic Mathematics Education learning model with Outdoor Approach to the concept understanding ability about the topic Presenting and Processing Data.
3. Results and discussion

Analysis of research instrument items using SPSS shows that validity of item 1 is valid with $r = 0.58$, validity of item 2 is valid with $r = 0.64$, validity of item 3 is valid with $r = 0.75$, and item 4 validity is valid with $r = 0.58$. By using the split-half method, the reliability coefficient of the test set is 0.748, including the high reliability category. So the test set about Presenting and Processing Data can be used to determine the ability to understand mathematical concepts.

Mathematical learning about Presentation and Processing Data in 5th grade elementary school begins with the provision of contextual problems to students in the form of assignments to measure the height of each student outside the classroom [8], then the students are asked to record, present, and process the data of these measurements. All students record height accompanied by a discussion of the results of their recording. Next, students present the data in the form of diagrams. After that, they process the data to determine the highest, lowest and average data. Then there is a class discussion to equalize perception. Another activity, students do data collection on the results of mathematics test scores. Data search activities from contextual problems are carried out by students outside the classroom by conducting observation activities, observing the UKS room (Student Health Unit) to measure student height and to the School Administration room to find data on the results of mathematical tests, discussing, and drawing conclusions on the results of problem solving and findings. The student activities are carried out with the guidance of the teacher.

Some of students’ work is shown in Figure 1 below.

![Figure 1. Completion of presenting and processing data.](image)

Learning activities that are carried out through realistic mathematics learning with activities outside of the classroom have a positive impact on students' concept understanding of Presenting and Processing Data. Discovery activities at RME, make students to be able to utilize and develop previous knowledge in learning new knowledge [10]. While activities outside of the classroom, making students' insights, experiences and knowledge become broader. Students become more interested in learning mathematics. Students can understand well enough that the data is information about a phenomenon. Students can present and process data correctly [11].
The result of analysing the student’s work at high level, medium level, and low level school is shown at Table 1 below.

| School Level | Data     | Experiment Class | Control Class |   |
|--------------|----------|------------------|---------------|---|
|              |          | Pre-test | Post-test | N-Gain | Pre-test | Post-test | N-Gain |
| High         | N        | 35       | 35       | 35     | 35       | 35       | 35     |
|              | Min Score| 32       | 50       | 0.00   | 35       | 60       | 0.00   |
|              | Max Score| 90       | 95       | 0.88   | 100      | 100      | 1.00   |
|              | Average  | 58.51    | 77.31    | 0.45   | 72.69    | 82.54    | 0.32   |
|              | SD       | 14.42    | 13.34    | 0.26   | 15.28    | 11.24    | 0.30   |
| Medium       | N        | 38       | 38       | 38     | 35       | 35       | 35     |
|              | Min Score| 20       | 37       | 0.00   | 35       | 55       | 0.00   |
|              | Max Score| 85       | 90       | 0.78   | 90       | 90       | 0.60   |
|              | Average  | 56.84    | 73.92    | 0.41   | 66.06    | 77.74    | 0.33   |
|              | SD       | 15.09    | 15.59    | 0.23   | 14.83    | 9.99     | 0.17   |
| Low          | N        | 21       | 21       | 21     | 18       | 18       | 18     |
|              | Min Score| 10       | 22       | 0.03   | 11       | 28       | 0.02   |
|              | Max Score| 75       | 85       | 0.81   | 61       | 72       | 0.67   |
|              | Average  | 41.29    | 57.86    | 0.27   | 34.22    | 47.11    | 0.18   |
|              | SD       | 17.71    | 17.18    | 0.19   | 13.12    | 11.42    | 0.17   |

The Realistic Mathematics Education learning model with an Outdoor approach in Elementary Schools has given a positive impact on mathematics learning outcomes for students from high, medium and low level schools. The achievement of the ability to understand the mathematical concepts of high school students is 77.31, medium school students is 73.92, and low school students is 57.86. Achievement of low level school students is smaller than medium and high school level students. Likewise, the achievement of medium school students is smaller than high school students, but not much different.

The improvement of ability to understand the mathematical concepts of low level school students is 0.27 which is smaller than medium level students (0.41) and high level students (0.45). The Realistic Mathematics Education learning model with the Outdoor approach provides a major impact on improving the ability of understanding the Presenting and Processing Data material for high school students rather than medium and low school students. The intelligence of high school students is more accommodated through discovery activities conducted outside of the classroom. Likewise, medium and low school students. The activity of discovering and the atmosphere of learning in the classroom have motivated and inspired students to learn more passionately. Because learning outside the classroom provided a good atmosphere for students to learn [12]. The improvement of ability to understand mathematical concepts about the Presenting and Processing Data material is presented in Figure 2.

In the picture it appears that the increased ability to understand the concept of Presenting and Processing Data material of lower level students is 0.45 greater than students of medium level is 0.41 and high level is 0.27. This shows that the Realistic Mathematics Education model with Outdoor Learning Approach is more influential for low-level students. Because low-level students are better able to understand mathematical concepts through concrete objects in real situations. This is in accordance with the mental development of those who are in concrete operations.
Figure 2. Improvement of mathematics concept understanding ability based on school level.

4. Conclusion
The results show that the Realistic Mathematics Education learning model with an Outdoor Approach could improve the ability to understand mathematical concepts about the Presenter and Processing Data material for elementary students at high level school by 0.45, medium level school by 0.41, and low level school by 0.27. While the achievement of students’ understanding of mathematical concepts about the Presenting and Processing Data for students in high level school is 77.31, medium level school is 73.92, and low level school is 57.86.

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