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The Understanding Profiles Of The Subject 1 About The Philosophy, Principles, And Characteristics Of RME Before Subject 1 Learns From The Learning Resource

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Abstract

This study aims to create a profile understanding and elementary school teachers who have not been following PMRI workshops before and after the study of learning resources on realistic mathematics approach in understanding the philosophy, principles, and characteristics of realistic mathematics approach. This type of research used in this study is qualitative research. Step-by-step analysis of qualitative data which was built by Miles and Huberman (1994) is used to create a profile understanding of research subjects. There are four elementary school teachers who become subjects in this study. These four subjects were classified into two terms, namely have or have not participated in the PMRI workshops and a class or mathematic teacher. The understanding profiles described in this paper is the understanding profile of a classroom teacher who taught in the grade five in the private elementary school, and have attended the PMRI workshops. The understanding profile of the teacher are as follows: (1) subject 1 does not yet have an understanding what is the RME philosophy, and her understanding about the meaning of mathematics as a human activity is in the daily life, human can use their mathematics knowledge; (2) the subject 1's understanding about the RME principles is the teaching learning process can connect the student pre knowledge and the daily life problem which are given by teacher to students; and (3)the subject 1's understanding about the RME characteristics is that teacher in the teaching learning process uses the examples which are often found in the children daily life. That is, if the teacher gives examples to the students, the teacher must provide a plausibility example for students, for example: if the teacher creates a problem that is related to the size of a field, then the field size is cultivated approximate the real size of the field in the daily life.

Key Words: understanding profile, realistic mathematics education (RME), and the realistic mathematics education learning resource.

1. Introduction

Realistic Mathematics Education Indonesia (PMRI) is an implementation of realistic mathematics approach in Indonesia, which began in 2001. PMRI movement is a movement to apply a realistic mathematical approach in teaching and learning process in mathematics. The aim of this movement is to improve the quality of teaching and learning process in mathematics. The implementation of PMRI started from primary level, and was started by 4 LPTK (Institute of Teacher Training). In the initial implementation, the 4 LPTK collaborated with 12 elementary/MIN. The implementation process always started with a workshop for school teachers who want to implement PMRI. There are two levels of the workshop held by the PRI team, namely local workshops and national workshops (Suryanto et al., 2010).

According the researcher, there is a quite fundamental weakness of the workshop, namely that the material given in the workshop was not illustrate how a teacher do the progressive mathematization process. The materials given in the workshop were about contextual issues that can be used by teachers to teach a mathematical concept, and models of solution that may be made by the student to solve the contextual issues

(models of), but the next steps that need to be done to help the students to achieve a model for and finally a formal mathematical knowledge were almost never given. Consequently, the understanding of teachers who attended workshops on progressive mathematization process is not complete.

This conjecture is supported by the findings that were founded by the researcher when the researcher observed on the teaching and learning process undertaken by teachers who attended the workshop PMRI when they are taught in class. The findings are teachers had difficulties to do the progressive mathematization process. One finding was discovered by the researcher when the researcher observed in grade two on September 30 and October 1, 2010. The teaching and learning process already begins by providing contextual issues that can be used by students in the phenomenological exploration, but in the next step the teacher did not give a series of problems associated with the given problem in the beginning so that the process of progressive mathematization may occur.

Base on some input from some teachers who attended the workshop PMRI that give to the researcher, the researcher knew that there were teachers who did not understand about the philosophy, principles, and characteristics of realistic mathematics approach and they had a desire to learn about realistic mathematics approach from various references, but in the process of learning they are often hampered by the language factor. Because it is for now, the realistic mathematics approach references are more in English than in the Indonesian language. According to researcher, if the teacher can learn from a reliable reference about the philosophy, principles, and characteristics of realistic mathematics approach by themselves, the teacher will also be able to construct an understanding of the philosophy, principles, and characteristics of realistic mathematics approach. Therefore, in this study, the researcher want to know about the understanding of teachers who have and have not participated in the PMRI workshop about the philosophy, principles, and characteristics of realistic mathematics approach before and after they learned the realistic mathematics approach learning resource by themselves. In other words, by doing this research, the researcher would like to get an answer for the question of how cognitive profiles of teachers who have and have not participated in the PMRI workshop before and after studied the RME learning resource compiled by the researcher.

2. Research Questions

From the introduction that was outlined by the author, the author noticed that there are problems that need to look for the answer sought through a process of research, namely how are the understanding profiles about the philosophy, principles, and characteristics of realistic mathematics approach of elementary school teachers who have and have not been following the PMRI workshop before they study the RME learning source?

3. Qualitative Research

According to Denzin and Lincoln (in Merriam, 2009), qualitative research is an activity that puts the observer in the world. According to Denzin and Lincoln (in

Merriam, 2009), a qualitative researcher studies things in their natural situation, try to consider, or interpret the phenomena. Van Manen (in Merriam, 2009) says that qualitative research is an umbrella term that covers an unity of interpretation techniques that try to describe, encode, translate, and interpret naturally occurring phenomena in the social world .

According to Merriam (2009), there are four characteristics of the qualitative research, namely:

a. Focus on meaning and understanding.
   Qualitative researchers are interested in how people interpret their experiences, how they construct their world, and what meaning they attribute to their experiences. Overall, the goals of qualitative research are to achieve an understanding of how people make sense of their lives, to describe the interpretation process, and to describe how people interpret their experiences.
b. The researchers are the main instrument for data collection and analysis.
c. An inductive process.
   Other important characteristic of the qualitative research is an inductive process, which the researchers collected data to build concepts, hypotheses, or theories.
d. The results of qualitative research are a rich description

According to Miles and Huberman (1994), there are three stages in the analysis of the qualitative data, namely:

a. Data reduction.
   The process of data reduction is related with the electoral process, centralization, simplification, abstraction, and transformation of data obtained from the script and transcription from the research field. Data reduction occurs continuously throughout the qualitative research conducted. Data reduction can be initiated before the data is actually collected (anticipatory data reduction).
b. Presentation of data.
   Presentation of data is the organized information is and do not contain things that are not relevant which allows making conclusions and actions.
c. Making conclusions and verification
   Making conclusions and verification are a process to record the regularities, patterns, explanations, links between one part and other part, causality, and statements that can be inferred from the existing data. A skilled researcher do not view these conclusions as something that is final, maintaining an openness and skepticism attitude, though the conclusions of global first and blurred, then rise and fundamental explicitly. Final conclusions will not appear until the collection data process is completed.

Denzin (1978 in Merriam, 2009) proposes four types of triangulation, namely: (1) method triangulation, (2) triangulation of data sources, (3) researcher triangulation, and (4) theory triangulation. In the method triangulation, qualitative researchers use a variety of methods to approximate the data. For example, data obtained from interviews with research subjects is cross-checked with data obtained from observation and reading documents. If it is done by qualitative researchers, it can be said that the researchers

used the method triangulation and the method used to approximate the data is by interview, observation, and reading documents (Merriam, 2009).

4. Realistic Mathematics Education

Table 4.1 The component of RME and the element of each component of RME

Component of RME	The element of each component of RME
Philosophy	Mathematics as a human activity.
Meaning of mathematics as a human activity	a. Mathematics is constructed from human activities. b. Mathematics can be implemented in human activities.
Principles	There are three principle PMR, namely: a. Guided reinvention and progressive mathematizing. b. Didactical phenemenology. c. Self developed models.
Principle 1a: guided reinvention.	a. The reinvention process of the concepts and procedures of mathematics is done by the students themselves. b. There is the guidance process in the reinvention process of the concepts and procedures of mathematics by students.
Principle 1b: progressive mathematizing	a. Mathematizing process. b. Horizontal mathematizing process. c. Vertical mathematizing process. d. Progressive mathematizing.
Principle 2: didactical phenomenology	There is a phenomena or a contextual problem explored by students.
Principle 3: self developed models	a. There are models that are built as a result of the mathematizing process. b. A model is a mathematics representation form of the problem and the solution of the problem in the problem solving process. c. There are four levels in the model, i.e. situational model, model of, model for, and formal model.
Characteristics	Five characteristics of RME are a. phenomenological exploration; b. bridging by vertical instruments; c. student contributions; d. interactivity; e. intertwining.
Characteristic 1: phenomenological exploration	a. There are phenomena that can be explored by students to bring them to mathematizing, horizontal mathematizing, vertical mathematizing, and progressive mathematizing. b. There are phenomena that can be explored by

	students to make them to a situational model, a model of, a model for, and a formal model. c. At the end, the phenomena explored by students can bring them to the reinvention process of the concept and procedure of mathematics. d. The first role of the contextual problem in realistic mathematics approach is to establish the mathematics concept and procedure, and the second role is to implement the concept and procedure of mathematics that has been owned by the student. e. Definition of a contextual problem.
Characteristic 2: bridging by vertical instruments	a. The definition of mathematizing. b. The four stages of the problem solving process are (1) the presentation of the problem, (2) write the problem in the language of mathematics, (3) solve the problem mathematically, and (4) translate the solution to the context. c. The definition of horizontal mathematizing. d. The definition of vertical mathematizing. e. The definition of progressive mathematizing.
Characteristic 3: student contributions	a. The definition of of models. b. Students contribute to mathematizing, horizontal mathematizing, vertical mathematizing, and progressive mathematizing. c. Students contribute to a situational model, a model of, a model for, and a formal model. d. At the end, the students contribute to the reinvention process.
Characteristic 4: interactivity	a. Students receive the guidance from the "adult" in the mathematizing, horizontal mathematizing, vertical mathematizing, and progressive mathematizing. b. Students receive the guidance from the "adult" in the constructing process of a situational model, a model of, a model for, and a formal model. c. At the end, the guidance of the "adults" can bring students to the reinvention process. d. A negotiation process occurs between the students in the mathematizing, horizontal mathematizing, vertical mathematizing, and progressive mathematizing. e. A negotiation process occurs between the students in the constructing process of a situational model, a model of, a model for, and a formal model. f. At the end, a negotiation process occurs between

	the students bring them to reinvention process of the concepts and procedures mathematics.
Characteristic 5: intertwining.	In order to set up a comprehensive formal mathematical knowledge, it is in the constructing process of a formal mathematical knowledge, students need to get a chance to make the fabric between the knowledge which they already have and the new knowledge.

5. Research Methodology

Broadly, the steps are carried out by the researcher in building cognitive profiles above are as follows:

a. Making an observation sheet, a worksheet 1 and 2, an interview sheet, student learning materials, and teacher guides.
b. Validating the observation sheet, the interview sheet, the student learning materials, and the teacher guides.
c. Implement the student learning materials and the teacher guides, and make a recording of the implementation process of student learning materials and teacher guides. The results of the implementation become examples to explain about the philosophy, principles, and characteristics of realistic mathematics education in a learning resource.
d. Building the learning resource for teachers that contains: a description of the philosophy, principles, and characteristics of realistic mathematics approach with simple language that needs to be understood by research subjects. The steps used to build the learning resource followed the developmental research steps.
e. Trying out of the worksheet 1 and 2, the interview sheet, and the learning resource to 3 PGSD students, and 3 elementary school teachers.
f. Making the understanding profiles of trial research subjects involved in the trial. The steps that used to develop the understanding profile are done in accordance with the steps in the qualitative data analysis revealed by Miles and Huberman (1994).
g. Revising the worksheet 1 and 2, the interview sheet, and the learning resource based on the trial results.
h. Validating the worksheet 1 and 2, the interview sheet, and the learning resource by experts.
i. Revising the worksheet 1 and 2, the interview sheet, and the learning resource based on the stricture from experts who validate the instruments.
j. Requiring the research subjects do the worksheet 1 and 2.
k. Interviewing the research subjects using the interview sheet.
l. Reducing and presenting the data, make inferences, and verification.
m. Doing the data triangulation. The triangulation data process in this research is the method triangulation process.
n. Making the understanding profiles of the research subjects about the philosophy, principles, and characteristics of the RME before they learn the learning resource.

6. Results and Discussion

There are four elementary school teachers become the research subjects in this research. These four subjects can be classified into four classes based on already have or

have not followed the PMRI workshops, and the classroom teacher or the mathematics teacher. In this paper, the authors will only describe the understanding profiles of the one of four research subjects who is the classroom teacher, teachs in the grade five in the private elementary school, and already follows the PMRI workshop. In this study, the teacher is identified as subject 1. The following understanding profiles are the subject 1' understanding description about the philosophy, principles, and characteristics of RME before she studied the RME learning resource.

Table 6.1 The understanding profiles of the subject 1 about the philosophy, principles, and characteristics of realistic mathematics education before studying learning resources

Component of RME	The understanding profiles
Characteristics of RME	• The RME characteristic is that teacher in the teaching learning process uses the examples which are often found in the children daily life. That is, if the teacher gives examples to the students, the teacher must provide a plausibility example for students, for example: if the teacher creates a problem that is related to the size of a field, then the field size is cultivated approximate the real size of the field in the daily life.
Characteristic 1: phenomenological exploration	
Explanation about the first characteristic of RME	• The meaning of this characteristic is that teacher in the teaching learning process uses the examples which are often found in the children daily life. That is, if the teacher gives examples to the students, the teacher must provide a plausibility example for students, for example: if the teacher creates a problem that is related to the size of a field, then the field size is cultivated approximate the real size of the field in the daily life.
Mathematizing process	• The mathematizing process is the problem solving process using mathematical calculations or concepts.
The contextual problem	• The contextual problem is the problem appropriate with the material to be learned by students, and close by the student daily life. • An example of the contextual problem: when the students follow the sport lesson, students were asked by the teacher to do the warm-up activity by running around the field in the school. The length of the field is 15 meters, and the width of the field is 12 meters. Calculate the distance which is taken up by the students in the warm-up activity, if they were asked to surround the field two times! • The example is the contextual problem because when students do the sport lesson, students were asked to warm up. The size of the field that gave in the example approximated the real size of the field that is in the school. • Mbah Joyo problem is the contextual problem, but if the problem is given to the students, there are some sentences that confuse students. • The bread dividing problem is not the contextual problem due to

	a mini trip commonly experienced by students, students are not divided up to visit different places in the same time.
The roles of the contextual problem	• The roles of the contextual problem are (1) helping students to understand the material, (2) helping students to find their own mathematics concepts relating to the material, and (3) helping students to understand the concepts and be able to last longer in the children memory.
Characteristic 2: bridging by vertical instruments	
Explanation about the second characteristic of RME	• Subject 1 does not yet have the understanding about the second RME characteristic.
The stages of the contextual problem solving process	• The four stages of the contextual problem solving process: a. Understanding the problem. b. Developing relation between the things that are known from the problem and the knowledge that the students already have. c. Trying to resolve these problems in several ways. d. Concluding that the proper way to resolve the problem.
Horizontal mathematizing	• Subject 1 does not yet have the understanding of the horizontal mathematizing process.
Vertical mathematizing	• Subject 1 does not yet have the understanding of the vertical mathematizing process
Progressive mathematizing	• Subject 1 does not yet have the understanding of the horizontal and vertical progressive mathematizing process.
Characteristic 3: student contributions	
Explanation about the third characteristic of RME	• The meaning of this characteristic is that students need to be given the opportunity to contribute in the reinvention process by different solution.
Model	• The model is something that is used to represent the problem to be solved child, so the child easily grasps what the purpose of the problem. The model can be an example, an image, or a demonstration.
Characteristic 4: interactivity	
Explanation about the fourth characteristic of RME	• The meaning of this characteristic is that "adults" and the negotiation process play role to help the students to use all their knowledge when they reinvent the mathematics concept properly in the reinvention process.
Negotiation process	• The negotiation process is a discussion process between students with each other in the reinvention process.
Characteristic 5: intertwining.	
Explanation about the fifth characteristic of RME	• The meaning of this characteristic is that students need to be facilitated to make the link between their preknowledge and their new knowledge, so they can be used them to reinvent the other

	concept.
The principles of RME	• The RME principle is that the teaching learning process can connect the student pre knowledge and the daily life problem which are given by teacher to students.
Principle 1: guided reinvention and progressive mathematizing	
Explanation about the first principle of RME	• The meaning of the guided reinvention principle is that students are given the opportunity to reinvent the concept, and in the reinvention process, teacher plays role to coach students so that the concept reinvented by students is correct. • Subject 1 does not yet have an understanding about the progressive mathematizing principles.
Principle 2: didactical phenomenology	
Explanation about the second principle of RME	• The meaning of this principle is that the teaching learning process can connect the student pre knowledge and the daily life problem which are given by teacher to students.
Principle 3: self developed models	
Explanation about the third principle of RME	• The meaning of this principle is that students should find something that in the PMR is called a model at its disposal to help solve the problem given to their teacher. • The meaning of the following statement "when teacher seek to build the formal mathematical knowledge of students, teachers need to do with the bottom-up approach" is the teaching and learning process begins from the basic things that students known to the matters relating to the material the students will learn.
The philosophy of RME	• Subject 1 does not yet have an understanding what is the RME philosophy.
Explanation about the mathematics as a human activity	• The meaning of mathematics as a human activity is in the daily life, human can use their mathematics knowledge.

7. Conclusions

Subject 1 does not yet have an understanding what is the RME philosophy, and her understanding about the meaning of mathematics as a human activity is in the daily life, human can use their mathematics knowledge.

The subject 1's understanding about the RME principles is the teaching learning process can connect the student pre knowledge and the daily life problem which are given by teacher to students.

The subject 1's understanding about the RME characteristics is that teacher in the teaching learning process uses the examples which are often found in the children daily life. That is, if the teacher gives examples to the students, the teacher must provide a plausibility example for students, for example: if the teacher creates a problem that is related to the size of a field, then the field size is cultivated approximate the real size of the field in the daily life.

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