Primary School Teachers' Perspectives on Designing Realistic Mathematics Education-Based Learning

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Abstract: The research is motivated by the phenomenon experienced by primary school teachers who have to face 21st century learning in which one of the demands of the teachers must have creativity. In addition, the curriculum that is run in Indonesian schools must be in accordance with the demands of the national curriculum based on textbooks provided. In this study, primary school teachers' perspectives were analyzed in accordance with their ability in implementing Realistic Mathematics Education (RME) using its characteristics. The qualitative descriptive is chosen to achieve the research goal. 67 primary school teachers from 13 provinces were involved in this research. The output target in this research is used to produce the prototype of Teacher Continuous Professional Development to improve primary school teachers' ability in implementing Realistic Mathematics learning contexts in their class.

Keywords: Realistic Mathematics Education, teachers'perspective, primary school

INTRODUCTION

Entering globalization and digital technology era in 21st century learning demands high competitiveness among people. The challenges faced by the community are also more in the context of realizing quality Human Resources (HR) that are ready to compete in the era of the industrial revolution (Ellitan, 2020). One of the phenomena in education field that exist is the need for innovation that is created by teachers.

According to (Rahayu et al., 2018), teachers' professional competence and school fruitfulness are influenced by innovation and emotional intelligence. Creativity is very closely related to skills or proficiency in designing the context of learning and the use of technology and information that exists today (Lawrence, 2016). This is very necessary to support the learning process which is a daily routine for a teacher, especially in learning mathematics which is judged by people as a difficult subject. (Salihu et al., 2018) stated that teaching and learning mathematics is a complicated process that demands a variety of cognitive challenges. The aim of mathematics educator is to provide the development of people in community, students' creativity and self-awareness through the learning mathematics experience (Ernest, 2004). Furthermore, it is stated that the strong aim is to improve the mathematics learner related to self-esteem and as a confident epistemological agent in mathematics.

In teaching and learning mathematics, there is one theory developed in The Netherlands since the 1970s by Hans Freudenthal, namely Realistic Mathematics Education (RME) and was adapted in Indonesia into *Pendidikan Matematika Realistik Indonesia*/ PMRI (Pramudiani et al., 2016a). One of the characteristics of RME is that mathematics is a human activity (Pramudiani & Herman, 2021). Since mathematics is an important part in human's life, it is ought that various contexts can be developed by teachers as the main of educator, but the study conducted by (Purnomo et al., 2019) found that most of Indonesian teachers tend to hold negative beliefs, especially there is a gap between educational research' findings and their classroom practices. Furthermore, it is stated that the traditional paradigm that the teachers' duty is to teach only has to be changed because "a teacher is also a researcher".

However, according to Burton (in (Eligio, 2017), the creativity is rarely showed in learning mathematics. Meanwhile, in the current national curriculum, mathematics is integrated into thematic especially for lower grades (grade 1, 2, and 3 primary school), and it is still also based on material textbooks. Besides that, RME in Indonesian culture has been translated differently from what was originally described by the Dutch educators (the level principle, activity principle, guidance principle, and interactivity principle (Revina & Leung, 2021). Furthermore, it is stated that as for the intertwinement principle, while the PMRI textbook has adopted this principle in their content, teachers preferred the content-based lesson that teach mathematics according to the topics rather than combining various topics in one lesson.

This is in line with the preliminary study conducted by the researcher which shows that the most difficulties for the teachers who already implemented RME in their class is integrating mathematics with other subjects (Bahasa, Citizenship Education, Culture and Crafts/ Arts, Sport, etc). We called it Tematik Terpadu. In the meantime, the designing context is the first characteristic of RME i.e. phenomenological exploration which is a starting point for implementing RME (Pramudiani et al., 2011; Zulkardi & Putri, 2006) and, in PMRI, it is usually based on local wisdom area. According to the interview results conducted by the researcher, it makes teachers difficult to adjust to the time allocation provided in the curriculum.

The following figure shows the responses of 67 primary school teachers when they were asked about what is the most difficulties in implementing RME/PMRI based on 5 characteristics of RME.

Picture 1. The Preliminary Study about Teachers' Difficulties in Implementing RME/PMRI

From the picture above, it can be seen that 46,3% teachers chose that the most difficult stage was integrating mathematical concept with other topics, 22,4% teachers chose designing mathematical context based on their local wisdom area, 16,4% teachers chose using models for progressive mathematization, 14,9% chose using student's own construction and production, and no one chose interactivity.

Departing from the problem faced by the primary school teachers in implementing RME/PMRI, this research has aim to analyze primary school teachers' creativity in designing Realistic Mathematics Education RME/PMRI.

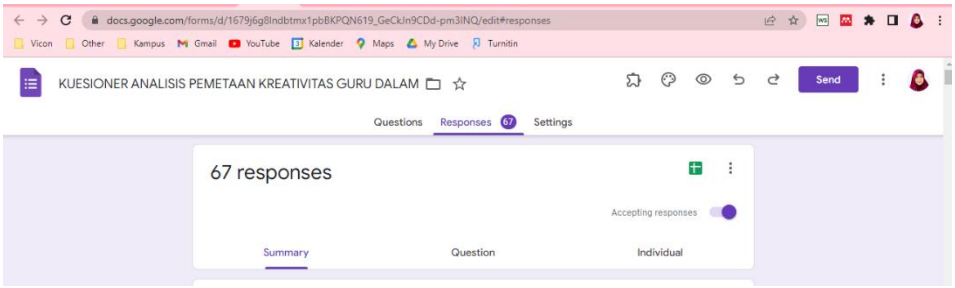
METHOD

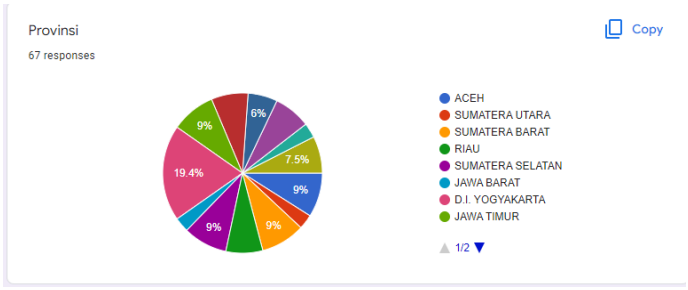
The method of this research is descriptive qualitative. To reach the goal of this study, the researchers conducted qualitative descriptive research. This was compatible with what (Creswell, 2012) described concerning characteristics of qualitative research, several of them were natural setting, participants' meaning, and theoretical lens. Therefore, to achieve the goal of this study, we conducted

observation in their classes and analyzed their answers using Likert Scale, and after that the open questions were conducted to obtain further explanation about their understanding toward learning theories

Participants

The participants of this research were 67 primary school teachers from 13 provinces in Indonesia who join Realistic Mathematics Education workshop





Procedures

The study involved compiling data through an observation, closed questions using Likert Scale, and open questions. The procedures used as follows:

Table 1. Details of Research Procedures for Each Aspect of Research

Research Aspects	Methods	Procedures	Achievements
First Phase			
Identify teachers' creativity through discussion class.	a. Literature review b. Focus Group Discussion 1 with pre-service primary school teachers	Consider and review primary and secondary sources related to teachers' creativity by consulting an expert.	Identifying primary school teachers' creativity toward designing Realistic Mathematics Education.
Second Phase			

Research Aspects	Methods	Procedures	Achievements
Development instrument and device for capture data for identifying primary school teachers' creativity.	Test Validity, and Reliability as well as face, content, and research instrument validity	a. Test the content and face validity by consulting a specialist at the field. b. The instrument improvement found primary school teachers' creativity	Test instruments, observation guidelines and open questions guides as well as primary school teachers' creativity
Third Phase			
Sampling, data collection and analysis of qualitative method.	a. Administrative test; b. Target selection; c. Observation;	a. The research target were given a test that has been adapted and revised; b. Identify primary school teachers' creativity toward implementing Realistic Mathematics Education.	Analysis of how primary school teachers' creativity toward implementing Realistic Mathematics Education.

RESULTS AND DISCUSSION

According to the research result conducted by the researcher which shows that the most difficulties for the teachers who already implemented RME in their class is integrating mathematics with other subjects (Bahasa, Citizenship Education, Culture and Crafts/ Arts, Sport, etc). We called it Tematik Terpadu. In the meantime, the designing context is the first characteristic of RME i.e. phenomenological exploration which is a starting point for implementing RME (Pramudiani et al., 2016b; Zulkardi & Putri, 2006) and, in PMRI, it is usually based on local wisdom area. According to the interview results conducted by the researcher, it makes teachers difficult to adjust to the time allocation provided in the curriculum.

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CONCLUSION AND SUGGESTION

According to the research results, it can be concluded that problem-oriented mathematics education puts mathematics in context. In realistic mathematics education, the real world is used as a starting point for the development of mathematical concepts and ideas. The problem of context in a realistic curriculum fulfills a number of functions, namely: Concept formation: in the first phase of a lesson, students are given the opportunity to access mathematics naturally. Model formation: Problem contexts are a solid basis for formal learning of operations, procedures, notations, rules, and they do this in conjunction with other models that serve as important support for problem thinking. Model formation is a process in which context is a model of a particular situation and practice of special ability training in applied situations.

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