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Study Literature Review: Realistic Mathematics Education Learning on Students' Mathematical Creative Thinking Ability

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ABSTRACT

This study aims to re-analyze Realistic Mathematics Education (RME) learning on students' mathematical creative thinking skills and then the results of the analysis from these studies are combined and obtained an overall conclusion. The method used in this study is the Systematic Literature Review (SLR) method. The SLR method is used to identify, review, evaluate, and interpret all available research with topic areas of interest to phenomena, with specific relevant research questions. With the use of the SLR method, a systematic review and identification of journals can be carried out, which in each process follows the steps or protocols that have been set. Data collection is done by searching journals and proceedings indexed by Scopus in the last 10 years with the keywords used in this search are "Realistic Mathematical Education (RME)", and "Creative Thinking Ability". From a search using these keywords, 8 articles were obtained that met the criteria for Realistic Mathematical Education (RME) on students' creative thinking abilities. Then the data obtained were analyzed. The data analysis used is quantitative data analysis with percentages and qualitative data analysis for the data from the narrative study of the studies encountered. Based on the results of research and discussion of research, it can be concluded that RME learning plays a role in improving students' mathematical creative thinking skills.

INTRODUCTION

In general, education is a process of learning knowledge, skills and habits carried out by an individual from one generation to another. The existence of education can also improve intelligence, noble character, personality and skills that are useful both for themselves and the general public. According to Law no. 20 of 2003 article 3 concerning the National Education System, the purpose of national education is to develop the potential of students to become human beings who believe and fear God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent, and become citizens who democratic and responsible. In line with the development of the paradigm of the world of education, a number of breakthroughs to improve the quality of education in order to be able to produce graduates who are ready to compete globally in the future are aimed at

producing graduates who are competitive, innovative, creative, collaborative and have good character (Muslim,2017).

There are 4 abilities that must be mastered by students so that they can survive or even color life. The four abilities are (1) critical thinking, (2) creative thinking, (3) working together, and (4) communication (Mulyana, et al: 2015). According to Lince (2016), the ability to think creatively is one of the abilities that must be possessed by students because creativity can affect the success of students learning mathematics and other sciences. Creativity is built on four basic aspects of creativity, namely: creative people, creative ideas, creative processes, and creative environments, (Guilford, 1967; Wadaani, 2015; Welsch, 1973; MacKinnon, 1975; Munandar, 1977). The reality on the ground shows that students' mathematical creative thinking skills are still low (Rohaeti & Dedy, 2013; Amalia, et al, 2015). Creative thinking students can generate ideas, make decisions and make generalizations. Munandar (2012) argues that creative thinking is to provide various possible answers based on the information provided with an emphasis on the diversity of numbers and suitability.

According to Wulandary (in Rohani: 2015) that the level of creativity of Indonesian children compared to other countries is at a low level. This information is based on research conducted by Hans Jellen from the University of Utah, USA and Klaus Urban from the University of Hannover, Germany. The sample was 50 children aged 10 years in Jakarta and the results were presented at the international conference on gifted children in Salt Lake City, Utah, United States, in August 1987. Of the 8 countries studied, the creativity of Indonesian children was the lowest. The following in a row from the highest to the lowest the average test scores are: Philippines, United States of America, United Kingdom, Germany, India, China, Cameroon, Zulu, and Indonesia. This is presumably because Indonesia is an environment that does not support these children to express their creativity, especially the family and school environment.

Freudenthal (in van den Heuvel-Panhuizen, 2003) argues that mathematics is a human activity and needs to be significantly linked to the concepts of students' daily lives. One of the learning models that are oriented to everyday life experiences and can improve students' creative thinking skills is the Realistic Mathematics Education (RME) learning model or in Indonesia known as Indonesian Realistic Mathematics Learning (PMRI). According to Fauzan (2002) RME learning allows an interactive teaching and learning process so that students can focus their attention on all activities in the classroom. Furthermore, Habsah (in Ulfah: 2020) revealed that giving realistic problems through RME can be used to train students' abilities. Reasoning ability by connecting real life problems with formal mathematics, human activities in everyday life cannot be separated from the use and application of concepts in mathematics (Nuraida, 2017). In other words, according to Arnellis (2020) the phenomenon of the didactic principle states that learning activities with the RME approach start from contextual problems which ultimately lead to mathematical concepts. Thus, reality and interweaving as RME principles can be used to encourage one's creative thinking process.

The Realistic Mathematics Education (RME) model requires students to construct knowledge with their own abilities through the activities they do in learning activities. Gravemeijer (1994:91) suggests three key principles of realistic mathematics learning, namely guided reinvention/progressive mathematizing, didactical phenomenology and self-developed models. This study aims to re-analyze Realistic Mathematics Education (RME) learning on students' mathematical creative thinking skills and then the results of the analysis from these studies are combined and obtained an overall conclusion.

Based on the problems above, this study will present a study of Realistic Mathematics

Education (RME) learning and students' creative thinking abilities. The results of the study can be used as a guide for teachers to determine the effect of Realistic Mathematics Education (RME) learning on students' mathematical creative thinking abilities. As well as improving students' creative thinking skills by using Realistic Mathematics Education (RME) learning.

METHOD

The type of research used is Systematic Literature Review (SLR) research. SLR is a literature review that identifies, assesses, and interprets all findings on a research topic, to answer previously determined research questions.

To complete this research, the researcher collected journal articles and proceedings indexed by Scopus with the help of the Publish or Perish application. The keywords are Realistic Mathematics Education (RME) and Creative thinking ability. The articles collected were only articles published in the last 10 years, namely from 2011 to 2021. After entering the keywords, 11 articles were obtained. Next, the researcher reads the 11 articles whether the articles really match the keywords used or not. The researcher grouped the articles both related to learning mathematics and learning outcomes in general. Of the 11 articles, 8 articles were selected because 3 articles did not match the keywords used. Then the data obtained were analyzed.

Data collection techniques using documentation techniques. The population in this study were all written documents regarding research using the RME learning model and mathematical creative thinking. The written documents are in the form of journals and proceedings indexed by Scopus. Samples were taken from Scopus indexed articles regarding the RME learning model and mathematical critical thinking skills. The data analysis used is quantitative data analysis with percentages and qualitative data analysis for the data from the narrative study of the studies encountered.

The metadata of the articles was tabulated including the author's name, title, year of publication, journal name, type of research and research results. After that, the researcher reviewed and analyzed the article regarding research methods, population and samples, data collection methods, and research results presented in the discussion section and conclusion section.

RESULTS AND DISCUSSION

In the search for articles, the researchers initially only looked for one criterion, namely the keyword, namely Realistic Mathematical Education (RME) and obtained 200 articles that matched these keywords. After that, the researchers searched for the keywords Realistic Mathematical Education (RME) and Creativity Thinking Ability, and found 11 articles related to these keywords. Then the researcher analyzes each article, the researcher narrows down the criteria in order to reduce errors or errors in this study, namely selecting samples based on the last criteria, this last criterion is the article that will be taken is a quantitative study involving 2 classes, namely the experimental class and the control class to see the comparison between the 2 classes, 8 out of 11 articles were selected. So these 8 articles will be used as samples for use in this SLR research.

At this stage the researcher codes the sample to be studied with the first sample being S1, the second sample being S2, the third sample being S3, until the last sample is S8. The results of the study obtained 8 articles related to the Realistic Mathematical Education

learning model on students' creative thinking abilities. Then the data is reported back in a qualitative and quantitative descriptive manner. The 8 samples used are as follows:

1. S1: Students' creative thinking process stages: implementation of realistic mathematics education (Sitorus: 2016)
2. S2: Use of Integrated Mobile Application With Realistic Mathematics Education: A Study to Develop Elementary Students' Creative Thinking Ability (Rudyanto: 2019)
3. S3: Design Module Of Learning With Rme Approach To Improve Creative Thinking Ability (Badengo: 2019)
4. S4: Design Of E-Module With RME Approach To Improve The Creative Thinking Ability Of Students (Achmad: 2020)
5. S5: The Effect of Treffinger Creative Learning Model with the Use RME Principles on Creative Thinking Skill and Mathematics Learning Outcome (Ndiung: 2021)
6. S6: Creative thinking skill of students through realistic mathematics education approach (Ismunandar et al: 2020)
7. S7: Mathematics Module Based On RME To Improve Students Creative Thinking (Rubiyanti: 2020)
8. S8: Development of teaching materials based on realistic mathematic education and its implementation in improving students' creative thinking skills on comparative material (Royhana et al: 2021)

Based on a review of 8 studies, SLR data can be generated based on research design on the RME learning model and creative thinking skills using several research designs, namely: experimental research, development research, qualitative research, and mix method research (qualitative and quantitative research). In 8 studies on RME and creative thinking skills, the designs used are as shown in table 1.

Table. 1. Design in RME Research and Creative Thinking Ability

No	Research Design	Frekuensi	Percentage
1	Eksperiment (S5 dan S6)	2	25
2	Pengembangan (S2, S3, S4, dan S7)	4	50
3	Kualitatif (S1)	1	12.5
4	Mix Method (S8)	1	12.5
		8	100

SLR based on population or population sample used in RME research on creative thinking skills which are the research subjects are students from three school levels. In 8 studies on RME and creative thinking skills, people who are used as populations or samples can be seen in table 2.

Table. 2. Population or Sample in RME Research and Creative Thinking Ability

No	Population atau Sample	Frekuensi	Percentage
1	Elementary school students (S1, S2, dan S5)	3	37.5
2	Junior high school students	5	62.5

	(S3, S4, S6, S7, dan S8)		
3	Senior high school students	0	0
		8	100

SLR based on the methods or data collection techniques used in the RME learning model and creative thinking skills consist of: Test, Observation, Questionnaire, and Interview methods. In 8 studies on RME and creative thinking skills, the methods or data collection techniques used can be seen in table 3.

Table. 3. Methods or Data Collection Techniques on the RME Learning Model and Mathematical Creative Thinking Ability

No	Metode/ Teknik Pengambilan Data	Frekuensi	Persentage
1	Test (S1, S2, S4, S6, dan S8)	5	62.5
2	Questionnaire (S3)	1	12.5
3	Interview (S4)	1	12.5
4	Observation (S7)	1	12.5
		8	100

From the research objectives of RME and creative thinking skills obtained, it is found that in developing or improving learning, testing the impact or influence of one or several teaching styles on students, comparing descriptively between the two teaching styles studied and describing teaching styles as a learning method. Based on a study of 8 studies, the following data were generated.

Table. 4. Objectives in RME Research and Mathematical Creative Thinking Ability

No	Research Purposes	Frekuensi	Persentage
1	Developing Teaching Materials (S2, S3,S4, dan S7)	4	50
2	Knowing Relationships	0	0
3	Describe (S1)	1	12.5
4	Knowing the Effect of Learning Model (S5, S6, dan S8)	3	37.5
		8	100

Increased creative thinking skills because of the learning model provided. Realistic Mathematics Education (RME) learning provide a positive influence on students' creative thinking skills. According to Ismunandar (2020) students can still reach the minimum standard targeted creative thinking skills. In this study the researchers concluded that learning using RME. This approach is quite effective to improve students' creative thinking.

Sitorus (2016) The main objective of RME is to enable students to apply mathematics. In RME, the reality principle is not always developed during the last stage of a lesson process, but also a source to learn mathematics. Mathematics is developed from the reality of mathematics, thus learning mathematics should be also begun by a realistic mathematics process.

In addition to the learning process in the classroom, teaching materials are also an important part of improving students' creative thinking skills. In line with Rubiyanti (2020), Badengo (2019), and Achmad (2020) students need teaching materials to improve their creative thinking and teachers need mathematics teaching materials in the form of module-based learning that can increase the creativity of students.

CONCLUSION

Based on the results of the research from the 8 articles, in general, some data are obtained that Realistic Mathematics Education (RME) learning can have a positive impact on mathematical creative thinking skills, namely as follows: 1) Mobile applications and module designs that are developed integrated with realistic mathematics meet the requirements valid/feasible based on expert and practitioner judgments that are practical and easy to apply in learning mathematics and are effective in improving students' creative thinking skills. 2) Simultaneously, creative thinking skills who follow mathematics learning with the Treffinger learning model using the RME principle are better than students who study the same subject through the same learning. conventional learning model. 3) The average result shows that the realistic mathematics learning approach is quite practical to improve students' creative thinking skills. 4) There is an effect of applying realistic mathematics learning (RME) on increasing students' creative thinking skills in solving problems on comparative material.

All subjects in this RME study when observed experienced almost the same increase in students' mathematical creative thinking abilities. However, in this study, it is necessary to note that with the different levels of education (SD-SMA) in the preparation of learning materials packaged in the RME learning model, it is necessary to pay close attention to the limits of improvement, so it is hoped that students at the lowest level can be further honed their skills at a higher level.

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Study Literature Review: Pembelajaran Pendidikan Matematika Realistik Terhadap Kemampuan Berpikir Kreatif Matematis Siswa

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Abstrak

Penelitian ini bertujuan untuk menganalisis kembali tentang pembelajaran *Realistic Mathematics Education* (RME) terhadap kemampuan berpikir kreatif matematis siswa kemudian hasil analisis dari penelitian tersebut masing-masing digabungkan dan didapatkan kesimpulan secara keseluruhan. Metode yang digunakan dalam penelitian ini adalah Metode *Systematic Literature Review* (SLR). Metode SLR digunakan untuk mengidentifikasi, mengkaji, mengevaluasi, dan menafsirkan semua penelitian yang tersedia dengan bidang topik fenomena yang menarik, dengan pertanyaan penelitian tertentu yang relevan. Dengan penggunaan Metode SLR dapat dilakukan *review* dan identifikasi jurnal secara sistematis, yang pada setiap prosesnya mengikuti langkah-langkah atau protokol yang telah ditetapkan. Pengumpulan data dilakukan dengan cara menelusuri jurnal dan prosiding yang teindeks Scopus dalam 10 tahun terakhir dengan kata kunci yang digunakan pada penelusuran ini adalah "*Realistic Mathematic Education* (RME)", dan "*Creative Thinking Ability*". Dari penelusuran dengan menggunakan kata kunci tersebut diperoleh 8 artikel yang memenuhi kriteria *Realistic Mathematic Education* (RME) terhadap kemampuan berpikir kreatif siswa. Kemudian data yang diperoleh dianalisis. Analisis data yang digunakan adalah analisis data kuantitatif dengan persentase dan analisis data kualitatif untuk data-data hasil kajian naratif terhadap penelitian-penelitian yang ditemui. Berdasarkan hasil penelitian dan pembahasan penelitian, maka dapat disimpulkan bahwa pembelajaran RME berperan dalam meningkatkan kemampuan berpikir kreatif matematis siswa.

Kata kunci: Systematic Literature Review, Realistic Mathematics Education, Kemampuan Berpikir Kreatif Matematis