The Effectiveness of the Realistic Mathematics Education Approach to Students' Mathematical Creative Thinking Skills on Circle Material

Ahmad Nizar Rangkuti[*1]; Mara Samin Lubis[2]
[1]UIN Syekh Ali Hasan Ahmad Addary Padangsidimpuan
[2]UIN Sumatera Utara Medan
nizarahmad1304@uinsyahada.ac.id[*1], marasamin@uinsu.ac.id[2]

Abstract

This research aims to see the effectiveness of a realistic mathematics education approach on students' creative mathematical thinking abilities. The research method used is a descriptive method with a qualitative approach. The research instrument used was a test. The analysis techniques used in this research are data reduction, data display and inclusion drawing/verification. Based on the results and discussion in this article, it is concluded that applying a realistic mathematical approach can improve students' creative thinking abilities.

Keywords: *Realistic Mathematics Education; Creative Thinking; Mathematics.*

Abstrak

Penelitian ini bertujuan untuk melihat keefektifan Pendekatan Pendidikan Matematika Realistik terhadap kemampuan berpikir kreatif matematis siswa. Metode penelitian yang digunakan adalah metode deskriptif dengan pendekatan kualitatif. Instrumen penelitian yang digunakan adalah tes. Teknik analisis yang digunakan pada penelitian ini yaitu *data reduction, data display* dan c*onclusion drawing/verificatio.* Berdasarkan hasil dan pembahasan pada artikel ini maka terdapat kesimpulan bahwa penerapan Pendekatan Pendidikan Matematika Realistik dapat meningkatkan kemampuan berpikir kreatif siswa.

Kata Kunci: Pendidikan matematika realistik; berpikir kreatif; matematis.

INTRODUCTION

The development of the world of education in the current era of globalization is experiencing very complex fluctuations. This makes every realm of education must improve the quality of education. One aspect of education that needs attention is mathematics education. The success of students in actualizing mathematics learning becomes very important as an effort to solve problems in everyday life (Hendriana, 2014).

*Correspondence:
Email: nizarahmad1304@uinsyahada.ac.id

Mathematics is an integrated science, meaning that mathematics needs to be viewed as a holistic whole. Thus, looking at mathematics as a whole is very important in learning and thinking about connections between topics in mathematics itself. The structure of connections between branches of mathematics allows students to perform mathematical reasoning analytically and synthetically (Fajri, 2017). In the context of mathematics education, the ability to think creatively is a very important skill in improving higher-order thinking skills (Anditiasari et al., 2021). In this case, students are required to develop thinking skills and solve problems through learning mathematics. The ability to solve this problem requires careful planning, including in the selection of appropriate techniques and strategies, so as to grow various skills and bring out abilities that may not have previously been seen in students.

Creative thinking is a thinking process that produces original ideas, ponders, and creates complex results in the context of mathematical problems. This thought process involves combining ideas, creating new ideas, and assessing how effective they are (Huliatunisa et al., 2020). In other words, creative thinking is a person's ability to evaluate new information and combine unique ideas or ideas to solve a problem. A student is said to think creatively if the student has the ability to come up with ideas or concepts to solve a problem.

There are three indicators of students' creative thinking ability. First, fluency which includes the correctness and fluency of the answers given by students. Second, flexibility involves different ways and approaches that students use to solve problems. Third, originality (uniqueness) that reflects new ways or ideas and emerges from the student himself, is something that is exclusively owned by the student in solving a problem (Ulandari et al., 2019). The three indicators aim to achieve a critical, logical assessment and be able to apply various structured strategies to search, collect, and consider information with new ideas, as well as being able to make connections in solving problems in order to bring definite results.

Today, teaching mathematics does not only aim to improve numeracy skills. Because in reality, numeracy skills alone are not enough to overcome the

challenges of daily life (Maulidina & Hartatik, 2015). This is also because mathematics is a lesson that deals with many concepts because it is abstract, logical, systematic and full of symbols and formulas that are confusing (Santri, 2017). In addition, mathematics is a learning material that is interrelated with each other (Novitasari, 2016). Therefore, students are required to think critically in mathematics (Egok, 2016). By thinking critically, students will cultivate skills and dispositions, which include prior knowledge, mathematical thinking and mathematical and cognitive generalizations and proof strategies, or reflective evaluation of unknown mathematical situations. Teachers in classroom math learning are designed to help students develop critical thinking processes, teachers need to take appropriate action to encourage students to reflect on their skills.

An initial study conducted at SMP N 5 Padangsidimpuan, found that students' mathematical creative thinking skills were still weak. To overcome this, an interesting learning approach is needed to improve students' creative thinking skills better. On this basis, an effective learning approach is needed that can involve students in the learning process. The learning approach applied must be able to consider success or achievement in improving students' creative thinking skills in mathematics learning. In this case, there needs to be an approach to improve understanding of mathematics by involving real or real situations in everyday life, one of which is a realistic mathematics education approach.

The realistic mathematics education approach is a learning method that relates and involves the surrounding environment and real experiences that students have experienced in everyday life (Iis Holisin, 2007). This approach uses mathematics as a relevant activity for students (Rangkuti, 2016). Realistic math learning begins with students understanding a given contextual situation. This condition trains students to become more proficient in generating many ideas and expressing them smoothly (Dewi & Indonesia, n.d.). Students are not asked to dive directly into the real world, but they are challenged to engage in problems stemming from real situations they have in mind. Thus, students will be trained to think about how to solve problems that they often experience in everyday life. Based on the description above, it was found that the creative thinking ability of

students in grade VIII of SMP Negeri 5 Padangsidimpuan is still not optimal. By implementing learning through Realistic Mathematics Education, it is hoped that students' creative thinking skills can be better. This study aims to reveal how effective the Realistic Mathematics Education Approach is in developing students' creative thinking skills.

RESEARCH METHODS

This study uses a descriptive method with a qualitative approach, the research subjects are 3 grade VIII students of SMP Negeri 5 Padangsidimpuan, each of whom has high, medium and low abilities who answer all indicators of mathematical creative thinking ability regardless of the students' answers right or wrong. This research was carried out in grade VIII of SMP Negeri 5 Padangsidimpuan. The research instrument used is a test. The analysis techniques used in this study are in accordance with the opinions of Miles and Huberman (dalam Sugiyono, 2018) activities in data analysis, namely data reduction, data display and onclusion drawing/verification.

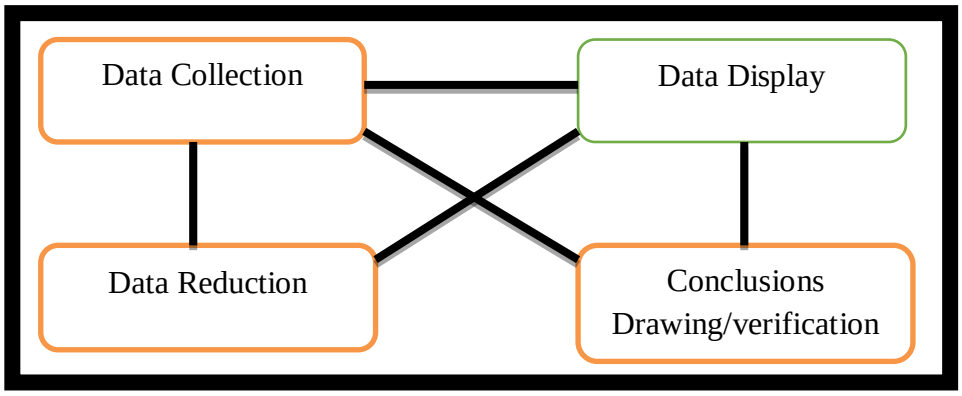

Figure 1. Data Analysis Process

1. Data Reduction

The stages of reduction in this study are as follows:

- Checking and analyzing the test results of learners who have answered all indicators of creative thinking ability from right or wrong.
- The test result data and interview results are compiled into good and neat notes and made notes that will be used to determine the ability to think

creatively mathematically in solving problems associated with a realistic mathematical approach.

2. Data Display

The stages of data presentation in this study are as follows:

- Presenting data on the results of students' answers in completing the test
- Presenting the results of interviews with students
- Presenting a table of student work
- Combining data on test answer results, and student interview results

3. Drawing/verification

The stage of drawing conclusions in this study is as follows:

Analyzing the test results of students, and interview results that can later draw conclusions about the ability to think creatively with the application of a realistic mathematical approach.

RESULTS AND DISCUSSION

The process of learning mathematics with PMR uses contextual problems as a starting point in learning mathematics (Susanti, 2014). The realistic mathematical approach provides stimulation to students to always think and always develop their thinking skills, so that the learning carried out is truly meaningful (Widyastuti & Pujiastuti, 2014). This certainly can have an impact on students to be able to get used to thinking logically when facing real problems in everyday life. Through PMR, students are expected to see mathematics learning more as an effort to solve problems in everyday life so that they have more motivation and creativity to master mathematical competence, so that they can develop optimal problem-solving skills (Widiarti, 2021).

Based on the analysis of test results in the form of story questions on circle material with a realistic mathematical approach, so that students can know their mathematical creative thinking skills. The students in the test are distinguished by high ability (Subject S-1), medium ability (Subject S-2), and low ability (Subject S-3).

(1) Exposure to Test Results Data and Interview Subject S-1 (high ability students)

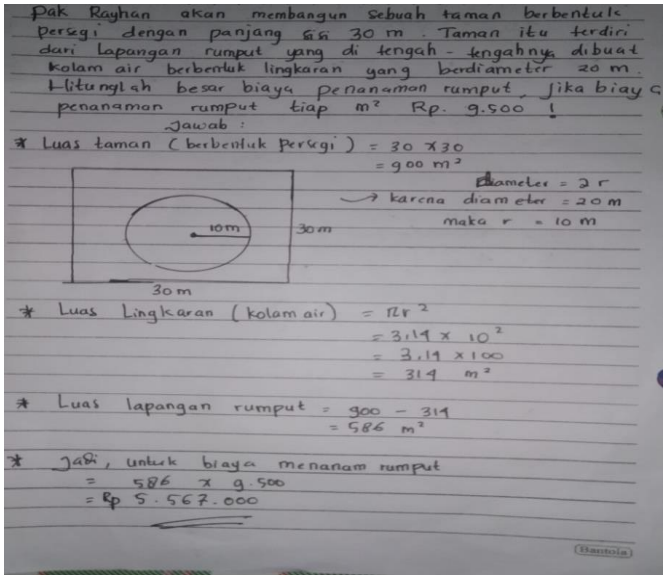

Figure 2. Process Student Answers at a High Ability Level

The fluency indicator has been fulfilled by S-1, where students have been able to do the questions smoothly. When asked, they do not find it difficult to do the question and are sure that the answer is correct. This is because they already have enough knowledge about circle material. The achievement of the S-1 subject flexibility indicator has been fulfilled where the student is able to do the problem correctly and is able to provide more than one solution. For the indicator of original thinking (originality) subject S-1 has also been fulfilled because the student provides original solutions in solving problems to the given questions and is able to answer the questions in detail.

(2) Exposure to Test Results Data and Interview Subjects S-2 (moderately capable students)

The fluency indicator has been fulfilled by S-2, where students have been able to do questions smoothly. When asked, the student did not find it difficult to do the question and was sure that the answer was correct. While the indicator of flexible thinking (flexibility) is fulfilled where the subject S-2 already understands and has tried to give answers in more than one way,

although there are still errors in the calculation process of the given questions. In the indicator of original thinking (originality) the research subject on the S-2 subject was also quite fulfilled, when asked the student said it was easy to identify problems in the problem because the story-shaped questions presented were easy to understand.

The student answer process can be seen in the following picture:

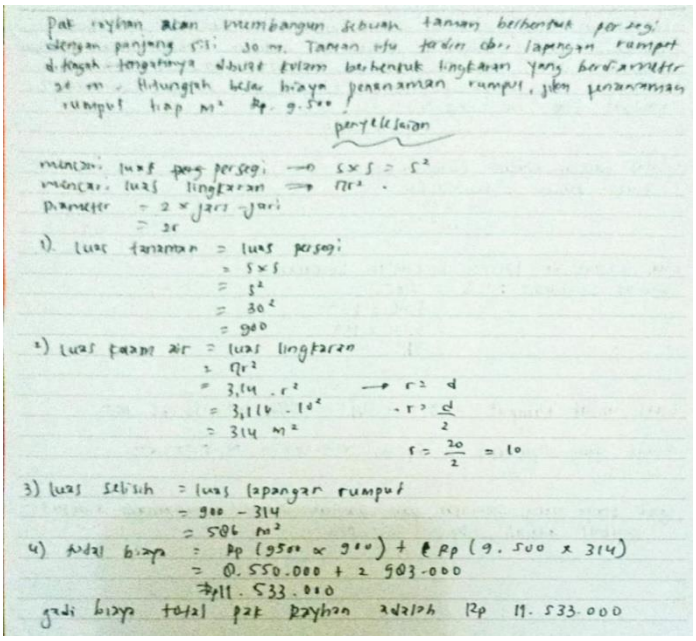

Figure 3. Process Student Answers at a Moderately Capable Students

(3) Data Exposure to Test Results and Interview Subjects S – 3 (low ability students)

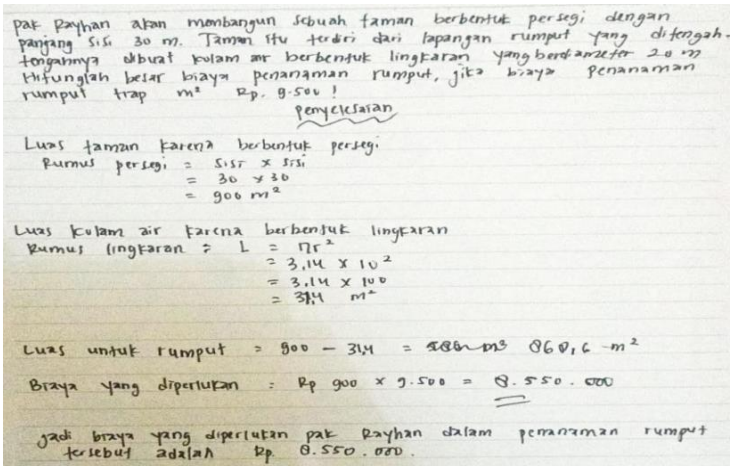

Figure 4. Process Student Answers at a Low Ability Students

The fluency indicator is fulfilled by S-3, where students are able to do questions smoothly. When asked, the student did not find it difficult to do the problem, but was not sure the answer was correct. This is in line with Maharani & Martin's research, that students have difficulty in carrying out correct mathematical procedures due to misconceptions in solving problems in the material tested (Maharani & Bernard, 2018). Meanwhile, the flexibility indicator is not fulfilled because there are errors in the calculation process and are only able to find one way to solve the problem from the given problem because the S-3 subject does not fully understand what is the problem and what is meant in the problem, so it is only able to find one way to solve the problem. This is also in accordance with research by Desianty et al, stating that the errors experienced by students in understanding story problems are related to the meaning of language meaning and interpreting images (Adilla et al., 2020). In the indicators of original thinking (originality) research subjects on S-3 subjects are not met, because they are only familiar with the way they have learned. So they are less able to provide original ideas to solve problems in their own way.

The findings of the research on the Analysis of Students' Mathematical Creative Thinking Ability in solving problem solving problems with a realistic mathematics education approach have answered the problem formulation compiled by researchers about how the effectiveness or success of applying a realistic mathematics education approach to students' mathematical creative thinking ability in solving problem solving problems in story problems with circle material.

The ability to think creatively is very important because it not only helps students in solving math problems, but also helps them to develop broader and relevant thinking skills in everyday life (Afsari et al., 2021). The ability to think creatively in mathematics is needed to utilize students' creative thinking which aims to arouse student interest and give students flexibility in making choices, asking questions and solving meaningful problems (Dalilan & Sofyan, 2022). The achievement of each indicator of creative thinking in students shows that student

success can achieve the desired learning goals (Supardi, 2011). Students who are included in the creative category, indicate that the student has been able to formulate detailed problem solving, then can combine some of the ideas they have, and can convey them clearly both orally and in writing (Lisliana et al., 2020).

For highly capable students have achieved all indicators of students' mathematical creative thinking ability. Students with moderate ability are able to achieve all indicators of creative thinking, even if there is a mistake in working on the problem. While low-ability students only achieve indicators of fluent thinking, and less achieve indicators of flexible and original thinking.

Fluency indicators can be achieved if students have been able to think of more than one answer in solving problems. In line with the opinion of Dwi Nur Qomariah and Hasan Subekti that students who have indicators of fluent thinking are able to spark many ideas, answers, or solutions (Qomariyah & Subekti, 2021).

Indicators of flexible thinking (flexibility) can be seen if students have been able to provide varied solutions. In line with the opinion of Fajriah & Asiskawati, that the indicator of flexibility in creative thinking is that students are able to present a number of different ways to solve problems (Fajriah & Asiskawati, 2015).

Indicators of original thinking can be achieved if students have been able to trigger answers using their own language. In line with the opinion of Angelica et al, that in original thinking students can formulate ways of solving that are different from existing ways of solving in general or convey ideas or ideas that are relatively new and unique in their own way (Ernitasari et al., 2022).

Thus, in the results of this study, the increase in mathematical creative thinking ability can be said to have been much better. From the results of data processing, the achievement of students has met the indicators of mathematical creative thinking ability, although low-ability students are less fulfilling, but the increase in creative thinking ability is much better than before. Therefore, the realistic mathematics education approach can be said to be successful in improving students' mathematical creative thinking skills. Students' creative

thinking is better after learning using Realistic Mathematics Education. This happens because in this learning students can build their own knowledge. Then the learning atmosphere is more fun and arouses students' enthusiasm for learning. In addition, students are also used to thinking and expressing opinions. Thus, it will be effective if mathematics teaching is carried out by applying a realistic mathematical approach.

CONCLUSION

The success of PMR (Realistic Mathematics Education) in improving students' mathematical creative thinking skills remains dependent on factors such as teacher teaching skills, appropriate use of resources, and appropriate curriculum support. With good implementation, PMR (realistic mathematics education) can be an effective tool in motivating students and increasing their understanding of mathematical concepts, especially on circle material. In mathematics learning, it is not seen in the number of concepts memorized but rather how students practice honing their thinking skills to find mathematical concepts through experience. Activities with a realistic mathematical approach make students enthusiastic to follow mathematics learning. Teachers also act as mentors and facilitators who provide the widest possible opportunity for students to gain experience and train students to be able to think mathematically complex and creative, without having to fixate on formulas, so that they can build their own knowledge and present mathematically.

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