



The Effect of The Application of The Realistic Mathematics Education (RME) Learning Model on Chrritical Thingking Ability

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Abstract: This research aimed to determine the effect of the Realistic Mathematics Education (RME) learning model on students critical thinking ability for systems of linear equations with two variabels material in class VIII at SMP Negeri 3 Jerowaru for the academic year 2023/2024. Research with a quantitative approach that uses a quasi-experimental design, the experimental class learning using the RME learning model while the control class using direct learning. The population in this study was 3 class VIII students. The samples were taken using a simple random sampling technique, resulting in class VIII A as the experimental class and VIII B as the control class. Data collection was carried out using critical thinking ability test questions (posttest). From the research results, it was found that there were differences between the experimental class and the control class. Judging from the average score of the experimental class 69.08 and the control class 58.40, this shows that the critical thinking ability of the class whose learning uses RME is better than the class whose learning uses direct learning. The effect size test results obtained were 0.69, which is in the medium category. So it can be concluded that there is an effect of the RME learning model on students' critical thinking skills in SPLDV material in class VIII of SMP Negeri 3 Jerowaru in the medium category.

Keywords: Realistic Mathematics Education (RME) Learning Model, Critical Thinking Ability, Systems of Linear Equations with Two Varabels.

Introduction

21st Century Learning demands communication, collaboration, critical thinking & creative thinking skills (Mulyasa, 2018: 5). This is also emphasized in Permendikbud number 21 of 2016 that one of the competencies obtained in learning mathematics is critical thinking in solving mathematical problems (Ministry of Education and Culture, 2016). So it can be said that mathematics has a close relationship with students' critical thinking skills.

Pursitasari, Rubini, & Suriansyah (2023: 35) stated that critical thinking is a thought process that can be accepted, reflective, rational, and responsible for deciding what to do. So that a problem can be solved if someone has good critical thinking skills as well.

Critical thinking skills are very important for students to have because it will be very helpful in everyday life. This is in line with the opinion of Purgianti, Akrom, Sari & Suntari (2022) that there are many examples of the application of mathematics in everyday life such as buying and selling, measuring, finance, and others. Furthermore, Nurfitriani, Makki, & Husniati (2022) emphasized that if students have critical thinking skills,

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students will be skilled in solving problems, especially in real life.

But in reality, students' critical thinking skills are still unsatisfactory. This is shown from the results of the 2022 PISA document, that Indonesia is ranked 68th out of 81 participating countries (OECD, 2023).

Congregation & Davidi (2020) said that some factors inhibiting students' critical thinking skills are that the methods used are still monotonous and poor classroom management. This also happened at SMP Negeri 3 Jerowaru. Based on observations at SMP Negeri 3 Jerowaru on April 11, 2023, students prefer to group during learning and class conditions are not conducive because students do not pay attention to the teacher's explanation.

The results of an interview with one of the grade VIII mathematics teachers of SMPN 3 Jerowaru on April 11, 2023, teachers still apply the direct learning model which causes ineffective learning, and students tend to focus more on delivering information by the teacher, so this can reduce students' active interaction in the classroom.

This is also supported by the results of the initial test of critical thinking skills in grade VIII students of SMP Negeri 3 Jerowaru for the 2022/2023 Academic Year on April 12, 2023, the following are the critical thinking skills given:

$$\begin{array}{l}
 \text{umur fira} = \text{fira} \quad \checkmark \\
 \text{umur dea} = \text{fira} - 1 \quad \times \\
 \text{umur latifa} = \text{fira} + 2 \quad \checkmark \\
 \Rightarrow \text{fira} = \text{dea} + \text{latifa} = 118 \\
 \text{fira} + \text{fira} + 1 + \text{fira} + 2 = 118 \\
 3 \text{ fira} = 118 + 2 - 1 \quad \times \\
 3 \text{ fira} = 119 \\
 \text{fira} = \frac{119}{3} \\
 \text{fira} = 39,66 \quad \times
 \end{array}$$

Figure 1. Sample Student A Answer 8

From the student's answer, it can be seen that A8 students are still lacking at the interpretation stage, which is not writing what is asked on the problem, then at the analysis stage students do not use symbols in the form of variables as mathematical modeling, as for the error in mathematical modeling which should be Dea's age = $x - 1$ is wrong to be Dea so that at the evaluation stage the answers described become incorrect. In addition, at the inference stage in drawing conclusions, the answer is also incorrect. It can be concluded that students' critical thinking skills are still low. = $x + 1$

To measure critical thinking skills in this study, 4 indicators were used according to the opinion of Facione & Facione (1996) which include 1) interpretation, namely the ability to understand and express the meaning of a situation, 2) analysis, which identifies relationships between concepts and existing statements, 3) evaluation can write down the steps to solve the problem, and the 4) inference, which is to draw conclusions based on existing data. In the 2013 curriculum, one of the goals is to make critical thinking as one of the indicators of learning achievement that must exist, so the ability to think critically becomes one of the demands in all subjects, including mathematics.

One way to improve critical thinking skills is to apply innovative models, one of which is the *Realistic Mathematics Education* (RME) model. RME is a learning model based on Fruedenthal's view which states mathematics as a human activity (Wijaya, 2011: 20). The RME learning model emphasizes the view that mathematics must be related to the real world, close to students' daily lives, and relevant to people's lives (Rejeki, Machromah & Harta. 2022: 83).

In addition, RME has several stages that transform abstract mathematics into realistic and contextual for students. The first stage is the provision of contextual problems related to everyday life, solving contextual problems, comparing and discussing answers and the last is to conclude concepts with solving problems that have been discussed together before (Isrok'atun & Rosmala. 2018: 74-75).

Therefore, by using RME students are required to be more active in solving a problem.

The Two Variable Linear Equation System (SPLDV) is one of the materials that can be packaged with the RME learning model. SPLDV is a material that is often found in everyday life, it is also one of the materials that is closely related to critical thinking skills (Febriano, Sugianto & Suratman, 2019). The reason for choosing SPLDV material in this study is that SPLDV material is widely found in everyday life.

In connection with the above problems, research has been conducted on the Effect of the Application of the RME Learning Model on Students' Critical Thinking Skills on SPLDV Material in Class VIII of SMP Negeri 3 Jerowaru for the 2023/2024 Academic Year.

Method

This study uses a quantitative approach using experimental methods, which is one of the methods used to find the influence of independent variables on dependent variables under controlled conditions (Abdullah et al, 2022: 96)

The research design used was *quasi experimental design*, which used two groups. The group given the RME model learning treatment is called the experimental group and the group given direct learning treatment is called the control group (Sugiyono, 2016: 76). Then both classes are given a final test (*posttest*). The *posttest* is used to see if there is an effect of RME on students' critical thinking skills.

This research was carried out at SMP Negeri 3 Jerowaru in class VIII in the even semester of the 2023/2024 academic year. The population in this study was all grade VIII students of SMP Negeri 3 Jerowaru. The samples in this study were class VIII A as an experimental class and class VIII B as a control class. The sampling technique uses *the Simple Random Sampling* technique where each unit has the same opportunity to be selected as a sample (Sumargo. 2020: 28).

The variables in this study are independent variables and dependent variables, the independent variable is learning with the RME model and the dependent variable is students' critical thinking skills.

The instrument used in this study was in the form of critical thinking ability test questions. The validity of the instrument used has been through an expert agreement consisting of 2 validators, namely 1 from the Mathematics Education Lecturer of FKIP Mataram University and 1 mathematics teacher of SMP Negeri 3 Jerowaru. To measure the validity of the instrument, researchers used Aiken's V index.

Furthermore, a hypothesis test was carried out using *the Independent Sample t-test* to determine whether or not there were differences from the RME learning model on students' critical thinking skills. Finally, an *Effect Size* test was conducted to determine how much influence RME had on students' critical thinking skills.

Result and Discussion

The purpose of this study is to determine whether or not there is an influence of the application of the RME learning model on the critical thinking ability of students at SMP Negeri 3 Jerowaru and how much influence the RME learning model has on critical thinking skills. Before the research was carried out, an instrument validity test was carried out using Aiken's V formula with a calculation result of 0.875 in the very valid category. Then the research data in the form of *posttest scores* were analyzed with the help of Microsoft excel 2010 and the SPSS IMB Statistic 25 program.

The posttest given is in the form of 3 questions describing critical thinking skills, where by critical thinking students can go through the stages of understanding problems, concepts, solving problems, and drawing conclusions better (Baharunnisa, Arjudin, Kurniawan & Sripatmi. 2023).

The following student *posttest* results are presented on a bar chart:

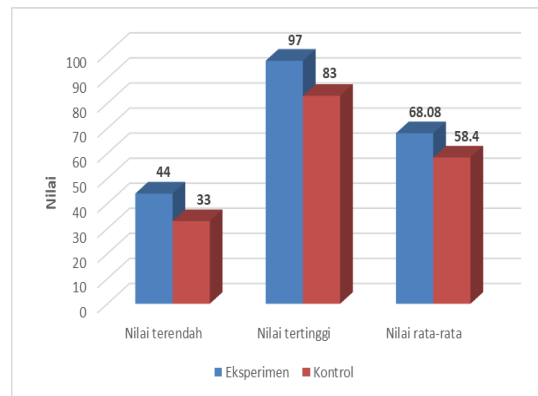


Figure 2. Posttest Results Bar Chart

Based on figure 4 above, the average score of the experimental class = 68.08 and the average of the control class = 58.4, this is in line with research from Silling, Sridana, Kurniati & Sripatmi (2022), namely the average value of *posttest learning outcomes* obtained in the experimental class and the control class respectively 65.15 and 59.24. So it can be said that student learning outcomes using the RME learning model are higher than the average value of student learning outcomes using the direct learning model. In line with research conducted by Nurmina, Sridana, & Junaidi (2021), which states that the learning outcomes of students who use the RME learning model are higher than the learning outcomes of students who do not use the RME learning model.

This happens because of less than optimal RME learning in class, due to lack of time in learning. In line with research conducted by Wismayani, Arjudin, Kurniati & Sarjana (2023) which states that RME learning is less optimal in class because of less time in learning. On the other hand, there are also some students who do not pay attention to the presentation of their group of friends. During the presentation process, awareness from groups that did not make presentations in listening was very lacking (Fahrani, Hayati, Lu'luilmaknun & Kurniati. 2023). So from this process, students have not been able to improve their critical thinking skills.

After getting the results of the *Posttest data*, proceed with conducting prerequisite tests, namely normality tests and homogeneity tests. Results of experimental and control class data normality tests using *Shapiro Wilk* with the help of SPSS IMB Statistic 25. The following normality test results are presented in tabular form:

Table 1. Normality Test Results of Experimental Class and Control Class

| Class | Shapiro-Wilk | | | Test Results |
|--------------|--------------|---|-----|---|
| | C | f | ig. | |
| Experimental | ,96 | 5 | ,50 | $sig > 0,05$ normally distributed data |
| Control | ,95 | 5 | ,28 | $sig > 0,05$ normally distributed data |

From table 3 above, the *Sig values in the posttest values* are 0.50 and 0.28 respectively. Based on these data, it can be seen that the value of $sig > 0.05$ so that it can be concluded that the experimental class and control class value data are normally distributed.

The results of the Homogeneity Test are presented in table 4:

Table 2. Test Results of Homogeneity of Experimental Class and Control Class

| Group | Ig | Conclusion |
|------------|------|--------------------------|
| Experiment | | |
| Control | ,522 | $sig > 0,05$ Homogeneous |

From table 4, the *Sig* value in the *posttest value* is 0.522 with a sig value of $0.05 >$, so that the variance of both *posttest data* is said to be homogeneous. This means that the results of *posttest data* on the critical thinking skills of SMP Negeri 3 Jerowaru students have the same variance.

After the prerequisite test is carried out, a hypothesis test is then carried out to find out whether there is a significant difference between the two average or mean values derived from two different distributions. The following are the results of the hypothesis test presented in tabular form:

Table 3. Test Results of t-Test Hypothesis

| Spects | Value obtained | Ig. (2-tailed) | Conclusion |
|-----------|----------------|----------------|----------------|
| calculate | 2,661 | ,01 | H_0 rejected |
| Table | 2,01 | ,01 | |

From table 5 above, the value of significance (2-tailed) is $0.01 < 0.05$. In addition, there is a difference between the experimental class and the control class with the value $t_{hitung} > t_{tabel}$, namely: Thus, $H_2,661 > 2,01$. is accepted and H_0 is rejected.

After the value *t* in the hypothesis test is obtained, then an *Effect size test* is carried out to find out how much influence the RME learning model has on students' critical thinking skills. The results of the *Effect size test* calculation can be seen in the following table:

Table 4. Effect Size Test Result

| Group | Verage | Rs. deviasi | Ohen's d | Riterion |
|------------|--------|-------------|----------|----------|
| Experiment | 7,44 | 3,313 | .69 | deep |
| Control | 8,40 | 5,016 | | |

From table 6 above, it can be seen that after getting a *d* value of 0.69, it can be concluded that, the influence of RME given on students' critical thinking skills is included in the medium category. This is because the value, $0,2 < d \leq 0,8$ so it is included in the medium category means that it can be said that the influence given is not large.

Conclusion

From the results of the data analysis above, it can be concluded that there is a difference in the average score between the experimental class and the control class, with the average score of the experimental class higher than the control class, meaning that there is an influence of the RME learning model on students' critical thinking skills. Retrieved *Effect Size* $d = 0,690994$ means that the influence is included in the medium category due to the value of $. 0,2 < d \leq 0,8$ So it can be concluded that there is an influence of the RME learning model on students' critical thinking skills in SPLDV material in grade VIII SMP Negeri 3 Jerowaru in the medium category.

References

- Abdullah, K., Jannah, M., Aiman, U., Hasda, S., Fadila, Z., Taqwin., Masita., Ardiawan, K. N., & Sari, M. K. (2022). *Quantitative Research Methodology*. Aceh: Muhammad Zaini Publishing Foundation.
- Baharunnisa., Arjudin., Kurniawan, E., & Sripatmi. (2023). Analysis of Students' Critical Thinking Skills in Solving Story Problems Subject Matter of Fractional Numbers Reviewed from Student Personality Type. *Journal of Classroom Action Research*. 5(4): 247-253.
- Congregation, G., S., & Davidi, E., I., N. (2020). Study of factors inhibiting critical thinking skills of grade V elementary school students in Indonesian subjects. *Journal of Basic Education Literacy*. 1(1): 44-49.
- Facione, N. C., & Facione, P. A. (1996). *Externalizing The Critical Thinking In Knowledge Development And Clinical Judgment*. *Nursing Outlook*, 44(3): 129-136.
- Fahrani, N., Hayati, L., Lu'luilmaknun, U. & Kurniati, N. (2023). The Effect of PBL Model on the Critical Thinking Ability of Grade VIII Students of SMPN 23 Mataram. *Scientific Journal of the Education Profession*. 8(4): 2403-2407.
- Febriano, R., Sugianto, & Suratman, D. (2019). Mathematical Critical Thinking Skills Studied from Student Belief in SPLDV Material in Junior High School. *Journal of Untan*.4(1): 1-12.
- Isrok'atun, & Rosmala, A. (2018). *Mathematical Learning Models*. Jakarta: PT. Earth Literacy.
- Mulyasa, E. (2018). *Implementation of the 2013 Revised Curriculum in the era of the Industrial Revolution 4.0*. Jakarta: Bumi Aksara.
- Nurfitriani, Makki, M., & Husniati. (2022). Analysis of Critical Thinking Skills in Mathematics Subjects: Learning Studies Using Problem Based Learning (PBL) Models. *Journal of Classroom Action Research*.4(3): 39-45.
- Nurmina, Siti., Sridana, N., & Junaidi. (2021). The Influence of 21st Century Skill-Based Realistic Mathematics Learning on the Learning Outcomes of Class VII MTs Students Muallimat NW Pancor. *Mandalika Mathematics and Education Journal*. 3(1):1-8.
- OECD. (2023). *PISA 2022 Results (Volume I): The State of Learning and Equity in Education*. Paris: OECD Publishing.
- Regulation of the Minister of Education and Culture Number 21 Year (2016) concerning *Content Standards for Primary and Secondary Education*. Jakarta: Ministry of Education and Culture of the Republic of Indonesia.
- Purgiyanti, E., Akrom, M., Sari, D., R., K., & Suntari. (2022). Mathematics Learning in the Application of SPLDV Story Problems in Class X Students of SMK Muhammadiyah Rembang. *Journal of Lesson Study and Teacher Education (JLSTE)*. (1): 14-21.
- Pursitasari, I. D., Rubini, B., & Suriansyah, M. I. (2023). *Critical Thingking & Ecoliterary*. Gorontalo: Ideas Publishing.
- Fortune, S., Machromah, I. U., & Treasure, I. (2022). *Junior High School Mathematics Learning Theory and Its Application*. Surakarta: Muhammadiyah University Press.
- Silling, A. R., Sridana, N., Kurniati, N., & Sripatmi. (2022). The effect of the application of Whatsapp-assisted realistic mathematics learning (PMR) on the mathematics learning outcomes of grade VII students of SMP Negeri 13 Mataram for the 2021/2022 academic year. *Griya Journal of Mathematics Education and Application*. 2(3), 773-783.
- Sugiyono. (2016). *Quantitative, Qualitative, and R&D Research Methods*. Bandung: Alfabeta.
- Sumargo, B. (2020). *Sampling Technique*. Jakarta: UNJ Press.
- Vijaya, Ariyadi. (2011). *Realistic Mathematics Education: An Alternative Approach to Learning Mathematics*. Yogyakarta: Graha Ilmu.
- Wismayani, K., Arjudin., Kurniati, N., & Bachelor, K. (2023). The influence of the RME (Realistic Mathematics Education) approach on the mathematical connection ability of grade VIII MTs Al-Aziziyah Putri Kapek Gunung Sari students. *Griya Journal of Mathematics Education and Application*. 3(1). 76-87.