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# IMPROVING STUDENTS' UNDERSTANDING OF MATHEMATICAL CONCEPTS THROUGH THE REALISTIC MATHEMATICS EDUCATION MODEL ASSISTED BY SIBICA VIDEOS

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**Abstract**

The lack of variety of learning models in the learning process and the low ability to understand mathematical concepts are the background of this research. This research aims to determine the improvement of mathematical concept comprehension skills after treating the Realistic Mathematic Education (RME) model assisted by SIBICA Video. The research method used is quantitative with the type of pre-experiment research and one group pretest-posttest design. The research place was the VA class of SD Negeri Ronggo 03, and the sample of this research was 20 students consisting of 14 boys and six girls. The data collection technique uses observation, interviews, documentation, and test questions, as many as ten description questions. The quantitative data analysis technique of the normality and hypothesis tests is an N-gain test assisted by SPSS 25 software and Microsoft Excel 2013. The research results showed that the average score of the pretest was 41.75 and the posttest was 90,875, with the results of the N-gain test obtaining an average score of 0.8588 ≥ 0.7, including the high category. Thus, it concluded that the RME model assisted by SIBICA Video can improve students' understanding of mathematical concepts on high-number material.

**Keywords:** RME; Video; Concept Comprehension Ability

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## A. Introduction

The independent curriculum is a refinement of the previous curriculum by considering the situation and conditions of educational institutions in Indonesia. The independent curriculum emphasizes strengthening the profile of Pancasila Students (Nuraeni et al., 2023). According to Putra et al., (2022), the independent curriculum has diverse intracurricular learning that gives learners enough time to learn concepts and strengthen skills. Al Fasya et al., (2022) supported this response by arguing that the purpose of implementing an independent learning curriculum is to address the challenges of education in the era of the Industrial Revolution 4.0. The curriculum should foster critical thinking, problem-solving skills, creativity, innovation, and proficiency in student communication and cooperation. Mathematics learning is the scientific and rational way of thinking that contributes to improving the quality of human resources (Siswondo & Agustina, 2021).

Mathematics has always been a discipline that students must study at every level of education, from elementary school to college (Umami et al., 2024). To learn the next level of material, students need a solid foundation. Therefore, they must understand previous mathematical concepts before advancing to new material (Hoiriyah, 2019). Apriliyana et al., (2023) reinforce this by stating that students will more readily accept new material if they understand the underlying concepts.

Mardiah et al. (2020), state that understanding concepts does not involve memorizing them; students can apply and solve the given problems. Understanding mathematical concepts must be applied because mathematical concepts are interconnected, so the learning process must be coherent and continuous (Riswari et al., 2022). At the same time, the goal of learning mathematics is for students to master mathematical concepts without memorizing them and solve problems using concepts.

Researchers conducted a review and interview in grade 5 of class A of SD Negeri Ronggo 03 on May 05, 2024. Researchers found several problems in learning mathematics: 1) a need for variations in learning models that foster students' understanding of concepts, 2) applying memorization methods to


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formulas, and 3) less attractive learning media. The KKTP (Criteria for Achievement of Learning Objectives) of 5th grade SD Negeri Ronggo 03 in mathematics is 76. Based on the STS (Mid-Semester Summative) II scores, the percentage of scores < KKTP of VA class students is 80%, and the percentage of student scores > KKTP is 20%. According to Warmi et al., (2024), more understanding of mathematical concepts is needed to maintain students' academic performance. With the lack of students' concept understanding abilities, if the example problems given by the teacher are different from those given by students, it can be seen that students need help solving problems (Rohmah et al., 2024). In addition to conducting a review, researchers conducted interviews with students who wanted technology-based learning media that was interesting and fun.

To manage the above problems, teachers can apply new learning models with students. The criteria for learning models that need to be applied are models that make it easier for students to understand the material, improve understanding of mathematical concepts, invite students to think from concrete to abstract and increase cognitive domain learning outcomes. In addition, it must determine the content presented in the learning model that can integrate students in the ability to understand mathematical concepts.

So, the learning innovation that suits the problem above is to provide a new learning model. According to Kaban et al., (2021), a learning model is a learning pattern or procedure applied and implemented to quickly and efficiently achieve the expected learning outcome goals or competencies. This research applied the RME (Realistic Mathematic Education) model. This model includes a realistic learning approach. According to Puspitasari & Airlanda (2021), the RME model is one of the learning models focused on using natural phenomena or real contexts and students' experiences as a point of learning mathematics. Realistic mathematics learning uses contextual problems to build a mathematical problem that is classified as abstract (Hairun et al., 2024).

According to Hobri Ningsih (Isrok'atun & Amelia, 2018), there are five stages in the RME learning model, as follows: a) Understanding contextual

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problems; b) Explaining contextual problems; c) Solving contextual problems; d) Comparing and discussing answers; e) Concluding.

The media students need when learning is a stimulating video with a new look. According to Yulisa et al., (2020), video is a moving image complemented by sound to make it easier to transmit. In addition, the video contains an explanation of mathematical material that is associated with the culture around students. Thus, math material is initially known to be abstract, but a math learning video makes it more realistic.

The purpose of using local wisdom-based learning video media is to introduce local wisdom to students, including Alpha Generation students, invite students to learn from the environment and invite students to think realistically or concretely. The SIBICA video contains material on the composition and decomposition of numerical numbers up to 1,000,000, which is associated with the transaction activities of buyers and sellers using the Republic of Indonesia's money and the nuances of buying and selling food typical of Pati City. Another reason is that students in grade 5A still need help differentiating place value.

The solution provided by the researcher above is relevant to the research conducted by Mardiah et al., (2020). The study was entitled The Effect of Realistic Mathematic Education Approach on Concept Understanding and Mathematical Disposition of Elementary School Students. What distinguishes these researchers from the current researchers is the learning video media based on local wisdom. The results of his research, namely the data analysis of the two-way ANOVA test and the discussion carried out, obtained that the understanding of mathematical concepts of students with high initial abilities significantly differs from the understanding of mathematical concepts of students with initial abilities.

The results of another study conducted by Putri & Agustika (2022) state that using ethnomathematics-based or local wisdom-based video media has a positive effect and can improve the quality of student learning, making learning activities more meaningful and effective.

Judging from the exposure of problems and theories supported above, researchers focus on research on improving concept understanding abilities through

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the RME (Realistic Mathematic Education) model assisted by SIBICA Video aims to analyze the improvement of concept understanding abilities of grade 5A students of SD Negeri Ronggo 03.

## B. Methods

This research uses a quantitative method with a pre-experimental type and one-group pretest-posttest design.

**Table 1**
**One Group Pretest-Posttest Design**

| Pretest | Treatment | Posttest |
|---|---|---|
| $O_1$ | X | $O_2$ |

Source: Sugiyono (2018)

**Description:**

- O1: The pretest value obtained before treatment in the form of learning using the RME learning model assisted by SIBICA Video.
- O2: Post-test value obtained after being given the treatment in the form of learning using the RME learning model assisted by SIBICA Video.
- X: The treatments were carried out by providing learning using the RME learning model assisted by SIBICA Video.

The implementation of this research was in May 2024 for three meetings. The researchers gave pretest questions in the first meeting and, in the last hour, gave post-test questions. After giving the pretest question, the researcher applied the RME model assisted by the SIBICA Video in grade 5A during the first and third meetings. The study's population and sample are in grade 5A. This sample is used when the population is relatively small, with fewer than 30 people (Sugiyono, 2018). So, the sample used in this research was 20 students of grade 5A of SD Negeri Ronggo 03, with 14 boys and six girls.

Data collection techniques are done through pretest-posttest questions, which can be as many as ten questions. The data analysis technique used was quantitative analysis of the N-gain test using SPSS (Statistical Product and Service Solution) 25 software and Microsoft Excel 2013. N-gain test categories were used in this research.

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**Table 2**
**N-gain Test Category**

| N-gain Score | Category |
|---|---|
| $\geq 0.7$ | High |
| $0.3 \leq g \geq 0.7$ | Medium |
| $\leq 0.3$ | Low |

Source: Sugiyono (2018)

This research focuses on improving the mathematical concept understanding ability of grade 5A students through the Realistic Mathematic Education model assisted by SIBICA Video in determining the composition and decomposition of numbers up to 1,000,000.

## C. Results and Discussion

Figure 1 shows descriptive statistics of the pretest-posttest results, which show an improvement in students' ability to understand mathematical concepts.

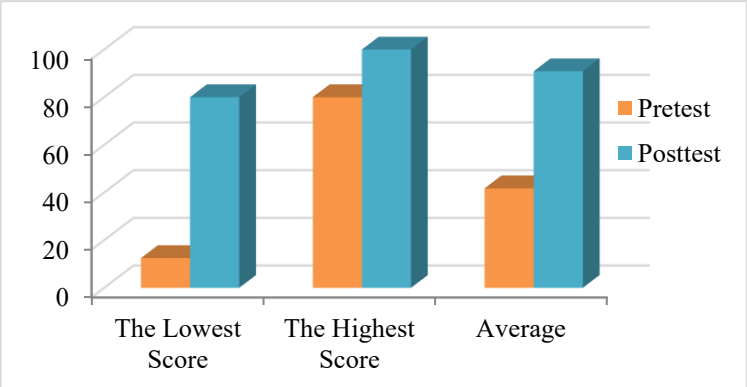


**Figure 1. Research Data**

In Figure 1, the pretest score is 41.75 with the condition that students have not been given treatment in the form of an RME model assisted by SIBICA Video. It still needs to be categorized as low student concept understanding ability. There is an increase in the post-test with a score of 90.87. Researchers treated students as an RME model assisted by SIBICA Video in this condition. The average post-test score of concept understanding ability obtained a higher score than the pretest average score, as seen in Figure 1. The KKTP standard (Criteria for Achievement of Learning Objectives) of SD Negeri Ronggo 03 is 76. Figure 1 shows that the number of students on the pretest who reached the KKTP score was only 1 out of

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20, while the number of students on the post-test, all the grade 5A students, reached KKTP.

**Table 3**

**The Results of the Normality Test**

| Normality Test | | | | | | |
|---|---|---|---|---|---|---|
| | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
| | Statistic | df | Sig. | Statistic | df | Sig. |
| PRE TEST | ,093 | 20 | ,200* | ,982 | 20 | ,954 |
| POST TEST | ,201 | 20 | ,033 | ,859 | 20 | ,008 |
| *. This is a lower bound of the true significance. | | | | | | |
| a. Lilliefors Significance Correction | | | | | | |

Source: SPSS 25 (2024)

The results of the Shapiro-Wilk normality test are in Table 3. The pretest Sig. score is 0.954, and the post-test value is 0.008. The decision-making is following Sugiyono's (2018) based on probability (Asymptotic Significance). It decides that the pretest is 0.922> 0.05, so Ho data is normally distributed. The post-test score obtained is Sig. 0.104> 0.05. So, the decision is that Ho is normally distributed data.

Table 4 below presents the improvement in students' mathematical concept understanding ability after being tested using the N-gain test assisted by SPSS 25**.**

**Table 4**
**N-Gain Test Results**

| Descriptive Statistics | | | | | |
|---|---|---|---|---|---|
| | **N** | **Minimum** | **Maximum** | **Mean** | **Std. Deviation** |
| N-GAIN_SCORE | 20 | ,67 | 1,00 | ,8588 | ,12140 |
| N-GAIN % | 20 | 66,67 | 100,00 | 85,8770 | 12,13962 |
| Valid N (listwise) | 20 | | | | |

Source: Data from software SPSS 25 (2024)

The results of the N-gain score test calculation in Table 3 show that the average N-gain score of 0.8588 is in the high category, which lies between $0.7 < g < 1$. Thus, using the RME model assisted by SIBICA Video can improve the concept understanding ability of grade 5A students of SD Negeri Ronggo 03 on the material of numerical numbers 1,000,000. The findings are relevant to the research of Nafia et al. (2023), which found that learning activities using the RME model positively increase students' mathematical understanding with an average N-gain test in the experimental class of 0.63 with moderate criteria. Although there are differences in the criteria results, this research is still declared to have

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improved. The disadvantage of this model is that it takes a long time because it is very enthusiastic about learning, so student learning activities are not controlled. According to Tandiling (Ridha et al., 2021), the weakness of the RME model is that it takes a long time for students who have difficulty, and intelligent students feel bored waiting for their friends who have difficulty solving problems.

Table 5 presents the following percentage improvement in students' mathematical concept understanding ability in this research.

**Table 5**
**Analysis of Scores per Indicator of Concept Understanding Ability**

| No | Indicator of Concept Understanding Ability | Average | | N-Gain Score | Description |
|---|---|---|---|---|---|
| | | Pretest | Posttest | | |
| 1. | Restating a concept. | 13,33 | 99,17 | 0,99 | High |
| 2. | Classifying objects according to specific properties as a concept. | 90 | 100 | 1 | High |
| 3. | Giving examples and non-examples of a concept. | 36,25 | 96,25 | 0,94 | High |
| 4. | Presenting concepts in the form of mathematical representations. | 63,75 | 97,50 | 0,93 | High |
| 5. | Name the necessary or sufficient condition of a concept. | 35 | 71 | 0,55 | Medium |
| 6. | Use and utilize, select specific procedures or operations. | 45,63 | 89,38 | 0,80 | High |
| 7. | Applying the concept of algorithms to problem-solving. | 7 | 81 | 0,80 | High |

Source: Researcher Data (2024)

Based on this description, Table 4 shows that all indicators increase concept understanding, even though the percentages are different. The RME model can be stated to improve students' concept understanding ability due to its application in this research.

The increase in concept understanding ability is very significant in the indicator of the ability to restate a concept and apply the concept of algorithms in solving problems. It is highly expected in learning objectives, where students will develop more complete ideas and strengthen them by applying them to everyday life (Hidayat et al., 2020). With a strong understanding of concepts, students can solve problems with concepts mastered. Moreover, this context is related to mathematics, and if the basic understanding of students' concepts is good, students

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can solve arithmetic problems with algorithms. Learning mathematics requires more excellent reasoning to understand its concepts and theories than counting. Students need an understanding of concepts, theories, the logic of thinking, and problem-solving skills (Aisyah et al., 2024).

The first indicator of concept understanding ability is restating a concept; the condition of students' understanding before treatment with a clear understanding of the concept still needs to be improved. This indicator obtained an average pretest score of 13,3% and, after treatment, got an average post-test score of 99,17%. However, after being given treatment as an RME model assisted by the SIBICA Video, students can find concepts based on their own experiences with an increase of 0.99 in ≥ 0.7 with a high category. However, after receiving treatment with the RME model assisted by SIBICA Video, students can find concepts based on their experiences. According to Isrok'atun & Amelia, (2018), the RME learning model emphasizes "The Use of Students' Production and Construction of Students' Contribution." Therefore, we can conclude that the indicator of a student's ability to restate a concept significantly increases after receiving treatment.

The second concept, the understanding ability indicator, reads and classifies the properties of objects according to the concept. Before students received treatment, the average pretest score increased by 90%. After treatment, the average post-test score was 100%. This indicator has an improvement value of 1 in ≥ 0.7 with a high category. It means that most students can classify objects, but there are errors in the form of answers that are not the same as the concept. Some students work on problems with this indicator carelessly, and only half understand the concept, so students cannot feel this ability equally.

The third concept, the understanding ability indicator, gives examples and non-examples of a concept, which has increased by 0.94 ≥ 0.7, classified as high. Before treatment, the condition concept understanding ability got a 36,25% average pretest score. However, concept understanding improved after treatment, with a 25% average post-test score. Only a few students can give three free examples of integers 100,000 to 1,000,000. These students have indeed been able to mention

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examples well and correctly. The number of exploration students increased after the treatment.

Furthermore, the fourth concept understanding ability indicator presents concepts in various forms of mathematical representation; the average pretest score is 63,75%, and the post-test score is 97,50. With an increase of $0.93 \geq 0.7$ according to the N-gain category, which includes the high category. The initial conditions on this indicator are that students can present the problem using numbers. However, not all students mastered this indicator. This is the thinking of students who are initially still realists and starting to move on to the idea that math is something abstract.

The fifth concept understanding ability indicator, namely developing necessary or sufficient conditions of a concept, has increased by 0.55 in $0.3 \leq g \geq 0.7$, included in the medium category. This ability is still weak, so the average pretest score is 35%. Because some students can solve this problem but are still not precise in their work, and only a few have the correct answer. After being given the treatment, the average score was 71%. However, not all students can properly and precisely solve problems with the fifth indicator. Most students are less careful in solving this problem, so there is still inaccuracy in solving the problem.

Then, the sixth concept, the understanding ability indicator, is to use, utilize, and select specific procedures or operations. The initial condition before the treatment of this indicator pretest average score was 45,63%. After being given the treatment, the post-test average score is 89,38%. This indicator obtained an increase of 0.80, classified as$\geq$ 0.7, representing high improvement. In this question, students must work on the problem coherently from ‘known’ to ‘conclusion’. In this indicator, students are adept at solving this problem and are coherent. Not all students’ answers are correct, but they can present specific procedures or operations.

The seventh concept is the understanding ability indicator, namely applying the concept of algorithms to problem-solving, and the pretest average score is 7%. After being given treatment, there was a difference in the ability to apply the concept, with an 81% post-test score. The increase was 0.80, including the indicator

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≥ 0.7 with a high improvement category. The application of the RME model in student activities such as interaction, problem-solving, brainstorming, and working with peers is improving. Lukman et al. (2023) observed that students demonstrate good interaction by working with their group companions and showing excitement about the lesson.

Thus, it concluded from the increase in indicators that students' concept understanding ability has increased because students can be said to have achieved their mathematical concept understanding ability. They must fulfil all indicators. Kusuma et al., (2023) state that the most crucial aspect of learning mathematics is the ability to understand concepts. Students are considered to have mastered a concept if they fulfil the indicators of concept understanding (Sari et al., 2023). The RME model significantly enhances students' ability to understand mathematical concepts. Selecting an effective and appropriate learning model plays a crucial role in the success of learning activities (Handayani & Aini, 2019). When students' understanding of concepts is not sufficiently developed, misconceptions may arise, leading to misinterpretation. Riswari & Salamah (2023) found that many 4th-grade students have mathematics misconceptions.

Learning media is a tool to help the teaching and learning process and improve students' knowledge, feelings, attention, and skills. Thus, learning media allows learning to run effectively (Ermawati & Riswari, 2023). Supported by exciting learning tools in the form of learning media, by providing learning that is studied in the form of animated videos based on local wisdom, it is clear that student's ability to understand concepts will increase. Video media positively impacts learning because video consists of visual, audio, and text where student sensors will be stimulated. In addition, the virtue of video media is that it can concretize abstract mathematical material. Video media can help students overcome boredom during conventional learning (Sofiana et al., 2023).

The SIBICA Video-assisted RME learning model can improve students' understanding of mathematical concepts. This statement aligns with the discovery of AS (2023), an RME learning model using animated videos to evaluate how students can understand mathematical concepts at SMP Negeri 23 Pekanbaru. On

the other hand, the RME approach can improve students' understanding of mathematical concepts, including learning outcomes, motivation, and students' way of thinking (Rahayu & Muhtadi, 2022).

## D. Conclusion

The ability to understand mathematical concepts of grade 5A students of SD Negeri Ronggo 03, Pati City, for 2023/2024 increased because of the treatment in the form of the RME (Realistic Mathematics Education) model assisted by SIBICA Video. The researcher's findings were an average pretest score of 41.90 and a posttest of 91.10, so there was a significant improvement in the ability to understand mathematical concepts of students who received treatment in the form of an RME model assisted by SIBICA Video. The N-gain test revealed an average score of 0.8618, which falls within the high category of ≥ 0.7, indicating potential applications that future studies can explore.

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