

# Effectiveness of Realistic Mathematics Education Assisted by Interactive Videos on Students' Learning Outcomes and Motivation

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## Abstrak

Salah satu pendekatan efektif untuk menjembatani konsep matematika abstrak dengan situasi kehidupan nyata adalah Realistic Mathematics Education (RME). Penelitian ini bertujuan mengkaji efektivitas model pembelajaran RME berbantuan video interaktif dalam meningkatkan motivasi dan hasil belajar matematika siswa kelas V salah satu SDN di Garut. Metode penelitian menggunakan pendekatan kuantitatif dengan Quasi Experimental dan Non-Equivalent Control Group Design. Subjek penelitian meliputi 60 siswa yang dibagi menjadi kelas eksperimen dan kelas kontrol. Data dikumpulkan melalui tes tulis. Analisis data dilakukan dengan statistika deskriptif dan uji t. Sebelum penerapan, motivasi belajar siswa di kelas eksperimen sebesar 54,9%, meningkat menjadi 81,1% setelah perlakuan. Rata-rata hasil belajar meningkat dari 69,73 menjadi 87,00 pada kelas eksperimen, sedangkan pada kelas kontrol hanya naik dari 69,67 menjadi 74,60. Hasil ini menunjukkan penerapan RME berbantuan video interaktif berpengaruh terhadap peningkatan motivasi dan hasil belajar siswa. Penelitian merekomendasikan pemanfaatan teknologi pembelajaran untuk menciptakan pembelajaran yang lebih menarik, interaktif, dan efektif.

Kata Kunci: Hasil Belajar; Realistic Mathematics Education; Video Interaktif

## Abstract

One effective approach to bridge abstract mathematical concepts with real-life situations is Realistic Mathematics Education (RME). This study aims to examine the effectiveness of the RME model assisted by interactive videos in improving the motivation and mathematics learning outcomes of fifth-grade students at one of SDN in Garut. The research employed a quantitative approach with a Quasi-Experimental design and a Non-Equivalent Control Group Design. The subjects consisted of 60 students, divided into an experimental class and a control class. Data were collected through written tests and analyzed statistically using descriptive statistics and Independent Sample T-Test. Prior to implementation, students' learning motivation in the experimental class was 54.9%, which increased to 81.1% after the treatment. The average learning outcomes improved from 69.73 to 87.00 in the experimental class, while the control class increased only from 69.67 to 74.60. These results indicate that the implementation of RME assisted by interactive videos has a significant effect on enhancing students' motivation and learning outcomes. The study recommends utilizing educational technology to create more engaging, interactive, and effective learning experiences.

Keywords: Outcome Learning; Realistic Mathematics Education; Interactive Video

## I. INTRODUCTION

Mathematics plays an important role in developing logical, analytical, and systematic thinking skills from an early age. However, many students, especially at the elementary school (ES) level, perceive mathematics as difficult and less engaging. This is largely due to its abstract nature and limited connection to everyday life (Sari et al., 2020; Saepuloh, Luritawaty, & Afriansyah, 2024). In mathematics learning, teachers need to foster students' cognitive, affective, and creative aspects (Anugrah et al., 2022). Therefore, an instructional approach that links mathematical concepts to real-life contexts is essential to make them more understandable.

The advancement of science and technology has brought significant changes to education, including the learning process. Teachers are required to utilize technological developments to create engaging lessons, prevent boredom, and maximize learning potential (Tafonao, 2018; Nuraeni & Siregar, 2024). According to Darmawan (in Satya et al., 2020), ICT-based education offers two main benefits: it encourages the educational community, including teachers, to be more appreciative and proactive in optimizing learning potential, and it provides students with broad opportunities to access unlimited learning resources.

Learning is defined as a process of relatively permanent behavioral change after acquiring specific knowledge, attitudes, or skills (Fahri & Qusyairi, 2019; Pratami, Sundayana, & Sofyan, 2023). This change is influenced by learning motivation, which arises from desires and needs. Motivation plays an important role

in clarifying learning objectives, increasing perseverance, and assisting in problem-solving (Hendrawan & Hendriani, 2021; Nafala, 2022). Meanwhile, learning outcomes include changes in cognitive, affective, and psychomotor domains, influenced by both internal and external factors (Anugrah et al., 2022; Nurrawi et al., 2023).

The 2013 Curriculum emphasizes understanding, skills, and character education. Teachers play a crucial role in ensuring successful learning through the selection of appropriate methods, strategies, and media (Nuriawati & Achadi, 2023; Pusporini et al., 2023). Learning media are essential in supporting the teaching and learning process, helping deliver material, enhancing interaction, and achieving learning objectives (Afriansyah et al., 2020; Harahap et al., 2022).

One effective approach to bridge abstract mathematical concepts with real-life situations is Realistic Mathematics Education (RME). This approach emphasizes starting from contextual problems familiar to students, then guiding them toward formal concepts through guided reinvention (Treffers, 1991; Fauziah & Wijayanti, 2021; Lestari et al., 2022). RME has been proven to improve students' engagement, conceptual understanding, and problem-solving skills (Widodo et al., 2022; Latifah et al., 2022).

In the digital era, interactive videos can serve as effective media to support RME implementation. Interactive videos present appealing visual and audio content, facilitate active engagement, and aid conceptual understanding (Putri & Syaodih, 2021; Afriansyah et al., 2023). Nurkhasanah

and Fauziah (2022) found that interactive videos in elementary mathematics learning significantly improved students' interest and learning outcomes compared to conventional methods. Combining RME with interactive videos has the potential to create more meaningful, enjoyable, and effective learning experiences for ES students.

Using videos as instructional media provides an audiovisual learning experience that engages both hearing and sight simultaneously (Yulianto, Yulianto, & Hidayanto, 2022; Rifanti, Septia, & Handayani, 2023). According to Arsyad (in Anugrah et al., 2022), videos are sequences of images in frames projected mechanically to produce moving visuals. This medium helps teachers explain material clearly and contextually, reduces misconceptions, and improves students' comprehension.

Although many studies have demonstrated the effectiveness of RME and interactive videos separately, research integrating both in elementary mathematics learning remains limited. Therefore, this study aims to examine the effectiveness of RME assisted by interactive videos on elementary students' mathematics learning outcomes. The findings are expected to contribute to the development of innovative learning models aligned with the needs and characteristics of 21st-century learners.

## II. METHOD

This study employed a quantitative approach with a quasi-experimental type and a non-equivalent control group design. The quantitative approach is a research

method based on the philosophy of logical positivism and operates under strict rules related to logic, truth, laws, and prediction (Watson in Gunawan, 2022).

The non-equivalent control group design involves two groups—an experimental group and a control group—that are not randomly selected. The experimental group received instruction through the Realistic Mathematics Education (RME) model assisted by interactive videos, while the control group received conventional instruction without the RME approach or video media.

The sampling technique used was purposive sampling, selecting fifth-grade students from SDN 1 Pakuwon, Garut Kota District, Garut Regency. Research subjects were determined based on equal initial characteristics, such as the average class score and the number of students, and both groups had never been taught using the instructional treatment that was the focus of this study (Abraham & Supriyati, 2022; Arib et al., 2024). Each group consisted of five students selected purposively according to these criteria.

Data collection techniques included: a learning achievement test, to measure mastery of the material before and after treatment (pre-test and post-test), and a learning motivation questionnaire, using a Likert scale to measure students' motivation levels toward mathematics learning. Data analysis techniques used descriptive statistical tests and Independent Sample T-Test.

### III. RESULT AND DISCUSSION

#### A. Description of Learning Motivation

To measure students' learning motivation, a measurement tool in the form of a questionnaire is needed. The questionnaire provided by the researcher to the students consists of statements, with the motivation instrument consisting of 10 questions for pre-motivation and 15 questions for post-motivation directed towards the students.

After the implementation of Realistic Mathematics Education (RME) with video-assisted media in the fifth-grade class at SDN 1 Pakuwon Garut, the students' learning motivation results reached 81.1%. This shows that there was an increase in students' learning motivation after the RME learning with video-assisted media was applied. Based on this, it can be concluded that the learning process conducted with the Realistic Mathematics Education (RME) approach supported by video media in the fifth-grade class at SDN 1 Pakuwon Garut was very suitable for the students' needs, improved their competence, and was very engaging and effective as a teaching material for mathematics teachers, specifically.

Learning motivation is a key factor in students' academic success (Hariri et al., 2024). According to Keller's learning motivation theory (as cited in Cahyana et al., 2017) in the ARCS model (Attention, Relevance, Confidence, and Satisfaction), learning motivation can increase if students feel interested (attention), understand the relevance of the material (relevance), have confidence in completing tasks (confidence), and are satisfied with their learning outcomes (satisfaction).

Moreover, Deci and Ryan's Self-Determination Theory (as cited in Siswanto, 2023) states that individuals are intrinsically motivated when they feel autonomy, competence, and social connection in the learning process.

In the conducted research, the results showed that after implementing Realistic Mathematics Education (RME) with video-assisted media in the fifth-grade class at SDN 1 Pakuwon Garut, students' learning motivation significantly increased, with an average score of 81.1%. This indicates that the RME model, based on realistic situations, was able to capture students' attention and provide a better understanding of mathematical concepts. The use of video media also had a positive effect on increasing student engagement and enthusiasm (Situmorang, 2023; Muthi et al., 2023). Additionally, this approach created a more interactive learning experience, reducing boredom and offering a variety of more engaging methods for delivering the material (Khasanah & Rigianti, 2023).

Piaget's and Vygotsky's Constructivist Theory also supports that learning involving interaction and real-life experiences enhances students' understanding and interest in learning (Putra & Hartutik, 2024). Thus, RME supported by video media can be an effective approach to improve students' motivation in learning mathematics.

#### B. Description of Learning Outcomes

To measure students' learning outcomes, a measurement tool in the form of a test is needed. The test provided by the researcher consisted of five essay questions, with a maximum score of 100.

## 1. Mathematics Pretest Learning

### Outcomes

The data obtained from the pretest scores of students in mathematics on the topic of Fractions at SDN 1 Pakuwon Garut showed that the average pretest score for the experimental class (30 students) was 69.73, while the control class had an average score of 69.67. Both medians were 70, the standard deviation for the experimental class was 8.73, while for the control class it was 8.74. The maximum score in the experimental class was 85, while the control class reached 88, and the minimum score in the experimental class was 50, while in the control class it was 55. These results indicate that the capabilities of both classes were not significantly different, thus making the comparison between the two classes more reliable after the experiment.

## 2. Mathematics Post-Test Learning

### Outcomes

Based on the post-test results, the average post-test score for the experimental class, which applied the Realistic Mathematics Education (RME) approach with video-assisted media, was 87.00. In comparison, the control class, which did not apply the RME approach with video-assisted media, achieved an average score of 74.60. The standard deviation for the experimental class was 8.99, while for the control class it was 7.86. Both classes had the same minimum score of 65, but the maximum score in the experimental class was 100, while in the control class it was 92. These results show that the mathematics learning outcomes in the experimental class applying the RME

approach with video-assisted media were significantly higher than those in the control class, which did not apply the RME approach with video-assisted media.

## 3. Pretest and Post-test Learning

### Outcomes

The data obtained from 30 students in the experimental class and 30 students in the control class showed that 22 students (73.3%) in the experimental class scored in the low category, while 19 students (63.4%) in the control class scored similarly. In the moderate category, 5 students (16.7%) in the experimental class scored, compared to 7 students (23.3%) in the control class. In the high category, 3 students (10%) in the experimental class scored, while 4 students (13.3%) in the control class scored. Neither class had students in the very high category.

It can be concluded that among the 30 students in the experimental class, 3 students (10%) scored in the low category, while 16 students (53.3%) in the control class did. The moderate category showed a change, with 6 students (20%) in the experimental class and 9 students (30%) in the control class. The high and very high categories also showed changes, with 11 students (36.7%) in the experimental class and 5 students (16.7%) in the control class achieving higher scores. However, only the experimental class had students in the very high category, totaling 10 students (33.3%), while the control class did not.

The completion rate of the pretest showed that 8 students (26.7%) in the experimental class achieved the Minimum Completion Criteria (KKM), while 11 students (36.7%) in the control class did.

The remaining 22 students (73.33%) in the experimental class did not meet the KKM, and 19 students (63.3%) in the control class also failed to meet the KKM. After the post-test, 27 students (90%) in the experimental class achieved the KKM, compared to only 16 students (53.3%) in the control class. In the experimental class, only 3 students (10%) did not meet the KKM, while 14 students (46.7%) in the control class did not.

#### 4. Learning Outcomes with Inferential Analysis

Data from students' learning outcomes were analyzed using the t-test (Independent Sample T-Test) formula. Prior to conducting the t-test, normality and homogeneity tests were performed.

According to the t-test output, the significance value was  $0.000 < 0.05$ , and the t-value (5.685) was greater than the t-table value (2.00172). Therefore, it can be concluded that the null hypothesis ( $H_0$ ) is rejected, and the alternative hypothesis ( $H_a$ ) is accepted, indicating that there is a significant effect of the RME approach with video-assisted media on students' motivation and learning outcomes in the fifth-grade class at SDN 1 Pakuwon Garut.

Learning outcomes are indicators of the success of learning that can be measured through pre- and post-test scores. According to Piaget's Constructivist Theory (as cited in Yolanda et al., 2024), students construct their understanding based on experiences and interactions with their surroundings. The RME model applied in this study supports this theory because it emphasizes the use of real-world situations to develop mathematical concepts in a deeper way.

The results of the research showed an average post-test score of 87.00 for the experimental class, while the control class only achieved 74.60. Furthermore, more students in the experimental class met the KKM compared to those in the control class. This difference demonstrates that the RME approach with video-assisted media has a positive impact on improving students' understanding of concepts and learning outcomes.

According to Bruner's theory (as cited in Nindarista et al., 2022), effective learning must go through three stages of representation: enactive (through direct experience), iconic (through images or visual media), and symbolic (through abstract representations). The use of video in RME learning supports the iconic stage, where students can better understand concepts through engaging visual representations. Additionally, this approach aligns with Kolb's experiential learning theory (as cited in Sholihah & Mahmudi, 2015), which states that concrete experiences can strengthen students' understanding of academic concepts.

#### IV. CONCLUSION

Based on the data analysis presented earlier, it can be concluded that the Realistic Mathematics Education (RME) approach supported by interactive video media has a positive and significant effect on students' motivation and learning outcomes. This finding indicates that the implementation of RME with interactive video support is highly aligned with the needs of fifth-grade students at SDN 1 Pakuwon Garut and is effective in increasing learning engagement,

conceptual understanding, and active participation in mathematics learning. Interactive video media provides visual and contextual representations that help students connect mathematical concepts with real-life situations, in line with the main principles of RME. This combination also accommodates diverse learning styles, especially for students with visual and auditory tendencies, making mathematics learning easier to understand and more enjoyable.

For teachers, it is recommended to regularly integrate RME-based learning with the support of interactive videos into mathematics instruction. Video materials should be adapted to the local context and students' daily experiences to strengthen the realistic aspect of RME. Furthermore, learning can be enriched with collaborative group activities and class discussions to further enhance student engagement and peer learning. Teachers should also carry out ongoing evaluations of students' motivation and learning outcomes to monitor progress and adjust instructional strategies accordingly.

For future research, it is suggested to conduct longitudinal studies to examine the long-term impact of implementing RME assisted by interactive videos on students' motivation and achievement over several semesters or academic years. Research with a larger and more diverse sample is also needed to make the findings more generalizable. In addition, it would be interesting to investigate variations in video design, such as comparing animated videos with live-action videos, to determine

differences in their effects on student engagement and comprehension.

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