



The Effect of Realistic Mathematics Education Approach Assisted by Interactive Multimedia Articulate Storyline on Reasoning Ability and Self Confidence

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ARTICLE INFO

Article history:

Received January 27, 2023

Revised February 05, 2023

Accepted March 10, 2023

Available online March 25, 2023

Kata Kunci :

Pendekatan RME, Kemampuan Penalaran, Sikap Percaya Diri, Articulate Storyline.

Keywords:

RME Approach, Reasoning Ability, Self Confidence, Articulate Storyline.



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ABSTRAK

Kegiatan pembelajaran matematika yang monoton, kurang menyenangkan membuat siswa mudah jenuh dan tidak tertarik mengikuti pembelajaran. Pembelajaran yang seperti itu tidak melatih kemampuan bernalar siswa. Penelitian ini bertujuan untuk menganalisis apakah penerapan pendekatan Realistic Mathematics Education berbantuan multimedia interaktif articulate storyline dapat mengatasi kurangnya kemampuan penalaran dan sikap percaya diri. Jenis penelitian ini adalah kuantitatif. Desain penelitian ini adalah penelitian semu (quasi eksperimental design). Penelitian ini menggunakan teknik pengumpulan data meliputi observasi, tes, angket, dan dokumentasi. Teknik analisis data yang digunakan adalah uji normalitas, uji homogenitas, uji-t, dan uji ANOVA. Hasil penelitian ini menunjukkan adanya pengaruh yang signifikan penggunaan pendekatan Realistic Mathematics Education berbantuan dengan multimedia interaktif articulate storyline terhadap kemampuan penalaran dan sikap percaya diri.

ABSTRACT

Monotonous, less fun mathematics learning activities make students easily bored and not interested in participating in learning. Such learning does not train students' reasoning abilities. This study aims to analyse whether the application of the Realistic Mathematics Education approach assisted by interactive multimedia articulate storylines can overcome the lack of reasoning skills and self-confidence. This type of research is quantitative. The design of this research is quasi-experimental design. This study used data collection techniques including observation, tests, questionnaires, and documentation. The data analysis technique used is the normality test, homogeneity test, t-test, and ANOVA test. The results of this study indicate that there is a significant effect of using the Realistic Mathematics Education approach assisted with interactive multimedia articulate storylines on reasoning abilities and self-confidence.

1. INTRODUCTION

Mathematics as a basic science has a significant role in the development of science and technology (Blume et al., 2021; Kurnia Putri et al., 2019). In addition, mathematics is a compulsory subject at every school level that has a significant role in everyday life (Faradillah & Humaira, 2021; Izzah & Azizah, 2019; Sadhukhan et al., 2021). Ministerial Regulation No. 21 of 2016 concerning Content Standards explains that aspects of skills can be achieved through activities: observing, asking, trying, reasoning, presenting, and creating (Nurmanita et al., 2019; Wahyuni et al., 2022). In addition, in Regulation of the Minister of Education and Culture No. 21 of 2016 concerning Content Standards states that, using concrete and symbolic models or other strategies in solving everyday problems (R. Hidayat et al., 2020; Widyani, 2018). Reasoning ability is an important skill for acquiring arithmetic knowledge. Reasoning ability is a basic skill that must be mastered, especially at the elementary school level (Gouet et al., 2020; R. Hidayat et al., 2020). Reasoning ability can help students to develop ideas and solve math problems (Nurjamilah et al., 2021; Thanheiser & Melhuish, 2023). The students' reasoning ability is low because the learning approach used is not appropriate. Therefore, mathematics is a subject that is not of interest to students, because students will tend to get bored by memorizing formulas and working on problems without understanding

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the material (Barbara & Bayu, 2021; Darmayanti et al., 2022; Kurnia Putri et al., 2019). Reasoning ability is the development of mathematical knowledge. This statement implies that reasoning is the basis for building mathematical knowledge (Kusmaryono et al., 2021; Saleh et al., 2018). Therefore, the teacher acts as a facilitator should be able to provide optimal facilities for students by helping develop their reasoning abilities so that students can find ideas and build knowledge in mathematics (Orland-Barak & Wang, 2021; Trisnawati et al., 2018; Yetri et al., 2019). Self-confidence is one of the key characteristics in starting something, especially in speaking. Self-confidence is an attitude and feeling that is confident in the abilities one has in oneself (Jalaludin et al., 2019; Tridinanti, 2018). Therefore, individuals can be responsible for what they have done, always think positively. However, there are still many students whose self-confidence is still low because they do not feel comfortable at school, the teacher's learning approaches and methods are inappropriate, they are under pressure, and they always feel anxious (Akbari & Sahibzada, 2020; Hong et al., 2021; Vega et al., 2019). Therefore, the teacher must become a facilitator in helping students to be active such as using methods and approaches that are appropriate and comfortable for students (Çiftçi & Yıldız, 2019; Hidayati & Hidayah, 2020).

The learning process at Cempaka Elementary School uses a contextual approach and is not yet in accordance with the conditions of the students. In the learning process, students only pay attention to the material explained by the teacher. This makes students bored, bored, and not interested in participating in learning (Kurnia Putri et al., 2019; Nugrahani & Asri Hardini, 2021). Such a learning process results in not being able to train students' reasoning abilities to the fullest. The ability of students to solve geometric is still low. This is because learning is less innovative and the lack of teachers utilizing interactive multimedia causes students' lack of interest in learning mathematics. This can be concluded from the small number of students completing the questions due to the lack of students understanding the questions. Based on the results of observation with fifth grade students at Cempaka Elementary School, the material for building space is difficult. In addition, based on daily tests students were given questions only on geometric shapes, out of 10 student questions the average student was only able to answer 5 to 6 questions correctly. The first ability of the fifth-grade students at Cempaka Elementary School in geometric material is still low because the percentage of completeness is 35% of the total number of students. In addition, students' self-confidence was still low and not well conditioned, because as many as 15.7% of students did not dare to give their opinion. The self-confidence of the fifth-grade students at Cempaka Elementary School is still low. Problems that can be found such as not daring to give opinions when conducting discussions. In addition, when getting new friends, students are not easy to adjust. Other things, such as not having the courage to appear in front of the teacher's appointment to come to the front of the class and being ashamed of their friends. Therefore, in addition to increasing children's reasoning abilities, teachers must also increase students' self-confidence. Confidence is needed to solve problems, especially in everyday life.

Solutions to make it easier for students to understand the material require a learning approach that encourages active students and can improve students' reasoning abilities and self-confidence (Dewi & Agustika, 2020; Yetri et al., 2019). A learning approach that supports learning mathematics, especially geometric, is Realistic Mathematics Education (RME). The Realistic Mathematics Education approach is an approach to learning mathematics based on early learning from concrete things and everyday life so that learning is more meaningful (Ardina et al., 2019; Ediyanto et al., 2020). The Realistic Mathematics Education approach requires students to be active because students rediscover mathematical ideas and concepts through investigations of everyday life problems (Artika et al., 2019; Laurens et al., 2017). The principles of the Realistic Mathematics Education approach are Guided Reinvention Through; Progressive Mathematizing, Didactical Phenomenology, Self-Develop Models (E. I. F. Hidayat et al., 2020; Ulandari et al., 2019).

Learning using the Realistic Mathematics Education approach can solve contextual problems. Solving contextual problems can be done by discussing, comparing, analysing ways of solving problems, and concluding (E. I. F. Hidayat et al., 2020; Trimahesri & Hardini, 2019). Based on the learning stages that have been described, the application of the Realistic Mathematics Education approach can support geometric materials in elementary schools. In addition to determining the proper learning approach, the use of interactive multimedia is also important in increasing students' reasoning abilities and self-confidence. Interactive multimedia can increase understanding of material related to the use of animation, images, text, and audiovisual so as to improve students' way of thinking (Adi et al., 2020; Saputri et al., 2018). In addition, interactive multimedia based on an articulate storyline is packaged in an interesting and creative form, so that students can be motivated to learn (Ketut Sinta et al., 2021; Sari & Harjono, 2021). Based on previous research, explained that the use of interactive multimedia based on articulate storylines can be used and makes it easier for students to understand the material (Juhaeni et al., 2021; Yolanda et al., 2022). Meanwhile, previous research also explained that the use of the Realistic

Mathematics Education approach can improve students' reasoning abilities and self-confidence (Ardina et al., 2019; Ekowati et al., 2021). Previous studies did not use interactive multimedia based on articulate storylines which help improve reasoning abilities and self-confidence (Sindu et al., 2020; Wijayanti et al., 2022). However, this study uses interactive multimedia based on an articulate storyline which helps improve reasoning skills and self-confidence. Therefore, the purpose of this study is to analyse whether the application of the Realistic Mathematics Education approach assisted by interactive multimedia articulate storylines can overcome the lack of reasoning abilities and self-confidence.ction.

2. METHOD

This type of research is quantitative research, namely research that has been planned specifically and has a collection pattern in the form of numbers. Quantitative research is carried out in detail and produces valid data. The design of this research is quasi-experimental design. Design drawings in Table 1.

Table 1. Experiment Design

Class	Preliminary Test	Action	Final Test
Experiment	O ¹	X	O ²
Control	O ¹	C	O ²

This research is divided into two classes. These two classes were used as the experimental class and the control class, but only the experimental class was given treatment. The experimental class and the control class were both given pre-test and post-test questions. The experimental class was given treatment in the form of learning using the Realistic Mathematics Education approach assisted by interactive multimedia and articulate storylines. Meanwhile, the control class used the approach and media used by the teacher in general, namely, a scientific approach assisted by textbooks. Indicators of reasoning ability and self-confidence in Table 2. and Table 3.

Table 2. Indicator of Reasoning Ability

No.	Indicator of reasoning ability
1.	Ability to make assumptions
2.	Ability of mathematical manipulation
3.	Ability to compile evidence, reasons for the correct solution
4.	Ability to draw conclusions
5.	Ability to check the validity of the argument

Table 3. Indicator of Self Confidence

No.	Indicator of self confidence
1.	Express opinion
2.	Ambition
3.	Independent
4.	Tolerance
5.	Positive Thinking

The number of elementary schools in Wonosegoro District, Boyolali Regency is 18 elementary schools. The schools used as research sites are two schools in Wonosegoro District. The determination of the two schools was carried out randomly. The school names were changed to Cempaka Elementary School and Melati Elementary School. This research was first conducted in the fifth grade of Cempaka Elementary School with a total of 20 students. The second is fifth grade at SD Melati, which has 18 students. Data collection techniques used are observation, tests, questionnaires, and documentation. Observations were made to observe students' reasoning abilities. The test in this study used two tests, namely the pretest and posttest in the experimental class and the control class. The test will be given at the beginning before receiving treatment and at the end after receiving treatment. The questionnaire in this study was conducted to determine students' self-confidence. Documentation in this study was in the form of names and lists of student grades, videos and photos while conducting research.

The data that has been obtained in the next stage is analysis, but before data analysis is carried out, the normality test and homogeneity test are carried out first. The normality test was carried out to find out whether the instruments used were normally distributed or not. After that, a homogeneity test

was carried out to find out whether the instrument used was homogeneous or not. After that, the data was declared normal and homogeneous, the next step was data analysis. The data analysis technique used is the normality test, homogeneity test, t-test and ANOVA test. The t-test and ANOVA test were used to find out the comparison between the Realistic Mathematics Education approach assisted by interactive multimedia articulate storyline and the scientific approach assisted by textbooks.

3. RESULT AND DISCUSSION

Result

In this study, researchers used two groups consisting of an experimental group and a control group. The subjects used were an experimental class of 20 students and a control class of 18 students. Data for calculating students' reasoning abilities in solving questions on geometric material are taken from pre-test questions. Descriptive analysis is used to determine students' self-confidence in the learning process. The results of the calculation of the normality test are shown in the statement that this study meets the normality requirements for sig. > 0.05 then normally distributed. The normality test results are shown in [Tabel 4](#).

Table 4. Normality Test

Variabel	Kolmogorov-SmirnovB			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Pre-experimental reasoning abilities	0.130	20	0.200	0.977	20	0.896
Post-experimental reasoning abilities	0.193	20	0.048	0.911	20	0,067
Pre-experimental self-confidence	0,128	20	0.200	0.980	20	0.934
Post-experimental self-confidence	0.186	20	0.068	0.917	20	0.085
Pre-control reasoning ability	0.125	18	0.200	0.937	18	0.258
Post-control reasoning ability	0.116	18	0.200	0.963	18	0.659
Pre-control self-confidence	0.130	18	0.200	0.951	18	0.428
Post-control self-confidence	0.149	18	0.200	0.950	18	0.423

Based on [Table 4](#) which contains the results of the normality test in the experimental class using the Realistic Mathematics Educations approach assisted by interactive multimedia articulate storyline and the control class using a scientific approach assisted by textbooks has a sig. >0.05. So, it can be concluded that the experimental class and the control class are normally distributed. The homogeneity test in this study aims to determine whether the two groups have the same variance or not. If it has a sig. > 0.05, then the group is homogeneous. The results of the variance homogeneity test are in [Table 5](#).

Table 5. Hypothesis Homogeneity Test 1

Hypotesis 1	Levene Statistic	df1	df2	Sig.
Based on Mean	2.566	1	38	0.117
Based on Median	1.186	1	38	0.283
Based on Median and with adjusted df	1186	1	35.600	0.284
Based on trimmed mean	2.403	1	38	0.129

Based on [Table 5](#). which contains the results of the homogeneity test in hypothesis 1 has a value of 0.117 > 0.05. So, it can be concluded that hypothesis 1 which compares the reasoning ability on geometric material in fifth grade after using the Realistic Mathematics Education approach assisted by interactive multimedia articulate storyline is better than before using showing homogeneous. Then the result of hypothesis homogeneity test 2 is show in [Table 6](#).

Table 6. Hypothesis Homogeneity Test 2

Hypothesis 2	Levene Statistic	df1	df2	Sig.
Based on Mean	2.566	1	38	0.711
Based on Median	1.186	1	38	0.764
Based on Median and with adjusted df	1.186	1	37.566	0.764
Based on trimmed mean	2.403	1	38	0,740

Based on [Table 6](#) which contains the results of the homogeneity test in hypothesis 2 has a value of $0.711 > 0.05$. So, it can be concluded that hypothesis 2 which compares self-confidence after using the Realistic Mathematics Education approach assisted by interactive multimedia articulate storyline is better than before using showing homogeneity. The result of hypothesis homogeneity test 3 is show in [Table 7](#).

Table 7. Hypothesis Homogeneity Test 3

Hypothesis 3	Levene Statistic	df1	df2	Sig.
Based on Mean	0.933	3	72	0.429
Based on Median	0.826	3	72	0.484
Based on Median and with adjusted df	0.826	3	66.491	0.484
Based on trimmed mean	0.957	3	72	0.418

Based on [Table 7](#) which contains the results of the homogeneity test on hypothesis 3 has a value of $0.429 > 0.05$. So, it can be concluded that hypothesis 3 which compares reasoning abilities and self-confidence after using the Realistic Mathematics Education approach assisted by interactive multimedia articulate storylines is better than before using showing homogeneous. This hypothesis test was carried out to answer the formulation of the problem by knowing whether there was an influence from the treatment given. If seen from the average pretest and posttest results, descriptively there is a difference in the average results. However, to determine whether the difference is significant or not, it is necessary to do a paired sample t-test. The results of the paired sample t-test are in [Table 8](#).

Table 8. Paired Sample Test t-test

Hypothesis	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
Hypothesis 1	-21.750	2.337	0.523	-22.844	-20.656	-41.625	19	0.000
Hypothesis 2	-8.150	2.498	0.559	-9.319	-6.981	-14.591	19	0.000

Based on [Table 8](#) paired or dependent t-test has conditions in decision making, namely if the value of Sig. (2-tailed) < 0.05 then H_0 is rejected, and H_a is accepted. Paired or dependent t-tests are used to test the pre-test and post-test hypotheses in classes that are treated with the Realistic Mathematics Education approach assisted by articulate storyline interactive multimedia. In [Table 8](#) indicates that the value of $0.000 < 0.05$. So, it can be concluded that hypothesis 1 has a significant effect of using the Realistic Mathematics Education approach assisted by interactive multimedia articulate storylines on reasoning abilities compared to before using. Meanwhile, in hypothesis 2 there is an effect of using the Realistic Mathematics Education approach assisted by interactive multimedia articulate storylines on self-confidence compared to before using it. [Table 9](#) shows the results of the ANOVA test calculations.

Table 9. ANOVA Test

Hypothesis	Type III Sum of Squares	df	Mean Square	F	Sig.
Hypothesis 3	972.003	2	486.001	28.289	0.000
Total	303605.000	76			

Based on [Table 9](#). the ANOVA test has conditions in decision making, namely if the value of Sig. < 0.05 then H_0 is rejected, and H_a is accepted. Based on [Table 9](#). shows that the value of Sig. $0.000 < 0.05$. Thus, it can be concluded that reasoning abilities and self-confidence after using the Realistic Mathematics Education approach assisted by interactive multimedia articulate storylines are better than the scientific approach assisted by textbooks.

Discussion

Based on the results of data analysis, this study shows that the Realistic Mathematics Education approach assisted by interactive multimedia articulate storylines can be applied in learning. The results of this study indicate that there is a significant influence between the Realistic Mathematics Education approach assisted by interactive multimedia articulate storylines on students' reasoning abilities and self-confidence. The application of the Realistic Mathematics Education approach assisted by interactive multimedia articulate storylines makes it easier for students to understand the problem-solving story

problems presented. In addition, the application of the Realistic Mathematics Education approach assisted by interactive multimedia which combines animation, video, images, audio, and also text makes it easier for students to understand geometric material. This is because the Realistic Mathematics Education approach has realistic guidelines, namely learning that is related to students' daily lives that are easily understood by students, so that students can easily solve problems with their abilities and knowledge. (Kowiyah et al., 2019; Mutaqin et al., 2021). The application of the Realistic Mathematics Education approach is assisted by interactive multimedia, articulate storylines containing pictures and videos that are made in such a way as to communicate with students so that students become more active in participating in learning. Students participate actively when answering the questions presented in the video. In addition, it is in line with previous study that found students were very enthusiastic when conducting discussions and presentations (Hendriani & Gusteti, 2021).

The results of the research that has been carried out are in line with previous research, namely, it was found that after the application of the Realistic Mathematics Education approach it was proven that the reasoning ability post-test score increased compared to the pre-test score (Ekowati et al., 2021; Saleh et al., 2018; Zubaidah Amir et al., 2021). Meanwhile, other studies have found that the Realistic Mathematics Education approach is proven to be able to increase self-confidence. The results showed that the average score of self-confidence using the Realistic Mathematics Education approach increased (Delina et al., 2018; Sucahyo et al., 2021). This opinion is supported by other studies, the results of which show that the use of interactive multimedia articulate storylines can improve students' reasoning abilities (Wijayanti et al., 2022). The results of this study are also relevant to previous research which proves that interactive multimedia articulate storylines are effectively used to increase students' self-confidence (Sindu et al., 2020). Based on the research that has been done and proven, the application of the Realistic Mathematics Education approach assisted by interactive multimedia articulate storylines is highly recommended to be applied in learning. Given that reasoning abilities and self-confidence are particularly important in education, especially in mathematics at the elementary school level. The application of the Realistic Mathematics Education approach assisted by interactive multimedia and articulate storylines can provide benefits that can assist teachers in increasing students' reasoning abilities and self-confidence. In addition, the application of the Realistic Mathematics Education approach assisted by interactive multimedia and articulate storylines can help students understand the material easily because learning is interesting, efficient and effective. This research can be useful and can be used as a reference for teachers in considering learning using the Realistic Mathematics Education approach assisted by interactive multimedia and articulate storylines. It is hoped that future research can deepen the material and be able to adjust the steps so that the learning carried out can take place as fully as possible.

4. CONCLUSION

Based on the results of hypothesis testing and discussion that has been carried out, it shows that the Realistic Mathematics Education approach assisted by interactive multimedia articulate storylines can have a considerable influence on reasoning abilities and self-confidence. This can be proven by a significance value of $0.00 < 0.05$, meaning that (H_0) is rejected and (H_a) is accepted. Learning using the Realistic Mathematics Education approach assisted by interactive multimedia articulate storylines on reasoning abilities and self-confidence is better than the scientific approach assisted by textbooks. In addition, by presenting learning that combines animation, video, text, audio, and interactive multimedia images, articulate storylines can help create interesting, effective and efficient learning.

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