Volume 6, Nomor 2, Desember 2022
Numerical: Jurnal Matematika dan Pendidikan Matematika
http://journal.iaimnumetrolampung.ac.id/index.php/numerical
DOI:https://doi.org/10.25217/numerical.v6i2.

The Effect of Realistic Mathematics Education (RME) Approach on Students' Numeracy Literacy Ability

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Article Info
Article History:
Received: 01-09-2022
Revised: 10-09-2022
Accepted: 12-09-2022

Keywords:
Education Approach;
Numerical Literacy;
Realistic Mathematics
.

Abstract

This study investigated the effects of learning methodologies based on Realistic Mathematics Education (RME) on students' literacy and numeracy abilities at SMP Negeri 1 Percut Sei Tuan. The population of this study was the Class VII even semester of SMP Negeri 1 Percut Sei Tuan, which consisted of 8 classes. Class VII-1 served as the experimental class and class VII-2 as the control class when choosing samples from these classes using purposeful selection. There are typically 26 pupils in a class. A quasi-experimental research approach is the Pretest-Posttest Control Group approach. The author developed a three-question essay test to evaluate children's aptitude for solving math problems. In order to examine the effect of RME at a significant threshold of = 0.05, the t-test (independent sample t-test) is used. The hypothesis was tested, and the findings revealed a (2-tailed) sign of 0.000 < 0.05. As a result, it is possible to conclude that the Realistic Mathematics Education approach greatly impacts studens' reading and mathematics abilities.

INTRODUCTION

Through education, a nation and country can develop its human resources. Because education is a process that helps develop the inherent capacity of society to more easily face any changes that will occur in one's life, everyone has the responsibility and right to obtain education [1]. Therefore, students must be able to absorb and understand school lessons. There are different types of subjects taught in schools, including mathematics. By developing human intelligence, mathematics also plays a vital role in improving and developing better technology. Therefore, mathematics needs to be included at all levels, from elementary to high school, to help them learn how to solve the problems faced logically, systematically, critically, analytically, and creatively [2]. According to Ikhsan (2019), the learning process is the half that has the most significant impact on student learning outcomes. Learning outcomes for students will be influenced by the teaching and learning process that is less than optimal because students experience math anxiety. One form of emphasis that can be done in mathematics lessons is through numeracy literacy [3]

According to Han in Rosmalah, numeracy literacy is the ability to use basic mathematical numbers and symbols to solve problems in various real-world situations and interpret the data provided in various forms such as t-abel, charts, graphs, etc [1]. In line with the opinion of

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Abidin et al. (2017), Digital literacy is a person's ability to reason. Reasoning is learning and understanding symbolically expressed statements and mathematical language used in everyday life and communicating these ideas orally and in writing [4]. Fiad, Suharto, and Kurniati (2017) suggest that numeracy literacy predicts, applies, and interprets mathematics in various backgrounds [5]. Based on the definition above, arithmetic competence is the ability to use numbers and understand mathematical symbols to be applied in everyday life.

According to Anggrieni & Putri (2018), as the Organisation for Economic Co-operation and Development (OECD) found, measuring numeracy literacy ability includes the following: a. Communication skills; b. Expertise to represent; c. Expertise in mathematization; d. Expertise in choosing solution strategies, e. Expertise to reason; f. Expertise in using mathematical tools, g. Expertise to express symbolic, technical, and formal operations [6]. Meanwhile, according to Han (2017), the indicators of numeracy ability include: To find solutions to various solutions in everyday life, a person must be able to: a. use various types of symbols and basic numbers related to mathematics; b. assess the data provided in various formats (diagrams, tables, charts, graphs, etc.); c. interpret the analysis findings to conclude [7]. In the opinion of the experts above, the indicators of this study refer to the opinion of Anggrieni and Putri (2018). a. communication skills; b. representational skills; c. mathematization skills; d. problem-solving competence, and e. reasoning ability.

According to Andreas Schleicher, reducing the number of unemployed, increasing income, and good health require good numeracy skills. Various aspects of life, workplace, home, and society require numbers [7]. Meanwhile, according to (2021), the benefits of numeracy literacy skills are having knowledge and the ability to manage suitable activities and making appropriate assessments in every area of life after calculating and evaluating data obtained from daily life [6].

The results (of the PISA (Programme for International Student Assessment) study (2018) found that Indonesia scored 371 with an OECD score of 487 in reading proficiency, Indonesian mathematics proficiency obtained a) score of 379 with an OECD score of 487, for science skills Indonesia scored 3.96 with an OECD score of 48.9. From statistical data, this result has decreased since PISA in 2015. Based on these findings, students in Indonesia have literacy skills level 3 out of 6, thus placing them in the "less or quite low" category and requiring additional development. PISA results can be used to assess and improve Indonesian education standards [6].. Research conducted by Fauzi et al. (2021) revealed that students' reading and numeracy skills are still lacking, and they have difficulty doing problems due to the lack of welding and reasoning of mathematical sentences in the questions.

According to Sholihah & Afriansyah (2017), factors that affect the low ability of students to do numeracy literacy problems include: 1) Students are not used to solving problems in the form of texts (literacy) in mathematics and science; and 2) students have difficulty understanding texts, interpreting them, and finding problem-solving solutions [8]. Meanwhile, according to Indah, Mania, & Nursalam (2016), one of the causes of low numeracy literacy in Indonesia is making media or compiling teacher learning models less attractive [9]. To overcome students' low numeracy literacy skills, teachers must find pedagogical methods that can encourage and improve students' numeracy literacy skills. The application of the RME (Realistic Mathematics Education) approach method is the most effective, innovative, and adaptive method.

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According to (Maher, Sigley, and Brunswick 2014), Realistic Mathematics Education (RME) is a concept that supports and motivates students to connect their knowledge with applying it in everyday life [10]. The RME approach seeks to inspire students to learn mathematical principles and connect these principles to problems that arise in everyday life.

The RME method begins the learning process with the reality and experience of students. The use of realistic problems as a foundation for developing formal mathematical knowledge or mathematical concepts can encourage efforts to organize the subject matter and solve problems. The RME approach expresses a point of view on mathematics as a topic, how students should learn it, and how mathematics should be taught. This learning uses a "real world" context based on constructivist learning theory [11]. The steps of the RME approach According to Shoimin (2014), these include 1) Recognizing contextual problems, 2) Solving contextual problems, 3) Comparing the answers obtained and discussing them, and 4) Concluding using evidence [12].

Through learning activities that begin with real-world experience, the RME strategy used in this study will affect the degree of numeracy literacy ability of students. Students will be accustomed to doing interesting thinking and reasoning exercises about a mathematical problem to find a solution through realistic problems. This approach seeks to teach mathematics that emphasizes learning from experiences that are not too abstract and relevant to the student's world, making learning more exciting and meaningful. This means that in this learning based on the experiences that students have experienced, eating will form their knowledge [11].

According to research by Ayunis and Stavin (2021), the learning outcomes of students taught with the RME method are higher than those of students taught with conventional methods on mathematical literacy skills; another study conducted by Badriyatul (2021) stated that the application of realistic mathematics education significantly influences student learning outcomes. According to research by Erna Siti Nur'aini et al. (2016), learning using the RME approach can increase students' mathematical knowledge.

METHOD

The type of research used in this study is quantitative research. This study evaluated the quality and effectiveness of practical mathematics teaching strategies on digital literacy. This study used a quasi-experimental design with a pre-post control group design. Before starting classroom learning, experimental classes and control classes are first tested to measure students' basic knowledge. The experimental class used practical mathematics teaching methods, while the control class used conventional teaching methods.

Procedures carried out in this study:

1. Determination of population and research sample
   Students of SMPN 1 Percut Sei Tuan became the population in this study. Eight parallel classes of grade VII students were used as research samples. Samples were then selected using purposive samples, with class VII-1 as the experimental group and class VII-2 as the control group, totaling 26 students in each experimental and control class.
2. Giving Pretest Questions in Both Research Samples
   Both research samples were given pretest questions on numeracy literacy skills, as many as three questions in the form of essay tests with a duration of 60 minutes. This pretest is to see

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the abilities and attitudes of students before being treated with the Realistic Mathematics Education approach to learning.

3. Application of Learning
   Learning was carried out for two weeks on geometry building materials. The experimental class applies the RME approach, while the control class applies conventional learning.
4. Giving Posttest Questions in Both Research Samples
   At the end of the meeting, the control class and experimental class were given posttest questions on student numeracy literacy skills that students would complete to obtain data on student literacy abilities. The posttest questions given were three items in the form of essays with a duration of 60 minutes. The questions on the posttest are identical to those on the previous pretest.

   In the course of testing against hypotheses and analyzed using inferential statistics. Before hypothesis testing, pre-requisite tests must first be carried out on posttest scores in experimental and control classes. The prerequisite tests are homogeneity and normality tests (Kolmogorov-Smirnov). The hypothesis is then tested when the prerequisite test has been fulfilled using the t-test (independent sample t-test) with a significant level of $\alpha = 0.05$. In testing the hypothesis of its test criteria, if the significance value (sig) is more significant than 0.05, then the hypothesis is accepted. In addition, Ha is rejected if the significance (sig) is less than 0.05.

RESULTS AND DISCUSSION

Class VII-1 was used as an experimental class in this study at SMPN 1 Percut Sei Tuan, while the control group was class VII-2. The study was conducted during six face-to-face meetings in classrooms. The pretest was carried out at the first meeting; learning was carried out between the second and fifth meetings in both the experimental and control classes and at the sixth meeting, a posttest was given to the experimental and control groups. The control class uses a conventional approach commonly used in daily learning at school, while the experimental class uses the RME (Realistic Mathematical Education) approach.

Descriptive results of numeracy literacy skills of SMPN1 Percut Sei Tuan grade VII students.

Table 1. Descriptive Analysis

Class	N	Minimum	Maximum	Mean	Std. Deviation
Pretest Control	26	63	80	70.73	4.863
Pretest Experiment	26	63	81	70.12	4.869
Posttest Control	26	69	80	73.65	2.813
Posttest Experiments	26	72	87	79.42	3.679
Valid N (listwise)	26				

Based on Table 1. It can be seen that the learning outcomes of the control class on the pretest obtained a score of 80 out of 100, the most significant score of 80, the lowest score of 63, and an average of 70.73; the standard deviation was 4.863. The lowest score of 69 and the highest

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of 80 in the posttest control group was a mean of 73.65, and the standard deviation was 2.813. While the experimental class learning results on the pretest obtained a score range of 63 to 81 with an average of 70.12 and a standard deviation of 4.869, the lowest score was 63. The posttest results of the experimental class showed a score range of 72 to 87. The mean was 79.42, and the standard deviation was 3.679. Before hypothesis testing, pre-requisite tests must first be carried out on posttest scores in experimental and control classes. The prerequisite tests are homogeneity and normality tests (Kolmogorov-Smirnov).

Table 2. Pretest and Posttest Normality Test Results

	Class	Kolmogorov-Smirnov		
		Statistics	Df	Sig.
Numeration Literacy Skills	Pretest Control (Conventional)	.139	26	.200*
	Pretest Experiment (RME)	.123	26	.200*
	Posttest Control (Conventional)	.145	26	.170
	Posttest Experiment (RME)	.142	26	.192

From Table 2. The normality permit is carried out using the IBM SPSS Statistics 26 program. It can be observed in the column section Sig. Kolmogorov–Smirnov control class in the pretest table above has df of 26 and Sig. of 0.200 > 0.05 with df of 26, experimental class pretest produces Sig. of 0.200 > 0.05. While in the experimental class, the posttest obtained Sig. 0.192 > 0.05 with df 26, and the control class posttest table showed Sig. 0.170 > 0.05 with DF 26. As a result, it can be said that the data is normally distributed.

Table 3. Posttest homogeneity test results

	Levene Statistic	df1	df2	df2	Sig.
Numeration Literacy Skills	Based on Mean	.982	1	50	.326
	Based on Median	.790	1	50	.378
	Based on the Median and with adjusted df	.790	1	47.765	.379
	Based on trimmed mean	1.025	1	50	.316

Based on Table 3. The homogeneity test yielded a Sig—value of 0.326. Then, the data is homogeneous because 0.326 > 0.05. The data meet the criteria in hypothesis testing because it is homogeneous and has a normal distribution. The next step is hypothesis testing using an independent sample t-test.

Table 4. Hypothesis Test Results

		Levene's Test		t-test Equality		
		F	Sig.	t	Df	Sig. (2-tailed)
Numeration Literacy Skills	Equal variances assumed	1.473	.231	-6.352	50	.000
	Equal variances are not assumed.			-6.352	46.790	.000

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From Table 4. Obtained Sig. (2 tailed) of 0.000. Based on the test criteria, Ho was rejected as 0.000 < 0.05. As a result, it can be said that students taught with the Realistic Mathematic Education approach have much better numeracy literacy skills compared to students taught with a conventional approach.

Applying Realistic Mathematic Education in the experimental class obtained an average score of 79.42. This result is better than the average score of the control class, 73.65, taught using a conventional approach. Test the hypothesis, yielding a value of sig.=0.000. Because of 0.0000.05, students who learn through the RME approach have a significantly greater numeracy literacy level than those who use conventional approaches.

After applying learning methods using the Realistic Mathematics Education approach, students get a positive impact on learning so that they become more involved in learning, focusing students' attention because they use problems contextually. In line with the opinion of Hendriana and Soemarmo (2017), a good teacher will teach mathematical skills and knowledge to students by connecting them with concrete situations [13]. This is in line with Susanto's opinion (2019), saying that "Realistic Mathematics Education (RME) is one of the mathematics learning approaches that focus on students and mathematics must be connected in real terms to the background of students' daily lives" [14].

One of the benefits of using EMR is that it develops good numeracy skills over time, can help students remember concepts from a lesson, makes them feel more valued and willing to voice their thoughts, and fosters teamwork. Students will find it easier to understand and remember concepts in the material well in learning if they solve problems through direct experience [15]. Students are motivated to connect their learning with real-world situations by applying Realistic Mathematics Education. Mathematics learning is strongly influenced by realistic mathematics education [16].

The results of a study conducted by Mutmainah and Suhendar (2023) entitled "Comparison of the Influence of RME and Scientific Approaches on Numeracy Literacy Ability" posttest results show that the average numeracy literacy ability of posttest classes using the RME approach is higher than the average numeracy literacy ability of posttest classes using a scientific approach [17]. In another study conducted by Nur Fauziah Siregar (2021) entitled "Understanding Mathematics Concepts of Junior High School Students through the Realistic Mathematics Education Approach," based on the results of the study, the Realistic Mathematics Education approach has a significant effect on the ability to understand mathematical concepts of SMP Negeri 7 Padangsidimpuan.

CONCLUSION

Based on the use of the SPSS application in analyzing data. The results of this study produced the value of sig. (2-tailed) of 0.000 from the data obtained after the t-test. Because 0.000 < 0.05, it is concluded that the Realistic Mathematics Education approach significantly influences students' numeracy literacy skills.

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