

Indonesian Realistic Mathematics Education: Alternative Mathematics Learning Approach to Improve Fifth Grade Numeracy Literacy Skills

I Gusti Ayu Putu Wintari Ekayanti^{1*} 

¹ Pendidikan Guru Sekolah Dasar, Universitas Pendidikan Ganesha, Singaraja, Indonesia

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ABSTRAK

Berdasarkan temuan observasi, kemampuan literasi numerasi siswa dinilai masih lemah. Temuan Asesmen Nasional Berbasis Komputer menunjukkan bahwa kurang dari 50% siswa telah mencapai tingkat kemampuan yang disyaratkan. Tujuan penelitian ini adalah menganalisis dampak pendidikan matematika realistik Indonesia terhadap kemampuan literasi numerasi siswa kelas V. Jenis penelitian yang digunakan dalam penelitian ini adalah desain quasi eksperimen dengan desain non-equivalent control group design. Populasi penelitian ini adalah seluruh siswa kelas V SD sebanyak 123 orang yang terdiri dari 8 kelas yang terdapat di 8 SD Negeri. Seluruh populasi disamakan dengan uji ANOVA satu arah setelah diberikan pretest. Apabila seluruh populasi dinyatakan sama maka teknik pengambilan sampel yang digunakan adalah cluster random sampling. Metode pengumpulan data dikumpulkan dengan menggunakan tes deskripsi 3 soal, kemudian data dianalisis menggunakan teknik analisis statistik deskriptif dan teknik analisis statistik inferensial dengan Polled Variance T-Test. Hasilnya ditemukan bahwa pendekatan pembelajaran pendidikan matematika realistik Indonesia mempengaruhi Keterampilan Literasi Numerasi Siswa Kelas V sebesar 52,9%. Temuan penelitian ini memberikan landasan teoritis untuk menerapkan pendekatan PMRI pada pembelajaran matematika di sekolah dasar, dengan fokus pada keterampilan literasi numerasi siswa.

ABSTRACT

According to the findings of observations, students' literacy numeracy skills are still considered to be weak. The findings of the computer-based national assessment show that fewer than 50% of pupils have attained the required level of ability. This study aims to analyze the impact of Indonesian realistic mathematics education on numeracy literacy skills of fifth grade students. The type of research used in this study is a quasi-experimental design with a non-equivalent control group design. The population of this study were all fifth-grade elementary school students as many as 123 people consisting of 8 classes contained in 8 public elementary schools. The entire population is equalized with a one-way ANOVA test after giving a pretest. If the entire population is declared equal, the sampling technique used is cluster random sampling. The data collection method was collected using a 3 questions description test, then the data was analyzed using descriptive statistical analysis techniques and inferential statistical analysis techniques with the Polled Variance T-Test. The result found that the Indonesian realistic mathematics education learning approach affects the Numeracy Literacy Skills of Fifth Grade Students by 52.9%. The findings of this study provide a theoretical foundation for applying the PMRI approach to mathematics instruction in elementary schools, with a focus on students' numeracy literacy skills.

1. INTRODUCTION

Mathematics is one of the subjects that must be taught in schools. beginning with kindergarten and continuing through elementary, junior high school, senior high school, and college. Even math is necessary for students to move on to the next level of study. Students study mathematics to develop their understanding of and aptitude for correct problem-solving (Abosalem, 2015; Utami & Wutsqa, 2017; Wibowo & Faizah, 2021). However, students claim that math commands the most respect. Many students believe that math is inherently harder to learn than other disciplines, contains a lot of formulas, and has

no bearing on their daily lives. This is predicated on the idea that pupils find arithmetic instruction to be less relevant and challenging to comprehend (Afriansyah, 2022; Faot & Amin, 2020; Hidayat & Irawan, 2017). Students consequently fail to comprehend how to apply what they learn to the difficulties they encounter in daily life. The reality in which students live and work is constantly relevant to math. There is no denying that every-daily action pupils engage in relates to math. The ability to think logically, analytically, systematically, critically, artistically, and jointly can be developed in students who study mathematics (Hidayat & Irawan, 2017; Rahmad & Wijaya, 2020). Therefore, the implementation of mathematics learning does not only provide concepts in the form of memorization; it is also necessary to provide opportunities for students to find their own concepts of solving mathematical problems that exist in everyday life (Retnowati et al., 2018; Schukajlow et al., 2022). Students must be involved in the process of building mathematical concepts rather than receiving math as a finished product. So, students who actively explore mathematical concepts are said to build these concepts (Callingham & Watson, 2017; Johar, 2014). This shows how students are treated as objects of learning and given the ability to create various problem-solving techniques that are beneficial to the development of their knowledge.

One of the abilities needed to solve mathematical problems related to everyday life is numeracy literacy. Numeracy literacy is the capacity to use various numbers and symbols associated with basic mathematics to solve real-world problems and then evaluate the data to reach a conclusion (Cahyanovianty & Wahidin, 2021; Perdana & Suswandari, 2021). Numeracy literacy can be achieved by linking activities to formulate, employ, and interpret mathematics in solving problems in students' daily lives in various contexts (Lubaale et al., 2021; Nelson et al., 2021). Because numeracy literacy is the foundational talent that every human being needs to have in order to exist in the future, it is crucial to develop these skills. It is anticipated that students will be able to accomplish each learning objective with the help of numeracy and literacy (Iswara et al., 2022; Saefurohman et al., 2021). Despite the fact that everyone needs numeracy literacy to face challenges in daily life and that numeracy literacy is closely related to work and daily activities, students' numeracy literacy skills are currently very low.

Based on the results of a study conducted by PISA in 2018 and released by the OECD in 2019, it shows that the average math score of Indonesian students reached 379 with an average OECD score of 487. Indonesia is ranked 74 out of 79 countries. This shows that the numeracy and literacy skills of students in Indonesia are still low (Fiangga et al., 2019; Syaifuddin, 2022). From the results of observations made at elementary schools in Cluster VI, Abiansemal District, it is stated that students' numeracy literacy skills are still said to be low. This can be seen in the Computer Based National Assessment (ANBK) score, which was carried out in 2021 with an average of 1.55 out of 8 existing public schools. Based on the average ANBK score, it can be said that students' numeracy literacy skills are below the minimum competency, where less than 50% of students have achieved the minimum competency for numeracy literacy.

In mathematics, of course, there are various scopes of material that need to be learned to solve problems in everyday life. Such as numbers, algebra, geometry and measurement, and data processing. Therefore, the material presented can be connected to everyday life so that students can participate directly in learning activities in the classroom (Awofala & Blessing, 2014; Rakhmawati & Mustadi, 2022). Student participation in question is when students express or communicate their ideas and reasoning so that learning is felt meaningful by students (Prahmana et al., 2020; Saleh et al., 2018). The existence of direct student participation during learning activities makes students feel active, which can hone their numeracy and literacy skills. One of the mathematics learning approaches that can be used to hone numeracy literacy skills is Indonesian Realistic Mathematics Education (PMRI). Thus, learning using PMRI can help students develop understanding, the ability to apply, and the ability to explain mathematics in various situations, including the ability to reason logically and use ideas, methods, and facts as resources to describe, explain, and anticipate an event (Prahmana et al., 2020; Tampubolon, 2016). In other words, the use of PMRI can give students the understanding that they have the right to determine the solution to solving mathematical problems in their own way, which is one of the basic characteristics of numeracy literacy, namely the ability to use strategies to solve problems.

In addition, there are other advantages of the PMRI approach, namely that it can develop and support students' problem-solving skills, allowing them to get used to giving reasons and answers to solving these problems, which makes them more courageous in expressing their opinions. This is inseparable from the learning process of a person, which is not only an individual process but also simultaneously a social process. The learning process will be shorter and more meaningful when students communicate their work and ideas to each other. This is in line with the goal of numeracy literacy, namely being able to make decisions in everyday life based on logical considerations (Amadea & Ayuningtyas, 2020; Johar, 2014). The purpose of this study is to analyze the impact of Indonesian realistic mathematics education on numeracy literacy skills of fifth grade students. The novelty of this study lies on utilization of

interaction in mathematics learning is beneficial in developing students' cognitive and affective abilities simultaneously. This study is limited to the application of the PMRI approach to fifth grade students at elementary schools in Cluster VI, Abiansemal District, only paying attention to its effect on students' numeracy literacy skills.

2. METHOD

The type of research used in this study is a quasi-experimental design, and the design used is a non-equivalent control group design (Gopalan et al., 2020). This research was conducted at elementary schools in Cluster VI, Abiansemal District. Elementary schools in Gugus VI Abiansemal District consist of 8 elementary schools. Before determining the research sample, an equality test was conducted first. To get an equal study sample, the equality test was run. The sampling technique in this study is cluster random sampling, and the method used to determine the research sample is drawing twice. From the results of the draw, it can be seen that the group of students who became the experimental class was SD No. 3 Mambal, and the group of students who became the control class was SD No. 2 Mambal. In this study, the data to be collected is data on the numeracy literacy skills of fifth grade students at elementary school in Cluster VI, Abiansemal District, with data collection methods using test techniques. The test that will be used to measure the improvement of numeracy literacy is a description test with three questions. Each item is given a score of 1 to 5, which is adjusted to the scoring rubric. After that, the scores obtained will be summed up. The amount is the numeracy literacy ability of students. Before the test is applied to the research sample, validity and reliability tests are carried out in order to get a research instrument that is suitable for use. The results of the research instrument test found that the three questions tested were said to be valid and reliable.

Data analysis methods and techniques used are descriptive statistical analysis techniques and inferential statistics. The descriptive statistical techniques used in this study are calculating the mean, median, mode, standard deviation, and variance (Budi et al., 2020; Sukestiyarno et al., 2021). In addition, the inferential statistical technique uses the normality test of the data distribution and the variance homogeneity test. After the prerequisite analysis test is carried out, the analysis used to test the research hypothesis is parametric statistical analysis using the t-test pooled variance formula.

3. RESULT AND DISCUSSION

Results

The data collected in this research is data on the numeracy literacy skills of fifth grade elementary school students at Cluster VI, Abiansemal District in the 2022/2023 academic year. The data was obtained from the analysis of the treatment results between learning using the Indonesian Realistic Mathematics Education (PMRI) approach in the experimental class and learning using the conventional approach in the control class. After being given both treatments for six meetings, the data were analyzed with descriptive and inferential statistical analysis techniques. The summary of descriptive statistics of students' post-test data in both research groups is in Table 1.

Table 1. Description of the Post-test for Experimental and Control Groups

	Experimental Groups	Control Groups
Highest Score	93.3	73.3
Lowest Score	40.0	40.0
Mean	70.33	56.0
Median	73.3	60.0
Mode	86.7	60.0
Standard Deviation	17.50	12.03
Variance	306.32	144.76

From Table 1, the experimental group post-test data shows that the highest score is 93.3 and the lowest score is 40. Furthermore, descriptive analysis is carried out, which consists of calculating that the class range is 53.3, the number of classes is 5, the class length is 10.7, the average (mean) is 70.33, the middle value (median) is 73.3, the value with the most frequency (mode) is 86.7, the magnitude of the deviation of the value is 17.50, and the diversity of the value is 306.32. In addition, from the post-test data of the control group, it can be seen that the highest score in the control group is 73.3 and the lowest score is 60. Furthermore, descriptive analysis is carried out, which consists of calculating that the class range is 33.3, the number of classes is 5, the class length is 6.7, the average (mean) is 56.0, the median value and

the value with the most frequency (mode) are 60.0, the magnitude of the deviation of the value is 12.03, and the diversity of the value is 144.76. To determine the effectiveness of the treatment given to the two research groups with a normalized gain score based on the pre-test and post-test values that have been carried out. The recapitulation of the normalized gain score test can be presented in [Table 2](#).

Table 2. Normalized Gain Score Test Results

Research Group	Mean pre-test	Mean post-test	N-gain	Category
Experimental Groups (SD No. 3 Mambal)	39.67	70.33	0.529	Medium
Control Groups (SD No. 2 Mambal)	41.33	56.00	0.262	Low

Base on [Table 2](#), the results of these calculations, it can be seen that the n-gain score value of the experimental group is 0.529, or 52.9%, which states that the effectiveness of the treatment given is classified in the moderate category, while the n-gain score value of the control group is 0.262, or 26.2%, which states that the effectiveness of the treatment given is classified in the low category. So, it can be concluded that in the experimental class group learning using the PMRI approach effectively improves students' numeracy literacy skills. In addition to descriptive analysis techniques, inferential analysis techniques include normality and homogeneity tests as prerequisite assumption tests for hypothesis testing. The normality test of data distribution is carried out to determine whether hypothesis testing with parametric statistics can be carried out or not. The recapitulation of the normality test of data distribution on the post-test results of numeracy literacy skills in the experimental group and control group is presented in [Table 3](#).

Table 3. Normality Test Results of Post-test Data Distribution for Experimental and Control Groups

Research Group	Number of Students	Maximum Score (A1 / A2)	K-S Table Value	Description
Experimental Groups (SD No. 3 Mambal)	20	0.210	0.294	The data is normally distributed.
Control Groups (SD No. 2 Mambal)	15	0.178	0.338	The data is normally distributed.

Base on [Table 3](#), the results of these calculations, it can be seen that the maximum value (A1 / A2) is 0.140, while the value of the Kormogorov-Smirnov table with a significance level of 5% and $n = 20$ is 0.294. So, it can be concluded that the maximum value (A1 / A2) < the critical price of the Kormogorov-Smirnov table, namely $0.140 < 0.294$. So, it can be seen that the experimental group's numeracy literacy post-test data is normally distributed. In addition, from the results of these calculations, it can be seen that the maximum value (A1/A2) is 0.230, while the value of the Kormogorov-Smirnov table with a significance level of 5% and $n = 15$ is 0.338. So it can be concluded that the maximum value (A1 / A2) < the critical price of the Kormogorov-Smirnov table, namely $0.230 < 0.338$. So, it can be seen that the control group's numeracy literacy pre-test data is also normally distributed. The homogeneity test is carried out to show that the differences that occur in hypothesis testing really occur due to differences in variance between groups, not as a result of differences within groups. The recapitulation of the homogeneity of variance test on the post-test results of numeracy literacy skills in the experimental group and control group is presented in [Table 4](#).

Table 4. Results of Homogeneity Test of Variance of Post-test for Experimental and Control Groups

Research Group	Number of Students	F _{count}	F _{table}	Description
Experimental Groups (SD No. 3 Mambal)	20	2.11	4.14	The data is declared homogeneous.
Control Groups (SD No. 2 Mambal)	15			

Base on [Table 4](#), the homogeneity test was carried out with the F test, and from the calculation results, it can be seen that the F_{count} Value is 2.11, while the F_{table} value, with a significance level of 5%, $df_1 (k - 1) = 1$ and $df_2 (n - k) = 33$, is 4.14. So, it can be concluded that the value of $F_{count} < F_{table}$, namely $2.11 <$

4.14, So, it can be seen that the post-test data on numeracy literacy skills in the experimental group and control group are declared homogeneous. Furthermore, both prerequisite tests stated that the data were normally distributed and homogeneous, so the analysis carried out was parametric statistics. The statistical analysis that will be used to test the hypothesis of this research is a t-test with a pooled variance formula. The t-test recapitulation of the post-test results of numeracy literacy skills in the experimental group and control group is presented in [Table 5](#).

Table 5. Results of T-Test of Post-test for Experimental and Control Groups

Research Group	Number of Students	Mean	Variance	$dk = (n_1 + n_2 - 2)$	t_{count}	t_{table}
Experimental Groups (SD No. 3 Mambal)	20	70.33	306.32	33	2.70	1.69
Control Groups (SD No. 2 Mambal)	15	56.00	144.76			

Base on [Table 5](#), the results of these calculations, it can be seen that the t_{count} value is 2.70, while the t_{table} value with a significance level of 5% and $dk = 20 + 15 - 2 = 33$ is 1.69. So, it can be concluded that the $t_{count} > t_{table}$ value is $2.70 > 1.69$. So, H_0 is rejected and H_1 is accepted, which states that there is a significant difference in the numeracy literacy skills of students who are taught using the PMRI approach with students who are taught using a conventional learning approach in fifth-grade of Cluster VI, Abiansemal District in the 2022/2023 academic year.

Discussion

Learning using the PMRI approach makes students look more active and does not look boring. Because learning is more focused on students, the teacher is only a facilitator for them to be able to solve the problems they get in the way and concepts they know ([Danoebroto, 2013](#); [Faot & Amin, 2020](#)). Similar research with the results showed that the application of the PMRI approach can make students more motivated to learn and that they can understand a mathematical concept through concrete media ([Pratiwi & Wiarta, 2021](#); [Sukriadi et al., 2015](#)). During learning, students carry out more discussions with their groups; this also allows students to share knowledge with each other so that they are not sleepy during learning. When students answer the Learner Worksheet (LKPD) given, students are invited to use their own way, even if they use a different way from the one in the book. This is what we need to appreciate from students. In addition, the learning provided is always related to other materials, such as the material taught, namely how to present data that can be connected to the fraction material that has been given previously. Where students will think critically to be able to solve the problems contained in the worksheet ([Novitasari et al., 2022](#); [Yerizon et al., 2018](#)). This is in line with the research where the results of the study showed that using the PMRI approach in solving High Order Thinking Skills (HOTS) problems can make students more active and can improve students' numeracy literacy competencies to achieve competency assessment ([Dewi & Agustika, 2020](#)). Learning that applies the PMRI approach can convey that, based on the results of the research that has been done, this approach can have an influence on students' numeracy and literacy skills.

On the other hand, learning using conventional approaches makes students less interested in learning. Most of the learning centers around the teacher, who only provides material more dominantly using the lecture method. Where student activities in this learning are more dominated by listening to the teacher and answering questions contained in the book. This is what makes students feel less interested in learning. Teachers can utilize the study's findings as guidance as they implement creative and varied learning activities. The Indonesian Realistic Mathematics Education (PMRI) method can be applied in mathematics classes, particularly those that focus on improving students' numeracy and literacy. This is due to the fact that this method helps students learn that they have the freedom to choose how they want to solve a math problem.

4. CONCLUSION

Based on the results of research and discussion, there is a significant difference in the numeracy literacy skill of students in the group of students who apply the Indonesian Realistic Mathematics Education (PMRI) approach and the group of students who apply the conventional approach of fifth-grade students in elementary school at Cluster VI, Abiansemal District. Thus, it can be concluded that the Indonesian Realistic Mathematics Education approach affects the numeracy skills of fifth grade students in elementary school at Cluster VI, Abiansemal District in the 2022/2023 academic year by 52.9%. It is

recommended that students always be actively involved in improving numeracy literacy skills in the mathematics learning process so that learning outcomes can be developed optimally. In addition, as a facilitator, want to be able to package learning by using the PMRI approach as one of the mathematical approaches to improving the numeracy literacy skills of fifth grade students.

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