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Implementation of the Reading to Learn Model to Improve Numeracy Literacy Skills at Smp Negeri 2 Suwawa

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A B S T R A C T

Education today emphasizes the importance of numeracy literacy as part of the basic competencies in the Merdeka Curriculum. Numeracy literacy is an essential skill for students to understand and use mathematics in real-life contexts. This study aims to examine the influence of the Reading to Learn learning model on students' mathematical numeracy literacy skills in statistical material. This study uses a quantitative approach with a post-test-only control group design. Two eighth-grade classes at SMP Negeri 2 Suwawa were randomly selected as the sample. The experimental class was taught using the Reading to Learn model, while the control class received conventional instruction. The research instrument is an essay test that has been validated to measure mathematical numeracy literacy. Data analysis shows that the distribution is normal and the variance is homogeneous. The independent samples t-test revealed a significant difference between the post-test scores of the two groups, with the experimental class achieving a higher average. The effect size, calculated using Cohen's d, is 3.53, indicating a strong effect. These results indicate that the Reading to Learn model significantly improves students' mathematical numeracy literacy. This model helps students understand concepts contextually, think critically, and actively participate in learning.

1. Introduction

Mathematics is one of the fundamental sciences that plays an important role both in everyday life and in the development of science and technology (Anwar, 2018). Mathematics is not just about calculations, but also a tool for solving various real-world problems. Mathematics is viewed as a subject that must be understood as well as a conceptual tool for constructing and reconstructing the material, honing, and training the thinking skills needed to solve problems in life (Kemendikbudristek, 2022). Mathematics education is important for developing reflective and critical citizens who can deal with the mathematical demands of everyday life, and also for preparing a sufficient number of mathematics and scientist capable of meeting the challenges of the contemporary world (UNESCO,

2022). Therefore, in the national curriculum, mathematics is designated as a core subject at all levels of education due to its significant contribution to the development of students' logical, analytical, and critical thinking skills.

Numeracy literacy has become an essential competency in understanding data-based information such as graphs, tables, and statistics, which frequently appear in various fields such as technology, health, and economics in the rapidly developing digital era. Mathematical literacy is an individual's capacity to reason mathematically and to formulate, employ, and interpret mathematics to solve problems in a variety of real- world contexts. It includes concepts, procedures, facts, and tools to describe, explain, and predict phenomena. It assists individuals to know the role that mathematics plays in the world and to make the well-founded judgments and decisions needed by constructive, engaged, and reflective 21^{st} century citizens (PISA, 2022). Meanwhile, numeracy is a person's skill in processing data in the form of numbers and describing the results verbally or in writing (Aziz & Septriyanti, 2023). Therefore, the objective of numeracy, which encompasses mathematical literacy, is to achieve mathematical proficiency (Pratiwi et al., 2024). This shows that numeracy literacy is not just a skill in processing quantitative information, but also an important foundation in shaping individuals who are capable of critical, reflective thinking and making accurate decisions in various real-life contexts.

Numeracy literacy plays an important role in enhancing mathematical skills and 21st-century skills in an optimal learning environment (Husna et al., 2022). However, the results of PISA 2022 show that Indonesia's ranking in numeracy literacy improved by five positions, but the score dropped by 13 points compared to 2018 and is still far from the OECD average (OECD, 2024). This indicates that Indonesian students' numeracy literacy is still relatively low. This condition is also reflected in the 2021 National Assessment in Gorontalo Province, particularly in Bone Bolango Regency, where the average numeracy competence of junior high school students is at a basic level. At SMP Negeri 2 Suwawa, the 2024 Education Report shows a decline in students' numeracy skills, particularly in the aspect of data processing (Kemendikdasmen, 2025).

In the world of education, statistics plays an important role as a foundation for understanding advanced mathematics. This material is introduced at the Elementary School level and further developed at the Junior High School level. However, the understanding of statistical concepts is often considered abstract by students due to monotonous data presentation and a lack of meaningful learning (Rahayu & Putri, 2021). The aspect of data that has declined reflects a weak understanding of statistical concepts, such as reading graphs, tables, and diagrams, as well as relating concepts to real-life situations (Junika et al., 2020). As a result, students often struggle to understand basic concepts such as mean, median, mode, and the interpretation of pie charts (Rosyidah & Mustika, 2021). The results of interviews with mathematics teachers at SMP Negeri 2 Suwawa indicate that most students have difficulty applying mathematical concepts to everyday life contexts. This is exacerbated by teaching methods that are still dominated by conventional

approaches, which emphasize rote memorization of formulas and practice problems without providing a deep understanding of the underlying concepts.

The Conventional Approach in mathematics learning, which results in minimal active participation from students and decreased learning focus. Conventional learning that is teacher-centered will make students passive in the learning process because the teacher only explains the material and then gives exercises for the students to work on (Anita, 2020). On the other hand, in the student-centered approach, teachers face many obstacles, both from students' attitudes and the varying abilities of students in each class (Satriaman et al., 2019). Therefore, it is very important to balance both approaches so that the learning process can run effectively and efficiently. Therefore, an innovative learning model is needed that integrates literacy and numeracy aspects to enhance students' understanding of mathematics. One learning model that is relevant to this need is the Reading to Learn model, which is designed to integrate literacy and numeracy skills in the learning process.

The Reading to Learn model is an approach that emphasizes reading comprehension to support concept mastery, including in statistics material. This model guides students to understand texts gradually, discuss them, and rewrite the content, thereby forming strong numeracy literacy skills (Tasman et al., 2022). Reading to Learn is a teaching model that facilitates students in understanding a reading by identifying key words and then explaining the reading in their own words (Sriwedari et al., 2023). The integration of Reading to Learn has great potential in enhancing students' understanding of statistical concepts, as students are not only fixated on formulas and numbers but are also able to relate statistical concepts to real-world contexts through reading and analyzing information.

However, the application of the Reading to Learn model in mathematics learning, particularly in statistics, is still very limited. The research by Tasman et al. (2022) only focused on mathematical literacy in the context of quadratic equations. Furthermore, the research conducted by Simamora et al. (2022) investigated the improvement of numeracy literacy through the Problem-Based Learning model. Another study, conducted by Suryati et al. (2021), examined the impact of Reading to Learn on students' writing skills and perceptions. There hasn't been much research integrating this model into mathematics learning as a means of improving numeracy literacy, particularly in statistics. Therefore, this study aims to determine the effect of the Reading to Learn learning model on students' mathematical numeracy literacy skills. This model is expected to enhance student engagement in the learning process, deepen the understanding of mathematical concepts, and develop numeracy skills in a meaningful context.

2. Methodology

This research uses a quantitative approach, which aims to examine the relationships between variables in a specific population or sample through the use of research instruments that produce data in the form of numbers. The research method used in

this study is the experimental method with a Posttest-Only Control Group Design. In this study, there will be two class groups, each selected randomly. The first group is given treatment and the other group is not. The class that is given treatment is called the experimental class and the class that is not given treatment is called the control class (Sugiyono, 2024).

The selection of respondents was conducted using a simple random sampling approach. The population in this study consists of all eighth-grade students at SMP Negeri 2 Suwawa, distributed across 4 classes, with class VIII-3 selected as the experimental class and class VIII-4 as the control class. The selection of these two classes was based on several criteria, namely the same mathematics teacher and a relatively balanced number of students, so that the learning process and research results are not influenced by differences in treatment by the teacher or disparities in the number of students.

In this study, there are two main variables, namely the independent variable and the dependent variable, which are operationally defined to be measured accurately and relevantly. The independent variable in this study is the Reading to Learn learning model, which is an approach that focuses on reading comprehension to build conceptual mastery, particularly in statistics material. The dependent variable is the students' mathematical numeracy literacy skills, which in this context are focused on statistics material. The ability of mathematical numeracy literacy is measured through posttest results that include statistical questions based on numeracy literacy indicators, such as data interpretation, table and graph analysis, and context-based problem solving.

The instrument used in this study is a posttest on numeracy literacy skills focused on statistical material. This instrument consists of 7 essay questions developed based on numeracy literacy indicators and adjusted to the context of data-based questions, graphs, and other statistical representations. The questions have undergone a content validity process by subject matter experts and mathematics education specialists to ensure the alignment between the measured indicators and the construction of the questions. In addition, the instrument has also been pre-tested on students outside the research sample to measure the reliability of the questions using the Cronbach’s Alpha technique, thereby ensuring the consistency and reliability of the instrument in measuring students' numeracy literacy skills.

The implementation of this research consists of three stages, namely: (1) preparation, which includes the development of test instruments in the form of essay posttest questions and validation of the instruments by experts; (2) the implementation of learning, where the experimental group is treated using the Reading to Learn learning model in three sessions, each lasting 80 minutes. Meanwhile, the control group follows the learning process using the conventional learning model with the same number and duration of sessions; and (3) the administration of posttests to both groups with the same questions to measure students' numeracy literacy skills in statistics.

In order to analyze the research results, two main statistical tests were used, namely the normality test and the homogeneity test. The tests are conducted to determine whether the obtained data are normally distributed or not, while the homogeneity test is conducted to determine whether there is a similarity in variances among several groups. In addition, a Cohen's d (effect size) test was also conducted to refer to a set of indices that measure the magnitude or strength of a treatment (Backer, 2015). Hypothesis analysis uses the Independent samples t-test to measure the difference in the average learning outcomes of students in both classes. The test aims to identify whether there is a difference in the students' post-test results. Both sets of data were analyzed using the SPSS IBM 27 software. The hypothesis tested using the t-test is H_0 the mathematical numeracy literacy ability taught through the Reading to Learn learning model is equal to that taught through the conventional learning model, while H_1 the mathematical numeracy literacy ability taught through the Reading to Learn learning model is greater than that taught through the conventional model.

3. Results and Discussion

Results

The experimental and control classes that are the subjects of this study are two parallel classes at SMP Negeri 2 Suwawa, each consisting of 20 students. Based on initial observation results, the learning atmosphere in both classes tends to be passive, with student involvement still low in discussion or problem-solving activities. The teachers who teach in both classes also have equivalent teaching experience. Additionally, the interaction between teachers and students is still one-way, with students receiving more material without being given room for exploration. Students often only take notes on the material presented without understanding the context or doing exercises without knowing how the material relates to real life. This indicates that the initial conditions of both classes were quite similar, allowing for the objective observation of the effects of different learning models on student activity.

In the control class, learning was conducted using the conventional approach that the teacher in that class was accustomed to applying. The lecture method still dominates the teaching and learning process, where the teacher delivers material verbally in front of the class, then provides practice questions from the student worksheets to be completed in groups. The classroom atmosphere tends to be calm, but it doesn't show a high level of learning enthusiasm from the students. Many students appeared passive, simply listening without asking questions or participating in discussions. When the teacher gave practice problems to each group, some students in the group actively discussed, while others only observed and listened to the ongoing discussion. Even during the Q&A session, only a few specific students were active, while the majority of the others were reluctant to participate. Learning activities are more focused on delivering material than on understanding context or applying it to daily life. This impacts the limited overall

strengthening of numeracy concepts, as students are not guided to connect the concepts with real data or information.

The teaching process in the control class followed a very structured and teacher-centered flow. The teacher began the lesson with a brief explanation of statistical concepts, such as data central tendency, data dispersion, standard deviation, and range. After that, the teacher immediately presented several example questions on the whiteboard and explained the steps to solve them. Students were instructed to copy and work on the questions in groups. There was no use of learning media or contextual texts to help students understand the real-world application of the material being studied. The teacher occasionally asked about the students' understanding, but did not delve into how well the students truly understood the meaning of the analyzed data. Learning activities become mechanistic, focusing solely on solving problems without the development of a strong conceptual understanding. The limitations of this approach are evident in students' lack of interest in exploring the material in greater depth, and their low skills in solving problems based on real-world data contexts.

Unlike the control group, the experimental group showed a more active and participatory learning dynamic. When the Reading to Learn learning model was implemented, students appeared more engaged in the learning process. As the teacher began distributing reading texts containing contextual information about statistical data, the students started showing interest. They read carefully, marked important passages, and took notes on things they didn't understand. Small group discussions are a key feature of learning in this class. Students exchanged understandings of the reading content and tried to answer questions based on the information in the text. The teacher acts as a facilitator, providing guidance and leading questions so that students can explore meaning and develop their numeracy understanding. The classroom atmosphere became more lively, with many questions, discussions, and reflections arising during the learning process. This indicates a positive change in student interaction and activity.

Instruction in the experimental class is designed to encourage students to understand concepts through relevant contextual text. The teacher began the lesson by providing math textbooks containing information related to the material to be studied, such as data central tendency, data dispersion, standard deviation, and range. This text not only contains narratives related to the material being studied, but also sample questions and their solutions. In its implementation, students are given the freedom to ask questions about what they don't understand in the reading material. This activity will helps students understand the material and which parts of each reading are important. After that, students were asked to identify important information, take notes on it, and discuss the text's content in small groups. The teacher then instructed the students to solve the problems on the student worksheet by discussing them with their group members. In solving the problems, students can use their notes to help answer the questions provided. This process trains students to think critically, understand relationships between data, and connect information to relevant mathematical concepts. In this way, learning becomes more interactive and aligns with the goals of numeracy literacy.

The Reading to Learn model is applied in four learning sessions lasting 80 minutes. Each session begins with the Preparing for Reading stage. This stage focuses on background knowledge, where the teacher prepares students before reading the text to make it easier for them to understand the text, and provides a summary of the steps involved in the text. Detailed reading, In this stage, the teacher guides students to read the text sentence by sentence independently and find important information. This is done by preparing students and telling them what the sentences are about, reading the sentences, asking them about the sentences, and explaining terms or concepts. In the sentence-making/spelling stage, This stage is very important for students to master the language in those texts. Students are asked to record important information they have read. This serves to reinforce the students' knowledge gained through detailed reading, manipulating words into meaningful sequences, and practicing spelling. The final stage is Joint Construction. After students have sufficient knowledge of the language, joint construction is carried out, involving all class members (or in groups) writing another text based on the model with teacher guidance. With this model, students are trained to read critically, understand text content, interpret data, and develop context-based solutions to problems. The observation results show that this approach increases student engagement and helps them develop better numeracy skills.

The descriptive posttest results in Table 1 show that the average numeracy literacy skills of students in the experimental class are higher compared to the control class. The experimental class that received treatment using the Reading to Learn learning model achieved an average score of 50.5 with a standard deviation of 7.592, a minimum score of 38, and a maximum score of 63. Meanwhile, the control class that used the conventional learning model obtained an average score of 41.585, with a standard deviation of 5.545, a minimum score of 31, and a maximum score of 51. This data indicates that the use of the Reading to Learn model has a positive impact on improving students' numeracy literacy skills. Complete descriptive statistics of the numeracy literacy posttest results for both classes can be seen in Table 1.

Table 1. Descriptive Statistics

Group Class	Number of Student	Mean	Standard Deviation	Minimum Value	Maximum Value
Experimental Class	20	50,5	7,592	38	63
Control Class	20	41,585	5,545	31	51

After the post-test implementation, the next step is to conduct data testing to assess the extent to which students achieve the learning objectives. The visualization of the normality test results on the post-test data is presented in Table 2.

Table 2. Test of Normality

Variable	Statistic	df	Sig.
Post-test Eksperimental Class	.964	20	.616
Post-test Control Class	.938	20	.215

Referring to the output in Table 2, it is noted that the Sig value for the class that received treatment (experiment) is 0.616, while the Sig value for the class without treatment (control) is 0.215. Since both Sig values are > 0.05, according to the criteria based on the decision-making guidelines derived from the Shapiro-Wilk normality test, the post-test score output for both classes shows that the data is normally distributed. Next, to determine if the two groups have homogeneous variances, a test for homogeneity of variance was conducted. The results of this test are presented in Table 3.

Table 3. Test of Homogeneity

		Levene Statistic	df1	df2	Sig.
Post-test	Based on Mean	1.668	1	38	.204

Based on the output of table 3 presented, the significance value Based On Mean related to the post-test output variable is 0.204. Since this significance value is higher than the alpha (α) value set at 0.05, the output indicates that the post-test variation for students in class VIII-3 and VII-4 at SMP Negeri 2 Suwawa shows homogeneity. After conducting normality and homogeneity tests, the next stage of the research is the effect size test (Cohen's d). The results of the effect size calculation are presented in Table 4.

Table 4. Effect Size (Cohens'd)

Group Class	n	$\bar{x}$	*SD Pooled*	*d*	Conclusion
Experimental Class	20	50,35	2,594	3,53	strong effect
Control Class	20	41,2			

The results of the effect test using Cohen's d formula show a value of d = 3.53, with a pooled SD from both groups of 2.594. Based on Cohen's classification of effect size interpretation, a d value above 0.8 is classified as a large effect. Thus, it can be concluded that the Reading to Learn teaching model has a very strong influence on improving students' mathematical numeracy literacy compared to the conventional teaching model. This effect shows a substantial and practically significant difference in learning. After determining the magnitude of the influence, the next step is to conduct hypothesis testing to determine the significance of the difference between the two groups. As for the results of the hypothesis test on the post-test scores between the two groups, they can be seen in Table 5.

Table 5. Test of Hypothesis

Group Class	Mean	Varians	*DK*	$t_{statistic}$	t_{table}
Experimental Class	50,5	56,239	38	4,271	2,026
Control Class	41,585	35,537			

Based on the output in the table, the $t_{statistic}$ value is 4.271, while the t_{table} value is 2.026 with 38 degrees of freedom and a 5% significance level. Since the $t_{statistic}$ value is greater than the t_{table} , the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. This can be interpreted that students taught using the Reading to Learn learning model have higher mathematical numeracy literacy skills

compared to students taught through the conventional learning model. This is also evident from the average scores, which are 50.5 for the Reading to Learn class (experimental) and 41.585 for the Conventional class (control).

4. Conclusion

This research was conducted at SMP Negeri 2 Suwawa involving two eighth-grade classes, each consisting of 20 students. Class VIII.3 served as the experimental group and was taught using the *Reading to Learn* model, while Class VIII.4 served as the control group and received instruction through conventional teaching methods. Employing a Posttest-Only Control Group Design, the results showed that students taught with the *Reading to Learn* model demonstrated significantly higher mathematical numeracy literacy compared to those taught using conventional methods. These findings confirm that the *Reading to Learn* model has a positive impact on students' numeracy skills, as it promotes contextual understanding, encourages active participation, and fosters critical thinking in interpreting data and information.

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