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Problem Based Learning Models to Numeracy Literacy Skills : A Study in Elementary School

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Abstract: low numeracy literacy ability of students is a particular concern considering that in this 21st-century learning, students should have mastered this ability. The problem-based learning models is a learning model that presents a contextual problems so that students can be directly involved in the problem-solving process. Thus, this study aims to determine the effect of the problem-based learning model on the numeracy literacy skills of elementary school students. The research method used by researchers is a pre-experiment with one group pretest and posttest design using a quantitative approach. The sample in this study was eleven students in fifth grade at Waru Timur 2 Pamekasan Madura state elementary school. Data collection was carried out by administering tests (pretest and posttest) regarding students' numeracy literacy abilities. Data were analyzed using descriptive statistics, prerequisite tests, and hypothesis testing with paired samples test. Based on the results of data processing, it is known that there is a significant influence of the use of problem-based learning models on students' numeracy literacy skills. That is because learning is student-centered so that students can be directly involved in problem-solving.

Keyword : Problem Based Learning, Numeracy Literacy Skills, Elementary School Students

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Introduction

Literacy skills are very important to master in the 21st-century, as the Ministry of Education and Culture in 2016 has held various activities to encourage national literacy and increase competitiveness, quality of life, character development, and improve the skills needed in the 21st century through the National Literacy Movement (Ambarwati & Kurniasih, 2021). There is six basic literacy in this literacy activities that must be mastered by the people of Indonesia, including language literacy, numeracy, digital, scientific, financial literacy, as well as culture and citizenship literacy (TIM GLN Kemendikbud, 2017).

One of the most important basic literacy skills is numeracy literacy. Numerical literacy is an ability that students acquire after experiencing changes in the ability to acquire, interpret, apply, and communicate numbers or symbols related to basic mathematics in solving real-life problems and analyzing information in various forms,

be it narratives, graphs, tables, charts, and others to make a decision (Mahmud & Pratiwi, 2019).

Indonesia is still a country that has very low numeracy literacy skills. Widiantari et al. (2022) explained the 2018 PISA results showed that the score of Indonesian students' mathematical literacy ability was 379 below the OECD average of 489, so they were ranked seventh from the bottom, indicating that students' mathematical literacy competence in Indonesia had not been achieved.

Based on the 2018 PISA results released by the OECD (Organization for Economic Cooperation and Development) (2019), it was found that Indonesia's literacy skills ranked 72 out of 78 countries, mathematics scores ranked 72 out of 78 countries, and science scores ranked 70 out of 78 countries. These results indicate that students' numeracy literacy skills are still low because the material tested by TIMMS and PISA is in the form of questions that are contextual problems in real life, while students have not been able to solve real problems and are not yet able to analyze information in various forms (Ambarwati & Kurniasih, 2021). The low ability of numeracy literacy is also seen in the direct observation of elementary school students. The demands of students' abilities in numeracy literacy are not only in counting but also the ability to reason logically and critically in solving problems encountered in everyday life (Warni, 2020).

These problems can occur due to several factors, one of which is the use of inappropriate learning models so that students appear less active in the implementation of learning, such as citing the traditional approach used in teacher-focused learning (teacher-centered), namely the teacher teaches material through repetition, making students write or say the same thing continuously so that learning in class is less interesting, then the teacher assesses student knowledge using tests or quizzes at the end of the meeting or the end of the year to identify student learning levels (Alismail & McGuire, 2015; Chairunnisak, 2020). In addition, the teacher's ability to involve students to play an active role in learning is still lacking so the learning material tends to be explained in detail by the teacher which causes students to feel bored just by listening and writing what the teacher explains.

The problem-based learning model is one of the appropriate and innovative learning models to use, such as quoting one of the definitions of problem-based learning that a learning approach so that students can learn critical thinking and problem-solving skills and obtain concepts from subject matter using problems in everyday life as a context (Anwar & Jurotun, 2019).

This statement is supported by research conducted by Firdaus et al. (2021) concludes that problem-based learning can have a positive and significant effect on increasing students' mathematical literacy skills. By learning problem-based learning, students are encouraged to be more active, critical, and systematic in dealing with the questions presented (Arismawati et al., 2018; Hendriana et al., 2018; Munir et al., 2020;

Napitupulu et al., 2016). That is also in line with research conducted by Awami et al. (2022) which concluded that the use of problem-based learning models can improve students' numeracy literacy skills compared to conventional models. Awami also concluded that there were differences in numeracy literacy skills between students who studied problem-based learning models and high self-confidence. Research using problem-based learning models has been carried out a lot, especially with the help of the media. Therefore, this research is more focused on the effect of problem-based learning models on numeracy literacy skills.

Methodology

1. Research Model

   This study aims to determine the effect of the problem-based learning model on the numeracy literacy skills of elementary school students. The research used this type of quantitative research using pre-experiment with the one-group pretest-posttest design method due to the limited population that it is impossible to divide between the experimental and control groups. The one-group pretest-posttest design method is used to determine students' initial abilities with final abilities after being given treatment so that it can be seen whether or not there is an influence of the problem-based learning model used. The following is an overview of this research design.

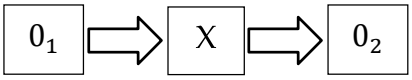

Figure 1. Research Design

Information:
0_1= pre-test
X = Treatment with problem based learning model
0_2= post-test
(Yulistiani & Indihadi, 2020)

2. Participant

   The population in this study were fifth-grade students at Waru Timur 2 Pamekasan Madura State Elementary School, which consisted of 11 students in one class, so the sampling technique used a saturated sample. So the sample in this study were all fifth-grade students at Waru Timur 2 Pamekasan Madura State Elementary School, totaling eleven students.

3. Data Collection Tools

   The data collection tools in this study are numeracy literacy ability tests and observations that have been validated by experts. This numeracy literacy ability test is in the form of an essay that aims to determine the numeracy

literacy abilities of fifth-grade students at Waru Timur 2 Pamekasan Madura state elementary school. This ability test is given at the beginning of learning and the end after being given treatment. As well as observations related to the suitability of teacher and student activities based on the syntax of the learning model used.

4. Data Collection Process

The data collection process used in this study is descriptive statistics to describe the mean, median, mode, standard deviation, and highest, lowest values. In addition, the data analysis technique used is the prerequisite test which includes the normality test and homogeneity test to determine if the data is normally distributed and homogeneous, as well as hypothesis testing to determine whether or not there is an influence of the problem-based learning model on the numeracy literacy skills of elementary school students.

Result and Discussion

1. Finding

This study uses descriptive statistics intending to describe the average value (Mean), the highest value (Maximum), the lowest value (Minimum), and the standard deviation. The results of the research descriptive statistical test can be seen in the following table.

Table 1. Descriptive Statistical Test Result

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Pre	11	43	53	522	47.45	3.804
Post	11	60	75	751	68.27	5.569
Valid N (listwise)						

Source: Output of Data Processing Results with SPSS 25

Based on the output table above, a total of eleven students were obtained who took the pretest and posttest. The lowest score in the pretest was 43 and the post-test was 60, the highest score in the pretest was 53 and the post-test was 75. The total score obtained by eleven students who took the pretest was 522 and the posttest was 751 with an average pretest of eleven students of 47.45 and an average posttest score of 5.569. From the table, it is known that the mean value is greater than the standard deviation, thus indicating that the results are quite good because the standard deviation itself is a reflection of a very high

deviation that the distribution of the data shows normal results and does not cause bias.

After the pretest and posttest data are known, a normality test is carried out first to find out whether the data is normally distributed or not. The normality test result that has been obtained from data processing with the help of SPSS 25 can be seen in the following table.

Table 2. Normality Test One-Sample Kolmogorov-Smirnov

		Unstandardized Residual
N		11
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	2.84539590
Most Extreme Differences	Absolute	.130
	Positive	.124
	Negative	-.130
Test Statistic		.130
Asymp. Sig. (2-tailed)		.200[c,d]

Source: Output of Data Processing Result with SPSS 25

Based on the output above, the normality test results obtained using the Kolmogorov-Smirnov show Asymp. Sig. (2-tailed) or a P-value of 0.200. Based on the test criteria which states that if the Sig level or p-value is > 0.05 then H_0 is accepted. Thus it is stated that the pretest-posttest data of the problem-based learning model is normally distributed because the Sig or p-value of 0.200 is greater than 0.05.

Furthermore, a homogeneity test was carried out to determine variations originating from the population. The following table presents the calculation of the homogeneity test results obtained with the help of SPSS 25.

Table 3. Homogeneity Test Results

	Levene Statistic	df1	df2	Sig.
Based on Mean	2.841	1	20	.107
Based on Median	1.129	1	20	.301
Based on Median and with adjusted df	1.129	1	19.978	.301
Based on trimmed mean	2.781	1	20	.111

Source: Output of Data Processing Result with SPSS 25

Based on the output table above, the Sig. Based on the Mean of 0.107. From the test criteria, it is known that if the value of Sig. ≥ 0.05 then the data can be declared homogeneous, and vice versa if the value of Sig. < 0.05 then the data

is declared not homogeneous. So it is known that Sig. 0.107 ≥ 0.05, it can be concluded that the data variance of students' numeracy literacy abilities is homogeneous.

After the data is known to be normally distributed and homogeneous, then a hypothesis test is carried out using a paired samples test to find out whether the proposed hypothesis is accepted or rejected. The following are the results of the paired samples test with the help of SPSS 25.

Table 4. Paired Samples Test Results

				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	T	df	Sig. (2-tailed)
Pre-Post	-20.818	4.167	1.256	-23.618	-18.019	-16.570	10	.000

Source: Output of Data Processing Result with SPSS 25

Based on the test criteria, if the value of P or Sig. (2-tailed) ≤ 0.05 then H_0 is rejected, and H_a is accepted. If the value of P or Sig. (2-tailed) > 0.05 then H_0 is accepted, and H_a is rejected. From the results of the paired samples test above, it is known that Sig. (2-tailed) of 0.000 ≤ 0.05 so that H_0 is rejected and H_a is accepted. This shows that there is an influence of the problem-based learning model on the numeracy literacy skills of elementary school students.

2. Discussion

Based on the research result, it is known that the students' post-test scores have increased from the pre-test scores. After going through the learning process, it can be seen that there is an influence of the problem-based learning model on students' numeracy literacy skills. Learning by using the problem-based learning model has an important role in increasing student activity in using their knowledge to solve problems given at the beginning of the learning process and the teacher is only a facilitator (Firdaus et al., 2021; Madyaratri et al., 2020). That is also in line with several research results which suggest that learning using the problem-based learning model students can be actively involved through problem-solving activities by discussing and digging up information involving media assistance, of course, adapted to the conditions of students, the environment, or the objectives of learning indicators (Agustin, 2022; Ambarwati & Kurniasih, 2021; Masliah & Nirmala, 2023; Mawarsari & Wardani, 2022; Widiastuti & Kurniasih, 2021).

From various previous studies, advantages and weaknesses can be found. The advantage is that it uses two classes as samples so that it can be compared between the experimental class that is given treatment with the

problem-based learning model and the control class that is given treatment using another model. However, the weakness in previous research was the use of the media-assisted problem-based learning model which caused the research to be less focused on whether the model had a significant effect on students' numeracy literacy skills or the learning media used.

In this study, the focus of the researchers was to answer the formulation of the problem by explaining answers regarding the presence or absence of the influence of the problem-based learning model on students' numeracy literacy skills and there was no other discussion. The stages of the learning process carried out by researchers are by giving a pretest first. After that, the researcher gave treatment using the problem-based learning model by the syntax of the model, as is known the syntax of the problem-based learning model, namely student orientation on a problem, organizing students in learning, guiding individual and group investigations, developing and presenting the work, as well as analysis and evaluation of the problem-solving process (Rosidah, 2018). After all problem-based learning syntaxes were implemented, the researcher conducted a posttest to measure students' numeracy literacy skills after being given treatment.

This problem-based learning model has benefits for teachers and students. Some of these benefits include that students are easier to remember the material; improve their understanding, skills in solving problems, and abilities that are relevant to the world of practice; build capabilities, leadership, and collaboration; and learning skills and motivation to develop higher-order thinking skills (Gunantara et al., 2014; Nadiya, 2017). While the weaknesses of the problem-based learning model itself are the need for mastery of basic concepts, cognitive assistance, and proper representational knowledge, one heterogeneous class will find it difficult to divide tasks, and not all subjects can use this learning model (Rachmawati & Rosy, 2020; Shoimin, 2017). From the advantages and weaknesses of this problem-based learning model, the teacher is expected to be able to adjust to the characteristics of the students and also the learning conditions that will take place to achieve the learning objectives that have been set.

Conclution

From the results and discussion above, it can be interpreted that the problem-based learning model has an effect on the numeracy literacy skills of fifth-grade elementary school students at Waru Timur 2 Pamekasan Madura state elementary school. This is shown from the active involvement of students in solving problems according to their knowledge so that the implementation of learning activities is more student-centered and the teacher is only a facilitator. In addition, it can also be seen

from the results of students' abilities, namely the posttest scores that experienced an increase compared to the pretest scores. Thus, it can be concluded that there is a significant influence on the use of problem-based learning models on the numeracy literacy skills of elementary school students.

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