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EFFECT OF PROBLEM-BASED LEARNING ASSISTED BY E-LKPD WIZER.ME ON STUDENTS MATHEMATICAL LITERACY SKILLS

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ABSTRACT
The purpose of this study was to determine how the mathematical literacy skills of junior high school students were affected by Problem Based Learning assisted by E-LKPD with Wizer.me. This research was conducted quantitatively, quasi-experimental type, with the design used nonequivalent control group pretest-posttest. This study focuses on eighth-grade students from Manbaul Ulum Gresik Islamic Junior High School, which has 128 students. In this study, the samples used were class VIII A with 31 students as the control class and class VIII C with 28 students as the experimental class, using simple random sampling. The research data collection used test instruments in the form of Pretest and Posttest to determine students' mathematical literacy skills. In technical research, the data analysis used is data analysis, normality test, and Mann-Whitney non-parametric test. The results showed that there were significant differences in the control class and the experimental class. So it can be concluded that learning mathematics using Problem Based Learning assisted by E-LKPD using Wizer.me has an effect on students' mathematical literacy skills.
Keywords: Mathematical Literacy, Problem Based Learning, Wizer.me

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PRELIMINARY

Mathematics development comes not only from the material or content but also from classroom learning. In addition, improving learners' skills is important (Husna & Kurniasih, 2023). Building appropriate mathematics learning is a difficult task, so developing appropriate learning is necessary to raise mathematical literacy levels. The National Literacy Movement, GLN, was established by the government around 2017. The movement covers six categories of literacy: numeracy, digital, language, science, culture and citizenship, and financial literacy. Creativity, critical thinking, collaboration and communication must be combined with mastery of these six literacies. Therefore, the Gerakan Literasi Nasional (GLN) includes numeracy literacy as a component (Suriyani & Wahyuni, 2021).

The reason mathematical literacy is crucial is because it improves pupils' capacity for analysi, make conclusions, and communicate concepts effectively related to the fractions of mathematical problems they encounter, (Tasekeb et al., 2019) stated that mathematical literacy includes mathematical problem solving, mathematics communication, mathematical reasoning, mathematical connection, and mathematical representation. These five NCTM competences can be included in mathematical literacy. However, this has not been matched by the quality of education in Indonesia. According to Kholid et al. (2022), teachers lack the reflective skills necessary to enhance the quality of problem solving, particularly when it comes to students' mathematical aptitude. It can be seen from various types of international level research participated by Indonesia, one of which is the PISA.

To become a developing country that can compete in the global education arena, Indonesians must have mathematical skills that are on par with citizens of other countries. However, students in Indonesia are less proficient in mathematics compared to students in other countries. Ojose (2011) defines mathematical literacy as the capacity to comprehend and utilize the fundamentals of mathematics in daily situations. This skill aids in students' capacity to think methodically, comprehend the laws that employ mathematics as a guide in daily life, and apply mathematics to other subjects in order to better prepare them for life in society. (Wardono et al., 2018).

Research conducted by PISA seeks to assess the skills of fifteen-year-old students to apply school lessons to non-school environments. Indonesian students received an average math score of 379 on the PISA 2018 exam, which was announced by the OECD in 2019. The average score for the OECD was 487. These results show that Indonesia has low mathematical literacy skills. Indonesia has participated in PISA from 2003 to 2018, but has not shown significant results (Iskandar et al., 2021). This is because pupils struggle to answer mathematical problems that involve creating, applying, and even interpreting concepts, and because the majority of the content offered in PISA takes the form of contextual problems (Indah et al., 2016). According to Afifah et al. (2020) the majority of students only memorize mathematical formulas without understanding their meaning or how concepts can be used for everyday problems. In addition, many teachers still use conventional learning methods, so students are not actively involved in the classroom.

To overcome this problem, there needs to be innovation in learning mathematics. This innovation will change the conventional learning model into a model that optimizes student activeness and improves their skills in mathematics (Lestari, 2023). The PBL

model is one example of this approach. According to Savery (2006) PBL is a student-centered methodology that allows students to conduct research, integrate theory and practice, and apply their knowledge and skills to solve relevant problems. Empowering students' mathematical experience so that they can use it in real life is very important for teachers (Sumirattana et al., 2017). Problem Based Learning is considered suitable for improving mathematical literacy, where in these PBL steps students are invited to discuss with their groups to solve the problem sheets given (Ambarwati & Kurniasih, 2021).

Problem Based Learning helps students learn and understand math concepts. PBL has five stages. They are as follows: 1) explain the issue to students; 2) plan their learning; 3) oversee both individual and group research projects; 4) produce and deliver work; and 5) assess and evaluate the outcomes of problem-solving techniques. For this reason, learning with a Problem Based Learning is ideal for enhancing mathematical literacy. Following the identification of contextual problem information, students hold group discussions to examine several solutions and select the most effective one (Hasanah et al., 2023).

Learning media must be available to support this learning model, in order to create the desired learning atmosphere and get maximum results. One drawback of employing Problem Based Learning (PBL), according to Fauzan & Afriansyah (2017), is that students may not have enough comprehension, which may affect how difficult issues are for them to solve, and learning may take a long time. According to Habibi & Suparman (2020), there is a need for learning resources that assist pupils in solving problems because mathematics literacy is strongly tied to PISA and 21st-century abilities. One educational resource that can be utilized in Problem Based Learning (PBL) is Wizer.me.

Wizer.me is an online E-LKPD platform that is easily accessible in cyberspace to create multimedia worksheets and can be assessed automatically. Through this platform, educators can channel their ideas in an E-LKPD by utilizing various types of existing methods, and can add images, audio, and video to help students complete the E-LKPD (Kopniak, 2018). According to Syafruddin et al. (2022) wizer.me-based E-LKPD helps solve everyday problems and improve learners' critical thinking. It also makes the material more interactive and interesting for learners (Purnama & Suparman, 2020).

According to Pamungkas & Franita (2019) earlier research, Problem Based Learning (PBL) has been shown to enhance students' mathematical proficiency. Furthermore, Ambarwati & Kurniasih (2021) findings indicate that using YouTube videos to support Problem Based Learning (PBL) can significantly improve eighth-grade students'

numeracy abilities. Therefore, this study developed E-LKPD assisted by wizer.me using Problem Based Learning model that can help improve students' mathematical literacy skills.

METHODS

This study employed a quantitative, quasi-experimental methodology. In the even semester of the 2023–2024 school year, 128 students from four classes at Manbaul Ulum Gresik Islamic Junior High School, or grade VIII pupils overall, participated in this study. The most popular sampling technique is selecting random samples from the population without taking population strata into account (Abjad et al., 2022). As a result, Class VIII A with 31 students served as the control class and Class VIII C with 28 students served as the experimental class, making up the research sample.

The study design used was nonequivalent control group pretest-posttest. The design is as shown below.

R_1	O_1	x	O_2
R_2	O_3		O_4

Description:

R_1 : Experimental class group

R_2 : Control class group

O_1 & O_3 : The level of mathematical literacy skills of students before learning

O_2 : Mathematical literacy skills of experimental class after learning

O_4 : Mathematical literacy skills of control class after learning

X : Treatment

An initial assessment, or pretest, was administered to both classes prior to the activity to gauge the students' proficiency in mathematical literacy. Following the test, the experimental class received problem-based learning using Wizer.me's E-LKPD assistance, while the control group received direct instruction. After the material was learned, both classes were given a final test, which was intended to evaluate their mathematical skills. The mathematical literacy test on SPLDV material, consisting of 1 item of description questions that had previously passed the validity, reliability, IK, dan DP, obtained the following data:

Table 1. Conclusion of Validity, Reliability, IK, and DP Test Results

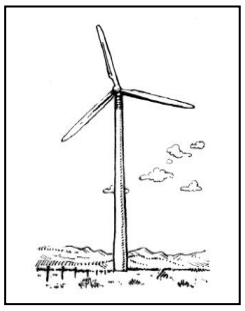
Question number	Validity	Reliability	IK	DP	Desciption
1.	Valid	Medium reliability	Medium	Enough	May be used with improvements
2.	Valid		Medium	Good	May be used

Based on the results of the analysis of validity, reliability, IK, and DP, the test of students' mathematical literacy skills that has been tested is good which is used as a test instrument. From the results of the trial, the question that will be taken is question number 2. Furthermore, the question will be used as a pretest and posttest question in this study.

Table 2. Mathematical Literacy Skills Test Question

Question
Zetdown is building a windmill station to produce electricity. Zetdown city council makes a design model for its windmill

Model	E-82
Tower height	138 m
Number of rotor blades	3
Length of 1 rotor blade	40
Max. Speed rotation	20 rpm
Construction cost	3.200.000 zeds
Overload cost	0.10 zeds per kWh
Maintenance cost	0.01 zeds per kWh
efficiency	97% per tahun



Question:

Determine if the statements about the E-82 windmill below match the information above. Circle "Yes" or "No" for each statement
(and give reasons)

Statement	Does the above information match?
To construct 3 windmill stations will cost more than 8,000,000 zeds.	Yes/No
The maintenance cost of a windmill station is about 5% of the excess cost.	Yes/No
The maintenance cost of the windmill stations depends on the number of kWh generated.	Yes/No

Question	
Exactly 97 days per year, the windmill stations are not operational.	Yes/No

In this study, the tool used is a mathematical literacy test, which uses data analysis techniques that use descriptive statistics, which means describing, recording, and analyzing data. Data analysis consists of three stages, namely:

1. Calculating mean and standard deviation
2. Verify the specifications for data analysis.
   a. Normality test

      The normal distribution of the research variables is ascertained using data normality testing. This test is intended to ascertain whether the distribution of the sample is normal. To make calculations easier, researchers will utilize the Windows SPSS 25.0 application.
3. Hypothesis testing

   In accordance with the title of the study, the researchers proposed a hypothesis in the study:

   H_0 = Students using the Direct Instruction model have mathematical literacy skills that are either superior to or on par with students using the Problem Based Learning model with support from E-LKPD Wizer.me.

   H_1 = The level of mathematical literacy among students using the Problem Based Learning methodology with support from E-LKPD Wizer.me are superior to those who use the Direct Instruction form of instruction.

   These are the statistical theories:

   $\boldsymbol{H_0 : \eta_1 \leq \eta_2}$

   $\boldsymbol{H_1 : \eta_1 > \eta_2}$

   Description:

   $\boldsymbol{\eta_1}$= Problem Based Learning learning model assisted by E-LKPD Wizer.me

   $\boldsymbol{\eta_2}$ = Direct Instruction learning model

RESULT AND DISCUSSION

In this study, the even semester results from Manbaul Ulum Islamic Junior High School in 2023–2024 were examined. 31 students in class VIII A were the control group, using the Direct Instruction method for learning competencies, whereas 27 students in

class VIII C were the experimental group, using the problem-based learning model with the aid of the Wizer.me E-LKPD for the learning process. Table 3 lists the educational activities for the experimental and control groups.

Table 3. Research Activities in Learning

Experiment Class (Problem Based Learning assisted by E-LKPD Wizer.me)	**Control Class (Direct Instruction)**
Stage 1. Orient learners to the problem	**Stage 1. Conveys objectives and prepares students**
1. Learners are given a video about economic activities, namely about buying some books and pencils. 2. Learners make questions about the conditions of the video shown	1. The teacher conveys the learning objectives
Stage 2. Organizing learners to learn	**Stage 2. Demonstrate knowledge and skills**
3. The teacher divides the learners into groups of 4-5 members. 4. E-LKPD links are distributed to each group and provides some information related to the E-LKPD that is done in the learning process. 5. Students do independent exercises in the form of E-LKPD according to their respective groups based on the ability of students to be discussed in their groups.	2. The teacher provides a video about economic activities, namely about buying some books and pencils and students answer the questions in the video 3. The teacher gives examples of SPLDV problems according to PISA 4. Learners and teacher discuss to solve statement 1 in the problem.
Stage 3. Guiding individual and group investigations	**Stage 3. Guiding the training**
6. Learners discuss with their group members to complete the SPLDV E-LKPD. 7. The teacher provides assistance and acts as a facilitator for learners who have difficulty in completing the E-LKPD	5. Learners continue to solve the statement in the problem guided by the teacher. 6. Learners who have finished, convey the results of their work in front of the teacher
Stage 4. Develop and present results	**Stage 4. Checking for understanding and giving feedback**
8. The teacher guides the learners to write and summarize the results of their group discussions neatly and ready to be presented. 9. Learners prepare the results of discussions that have been done with their groups to be presented in front of	7. After doing interactive problem exercises, the teacher distributes the LKPD to assess the students' level of understanding. 8. Learners work on the LKPD distributed by the teacher 9. Teacher and students discuss the results

Experiment Class (Problem Based Learning assisted by E-LKPD Wizer.me)	Control Class (Direct Instruction)
other groups in front of the class.	of the LKPD
Stage 5. Analyze and evaluate problem solving	**Stage 5. Provide opportunities for further training and application**
10. The designated group presents the E-LKPD that has been discussed 11. Learners are invited to critically and actively respond to presentations from other groups 12. The teacher acts as a moderator who will bring order to the presentation and discussion	10. The teacher gives additional assignments to students

Table 4 shows the research results from the pretest and posttest of mathematical literacy skills of Manbaul Ulum Islamic Junior High School.

Table 4. Descriptive Statistical Analysis

		Experimental pretest score	Experimental posttest score	Control pretest score	Control posttest score
N	Valid	27	27	31	31
	Missing	4	4	0	0
Mean		56.1533	75.7204	54.7484	65.8600
Std. Error of Mean		3.76783	2.92269	4.15268	3.46150
Std. Deviation		19.57822	15.18675	23.12117	19.27283
Range		66.67	55.55	72.23	72.22
Minimum		11.11	38.89	19.44	25.00
Maximum		77.78	94.44	91.67	97.22

The average learning outcomes of the experimental class have grown, as shown by Table 4 descriptive statistical analysis results. Specifically, the pretest scores of 56.1533 have increased to 75.7204 posttest scores, with a 19.5671 difference between the two average values. Meanwhile, the control class experienced an increase from 54.7484 pretest scores to 67.2039 in posttest scores with an average difference of 12.4555. In the experimental class, the lowest pretest value was 11.11, while in the control class, it was 19.44. In the meantime, the control class had a top score of 91.67 and the experimental class's maximum score was 77.78. The experimental class's minimum posttest value was 38.89, while the control class's was 25.00. In the meantime, the experimental class's maximum posttest value was 94.44, whereas the control class's was 97.22.

Variations in the learning treatment are the cause of the average difference. Students in the experimental class using the Problem Based Learning model with support from E-LKPD Wizer.me have the chance to formulate or orient problems, research problems, solve problems by applying concepts, and provide solutions to problems. Therefore, the PBL learning process can help students in achieving mathematical literacy skills. Although, there were still some incorrect solutions when the pretest was conducted and some students had improved on the posttest, so that students' mathematical literacy skills varied. The normality test was performed as a prerequisite for evaluating the hypothesis, after the computation of descriptive statistics, as indicated in Table 5.

Table 5. Normality Test

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Class	**Statistic**	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Mathematical literacy test results	Experimental Pretest	.209	27	.004	.889	27	.007
	Experimental Posstest	.181	27	.024	.896	27	.011
	Control Pretest	.202	31	.002	.888	31	.004
	Control Posstest	.135	31	.157	.925	31	.031

Table 5 displays the significant values for all data in the Shapiro-Wilk test, which were less than 5% (< 0.05). As a result, we may draw the conclusion that the study's data were not distributed normally. As a result, as indicated in Tables 6 and 7, the analysis moved forward with a non-parametric test, the Mann-Whitney test.

Table 6. Mann-Whitney Test Ranks Results

	Class	**N**	**Mean Rank**	**Sum of Ranks**
Mathematical literacy test results	Experimental Class	27	34.52	932.00
	Control Class	31	25.13	779.00
	Total	58		

Table 7. Mann-Whitney Test

	Mathematical literacy test results
Mann-Whitney U	283.000
Z	-2.121
Asymp. Sig. (2-tailed)	.034

According to Table 7 Mann-Whitney test results, the asymptotic significance (2-tailed) value is 0.034. It can be concluded that students who use the Problem Based Learning model with assistance from E-LKPD Wizer.me have better mathematical literacy

skills than those who use the Direct Instruction model because the significance obtained is 0.034 < 0.05, which means that H_0 is rejected and H_1 is accepted. As a result, there are significant differences between how well students' mathematical literacy skills improve in the experimental and control groups. The Problem Based Learning methodology, with support from E-LKPD Wizer.me, allowed students to demonstrate growth in their mathematical literacy. There is proof that using this paradigm to teach students the Two-Variable Linear Equation System affects their level of mathematical literacy.

This is consistent with studies by Muharomah & Setiawan (2020), who discovered that problem-based learning models outperform traditional learning models and enhance students' arithmetic skills using the Mann-Whitney test. Previous studies Firdaus et al. (2021) that discovered that problem-based learning models can enhance students' mathematical literacy abilities provide additional evidence for this research.

Students who learn through the problem-based learning model are not the same as students who learn through the direct instruction model in terms of mathematical literacy for a number of reasons. These elements consist of the following: 1) To help students understand the content, the teacher created learning experiences based on the problem-based learning model and facilitated group discussions with the help of the Wizer.me E-LKPD. 2) The problem-based learning model is utilized in this experiment with the assistance of the Wizer.me E-LKPD. Students are more actively involved in deriving the formulas taught in this model. Students' mathematical literacy will be impacted by this, and it will also connect them to other areas of mathematics and the real world. 3) All students are divided into groups during the learning process, which helps students recognize the knowledge they possess and ensures that relationships between classmates particularly those involving the exchange of ideas function well. 4) With this Probem Based Learning through E-LKPD assisted by Wizer.me, it makes learning more interesting with the features in wizer.me can improve students' mathematical literacy skills. Although the Direct Instruction learning paradigm is used in the learning control class, the control class engages in problem-solving discussions during a session (Fatwa et al., 2019). This is consistent with research findings by Dewi et al. (2023), who discovered that E-LKPD, which is based on Wizer.me, can raise students' interest in learning. The findings of this study are consistent with those of earlier research, which found that E-LKPD can be used as a reference to enhance language literacy and boost mathematics literacy.

CONCLUSION

The results show that students at Manbaul Ulum Islamic Junior High School class VIII have different mathematical literacy skills due to the influence of the Problem Based Learning model assisted by E-LKPD Wizer.me. Therefore, this research can be used as a form of contribution from researchers to educators about student worksheets, wizer.me, which can encourage students to learn mathematics. However, there were still some incorrect solutions when the pretest was conducted and some students had improved on the posttest, so that students' mathematical literacy skills varied.

The results of this study state that the Problem Based Learning model with Wizer.me E-LKPD can improve the quality of students' mathematical literacy skills. This is supported by the average pretest and posttest scores obtained by students. It can be seen that the experimental class gets a higher average value than the control class. So it can be concluded that learning mathematics using Problem Based Learning assisted by E-LKPD using Wizer.me has an effect on students' mathematical literacy skills.

It is hoped that this research can be a reference for teachers to identify students' mathematical literacy skills on story-shaped problems, both on SPLDV material or other materials. Teachers must also take advantage of existing technology and infrastructure and use other platforms to develop student worksheets.

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