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The Influence Of Problem Based Learning Model Accompanied By Multirepresentation Based Students Worksheets on Junior High School Students Learning Outcomes

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Abstract

This research was conducted to test the significant influence of using the problem-based learning model accompanied by multi-representation-based students worksheets (LKPD) on junior high school students' learning outcomes. The research method used was quasi-experimental with a nonequivalent control group design. The research subjects were class VIII students at SMP Katolik Santo Petrus Jember in the even semester of the 2022/2023 academic year, with 52 students divided into experimental and control classes. Data collection uses test techniques in the form of pretest and posttest accompanied by data analysis techniques in the form of normality test, independent sample t-test, and right-tailed t-test. The results of the research show that the use of the problem-based learning model accompanied by multi-representation-based students worksheets (LKPD) for junior high school students has a significant effect on improving the learning outcomes of junior high school students.

Keywords: Problem-Based Learning, Multirepresentation, Students Worksheets Learning outcomes

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INTRODUCTION

Science subjects are the management of natural knowledge given to students by teachers regarding facts, principles, concepts, processes and scientific attitudes in their discoveries. Additionally, science also leads to developing competencies and direct experience where students must be active in learning to relate to real life and show activeness and satisfactory results during the learning process (Mahlianurrahman & Lasmawan, 2020). These satisfactory results are closely related to student learning outcomes obtained from the learning process; quantitative data in grades or scores prove this. However, many students' learning outcomes, especially in science subjects, are below the standard of minimum completeness (Kamil *et al*., 2021).

The lack of or low student learning outcomes is caused by the teacher's inability to use interesting learning strategies during the learning process

(Sriwahyuni *et al*., 2020). The problem of low student learning outcomes is also caused by the material presented by teachers being considered difficult and boring, so students feel unenthusiastic about the learning activities provided, resulting in low student learning outcomes (Ningsih *et al*., 2021).

In response to this problem, much research has been carried out, including explaining that the use of the problem-based learning model is more effective because it positions students as the main actors in overcoming problems designed by teachers so that students play an active and innovative role during the learning process (Dwindiarti *et al*.,). Apart from that, other research explains that the problem-based learning model is suitable for learning in the classroom, especially for students who need teacher assistance in solving the problems given (Wulandari & Koeswanti, 2021). From this explanation, the problem-based learning model positions students as the main subject in the learning process. It aims to encourage students to develop innovative and creative attitudes within themselves to provide better learning results.

Based on the results of previous research and existing correlations, researchers propose an idea to help students understand learning concepts more quickly and overcome difficulties during learning. The application can be used by applying the problem-based learning model accompanied by multi-representation-based students worksheets (LKPD). It is known that students worksheets (LKPD) is teaching material that contains independent learning tasks and activities that are arranged systematically and used as a companion to textbooks. At the same time, multi-representation is a way of describing concepts in various forms in the form of images, graphics, verbal, and mathematics. So, it can be seen that multi-representation-based students worksheets (LKPD) leads to a good correlation between teachers and students because both provide learning concepts in different ways and forms. Also, multi-representation-based students worksheets (LKPD) can increase students' average learning scores (Suyati *et al*., 2021).

RESEARCH METHOD

The research used is quantitative research conducted in the even semester of the 2022/2023 academic year. The type of research used was a quasi-experiment accompanied by a nonequivalent control group design.

Table 1. The research design is nonequivalent control group design

Class	Pretest	Treatment	Posttest
Experimental	O	X	O
Control	O	-	O

(Sugiyono, 2013)

This research was conducted from May 16, 2023, to May 30, 2023, at SMP Katolik Santo Petrus Jember. The research population was all students in class VIII of SMP Katolik Santo Petrus Jember with a sample of two classes, namely class VIII A as an experimental class using a problem-based learning model accompanied by a multi-representation-based students worksheets (LKPD). In contrast, class VIII B as a control class, used a learning model commonly used by school teachers (discovery learning). However, each class receives the same material in their treatment: vibrations, waves, and sounds in everyday life.

Pengumpulan data dilakukan dengan teknik tes (pretest-posttest) sehingga digunakan rumus sebagai berikut:

$$\text{Score} = \frac{Total\ score\ obtained}{Maximum\ total\ score} \times 100$$

Then, after obtaining student learning outcomes data from the experimental and control classes, a statistical test was carried out to test the significance of the influence of the problem-based learning model accompanied by multi-representation based students worksheets (LKPD). The test steps use a normality test with a significance level of 5% (Istiqamah, 2019) : 1). Sig. (significance) > 0.05 is said to be normally distributed. So, the following data analysis applied was the independent sample t-test. 2). Sig. (significance) < 0.05 is said to be non-normally distributed. So, the following data analysis applied the Mann-Whitney test. If the data is said to be normal, then an independent sample t-test is carried out with the hypothesis:

H_0 : There is no significant difference in the score or average value of the results and learning outcomes of the pretest-posttest experimental and control classes.
H_a : There is a significant difference in the score or average value of the results and learning outcomes of the pretest-posttest experimental and control classes.

The criteria for using decisions (Khoirurrohmah *et al*., 2018) : 1). p (Sig.) > 0,05 H_0 is accepted and H_a is rejected, meaning there is no significant difference in scores or outcome values and student learning outcomes from both the experimental class and the control class. 2). p (sig.) < 0,05 H_0 is rejected and H_a is accepted, meaning that there is a significant difference in scores or outcome values and student learning outcomes from both the experimental class and the control class. Next, a right-tailed t-test is carried out; the hypothesis is as follows:

H_0 = R1 ≤ R2 , where the average score of the experimental class is not superior to the control class.
H_a = R1 ≥ R2 , where the average score of the experimental class is superior to the control class.

By paying attention to the right-tailed t-test criteria as follows: 1). (H_0) the null or nil hypothesis is accepted, then (H_a) is rejected if $t_{count} < t_{table}$ and 2). (H_0) the null or nil hypothesis is rejected, then (H_a) the alternative hypotehesis is accepted if $t_{count} > t_{table}$.

RESULTS AND DISCUSSION

Research Results

This research aims to test the effect of a problem-based learning model accompanied by multi-representation-based student worksheets (LKPD) on junior high school students' learning outcomes. Learning outcomes were obtained by giving the experimental and control classes a description test in the form of pretest-posttest questions. Data on pretest-posttest learning outcomes can be shown briefly in Table 2 below:

Table 2. Data on pretest and posttest learning outcomes

Class	**Experimental Class**		**Control Class**	
	Pretest	Posttest	Pretest	Posttest
The Number of Students	26	26	26	26
Highest Score	78	94	64	90
Lower Score	16	37	13	30
Average	37,69	70,77	27,85	51,62
Standard Deviation	14,94	13,83	11,07	15,77

Table 2 shows no significant difference in students' initial abilities to solve the pretest questions given. However, after being given a treatment, it was seen that the average value of the experimental class increased more than the average value of the control class. The experimental class got a posttest average of 70.77; the lowest score was 37, and the highest was 94. However, in the control class, the average posttest result was 51.62, with the lowest score of 30 and the highest score of 30. amounting to 90. It is known that the increase in scores obtained by the control class was still relatively low compared to the experimental class; this was because the class did not apply the same learning model and media, so the impact of their learning outcomes did not improve significantly.

Furthermore, to determine the effect of the problem-based learning model accompanied by multi-representation-based students worksheets (LKPD) on student learning outcomes, several statistical tests were carried out to determine the significance value. The first statistical test after obtaining the pretest-posttest value data is the normality test, which is carried out to ensure the assumption that the data is distributed normally or not; here are the results:

Tabel 3. Test of normality of learning outcomes

Tests of Normality							
		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Class	Statistic	df	Sig.	Statistic	df	Sig.
LearningOutcomes	PretestExperimental	.131	26	.200*	.931	26	.080
	PosttestExperimental	.162	26	.078	.921	26	.047
	PretestControl	.135	26	.200*	.879	26	.005
	PosttestControl	.169	26	.053	.902	26	.018

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Based on Table 3, the Kolmogorov-Smirnov normality test shows that the learning outcomes for the experimental class pretest were 0.200, and the post-test was 0.078. The control class pretest was 0.200, and the post-test was 0.053. So, it is known that the significance of the pretest-posttest learning results is greater than 0.05 (Sig. > 0.05). So, the learning outcome value data in the normality test is said to be normally distributed, so the next stage is to carry out a second test or t-test in the form of a parametric statistical test (independent sample t-test) to provide a comparison of the average student learning outcomes in the two classes. Significantly. The results of the independent sample t-test calculation of student learning outcomes can be seen in Table 4 as follows:

Tabel 4. Independent sample t-test of learning outcomes

Independent Sample test							
		Levene's Test for Equality of Variances		t-test for Equality of Means			
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference
Learning Outcomes	Equal variances assumed	.444	.508	4.654	50	.000	19.154
	Equal variances not assumed			4.654	49.164	.000	19.154

Berdasarkan Tabel 4 keluaran hasil uji independent sample t-test menyatakan *Sig.* (*2-tailed*) dengan berpedoman keputusan uji *independent sample t-test* diperoleh sebuah nilai 0,000 dengan makna atau arti signifikansi lebih kecil dari 0,05 (0,000 < 0,05) maka dikatakan H_0 ditolak sedangkan H_a diterima. Dari hal tersebut, didapatkan hasil berupa adanya perbedaan signifikansi rata-rata nilai hasil belajar siswa antara kelas eksperimen dan kelas kontrol. Selanjutnya dilakukan uji hipotesis berupa uji t-pihak kanan guna mengetahui perbandingan rata-rata hasil belajar dan pembelajaran mana yang lebih baik atau unggul antara kelas eksperimen dan kelas kontrol. Perolehan hasil belajar pada uji t-pihak kanan bisa dilihat Tabel 5 berikut:

Based on Table 4, the output of the independent sample t-test shows Sig. (2-tailed) guided by the decision of the independent sample t-test, a value of 0.000 was obtained with a meaning or significance of less than 0.05 (0.000 < 0.05), so it is said that H_0 is rejected while H_a is accepted. From this, results were obtained as a significant difference in the average value of student learning outcomes between the experimental and control classes. Next, a hypothesis test was carried out as a right-tailed t-test to compare average learning outcomes and which learning was better or superior between the experimental and control classes. The learning outcomes obtained in the right-tailed t-test can be seen in Table 5 below:

Tabel 5. Right-tailed t-test of learning outcomes

Class	Average	T_{count}	t_{table}	Description
Experimental	70,77	4,654	1,675	H_a is accepted
Control	51,62			H_0 is rejected

Data obtained from the right-tailed t-test in Table 5 shows a count of 4.654, while the table has a value of 1.675. So that $t_{count} > t_{table}$ and paying attention to the right-tailed t-test decision criteria, it is said that H_0 is rejected but at the same time H_a is accepted, which means that the experimental class has an average of better or superior learning outcomes than the control class. Thus, it can be concluded that the problem-based problem-based learning model accompanied by multi-representation-based students worksheets (LKPD) significantly affects junior high school students' learning outcomes.

DISCUSSION

The significant difference in student learning outcomes between the experimental and control classes was due to the influence of using the problem-

based learning model accompanied by multi-representation-based students worksheets (LKPD). The problem-based learning model used in experimental classes makes students the center of learning activities (student center learning) who are active in solving problems presented by the teacher during the learning process. Through this active involvement, students can stimulate their understanding and remember the essence of the teaching material being studied. Apart from that, the problem-based learning model challenges students to overcome problem situations using a scientific approach, which ultimately contributes to increasing students' learning scores indirectly. This can be said to be by research conducted by Nofziarni et al. (2019), who stated that the problem-based learning model was able to significantly improve student learning outcomes because the problem-based learning model was designed and developed with the aim of increasing students" capacity to overcome problems presented by the teacher.

During the learning process, it was proven that experimental class students were more actively involved and enthusiastic using the problem-based learning model accompanied by multi-representation-based students worksheets (LKPD) than the control class which had learning using the model usually used by teachers (discovery learning). The use of the problem-based learning model accompanied by multi-representation-based students worksheets (LKPD) during the research is also in line with previous research by Nurzaman et al. (2018), who stated that the use of a problem-based learning model accompanied by multi-representation-based students worksheets (LKPD) was able to provide effective changes in drastically improving student learning outcomes. In this case, the research results from Hasanati and Supardi (2020) also confirm that the problem-based learning process accompanied by multi-representational-based students worksheets (LKPD) provides positive results in the form of increased understanding and student learning outcomes, where this is obtained through students' activeness in finding, searching, and understand the problems given by the teacher and relate them to the basic concepts being studied at that time. Through active discussions in learning activities, especially in groups in experimental classes, students can develop the ability to find knowledge in a problem both individually and in groups. In this way, their learning experience becomes more meaningful and memorable.

CONCLUSION

Based on the research results, it can be concluded that the application of the problem-based learning model accompanied by multi-representation-based students worksheets (LKPD) has a significant effect on the learning outcomes of class VIII students at SMP Katolik Santo Petrus Jember. So, the application and use of the problem-based learning model can be used as an alternative to support improving the learning outcomes of middle school students in achieving the expected goal.

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