



Problem-Based Learning Model in Classroom Management with Scaffolding Techniques on Learning Outcomes and Student Independence

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ABSTRAK

Masih banyak siswa yang mendapatkan nilai dibawah rata-rata. Hal ini disebabkan karena siswa kesulitan dalam belajar. Penelitian ini bertujuan untuk menelaah pengaruh model pembelajaran berbasis masalah dengan teknik scaffolding, pengaruh pembelajaran mandiri terhadap hasil belajar siswa dan melihat tingkat perbedaan hasil belajar antara siswa yang menerapkan model pembelajaran berbasis masalah dan model pembelajaran berbasis masalah dengan teknik scaffolding daripada model pembelajaran konvensional. Penelitian ini menggunakan jenis penelitian kuantitatif dengan desain eksperimen semu dengan desain faktorial 3 x 3, menggunakan desain kelompok kontrol Nonequivalent (pretest-posttest). Sampel dalam penelitian ini berjumlah 77 siswa. Penelitian dilakukan dengan menggunakan data kuantitatif yang diperoleh dari pemberian angket dan survei. Instrumen yang digunakan untuk mengumpulkan data yaitu kuesioner. Teknik yang digunakan untuk menganalisis data yaitu analisis deskriptif kualitatif, kuantitatif, dan statistik inferensial. Hasil Penelitian yaitu terdapat perbedaan yang signifikan antar model pembelajaran Problem Based Learning dengan teknik Scaffolding dengan model pembelajaran konvensional kemandirian siswa dalam belajar dan hasil belajar siswa dominan pada penerapan pembelajaran berbasis masalah. Dapat disimpulkan bahwa Penerapan model Problem Based Learning dengan teknik Scaffolding memperoleh hasil belajar yang paling baik jika dibandingkan dengan model pembelajaran lainnya.

ABSTRACT

There are still many students who get scores below the average. It is because students have difficulty in learning. This study examines the effect of problem-based learning models with scaffolding techniques, the effect of independent learning on student learning outcomes, and the level of differences in learning outcomes between students who apply problem-based learning models and problem-based learning models with scaffolding techniques rather than conventional learning models. This study uses a quantitative research type with a quasi-experimental design with a 3 x 3 factorial design, using a Nonequivalent control group design (pretest-posttest). The sample in this study amounted to 77 students. The study was conducted using quantitative data obtained from questionnaires and surveys. The instrument used to collect data is a questionnaire. The techniques used to analyze the data are qualitative descriptive analysis, quantitative, and inferential statistics. The study results are significant differences between the Problem Based Learning learning model with the Scaffolding technique with the conventional learning model of student independence in learning, and student learning outcomes are dominant in the application of problem-based learning. It can be concluded that the application of the Problem Based Learning model with the Scaffolding technique obtains the best learning outcomes when compared to other learning models.

1. INTRODUCTION

Science has many branches in the division, one of which is mathematics. Mathematics in education has an important role because mathematics is found in all fields of science (Bustami et al., 2020; Cheung & Yin, 2021; Nurrahmi et al., 2019). Mathematics in various fields of knowledge is considered difficult among students (Areepattamannil et al., 2015; Cai et al., 2015; Nur et al., 2018). In mathematics learning activities, students are expected to achieve the goals of learning mathematics (Faidah et al., 2019; Kezer & Turker, 2012; Suarsana et al., 2019). Therefore, the process in learning activities must be considered in achieving learning objectives. Learning activities will run well if there is the interaction between students and teachers in a learning activity. Learning activities are carried out to develop the potential possessed by someone with existing knowledge (Budiarti et al., 2016; Mashud, 2020; Park et al., 2020). In learning

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activities, it is necessary to have a design before starting to achieve what is expected (Lisdayanti et al., 2014; Murfiah & Saraswati, 2016; Utama et al., 2017). Learning from time to time has changes and developments. Teachers need extensive knowledge in changing learning patterns to suit their needs (Benbow et al., 2021; Chai & Kong, 2017; Gürsoy, 2021). The problem that occurs today is that many students still get scores below the average. The findings of previous studies also stated that many students still had difficulties in learning (Benbow et al., 2021; Dupri et al., 2020; Lawrence & Tar, 2018). One of the factors that cause students to have difficulty understanding learning materials is that teachers are less innovative in creating fun learning for students (Dupri et al., 2020; Lisdayanti et al., 2014; Triwahyuningtyas et al., 2020; Zaki et al., 2020).

The learning pattern applied affects the success of students in learning activities. The students build social construction knowledge (Raiden & King, 2021; Zhang et al., 2021). Independent learning is one of the efforts in students' understanding of the material, one of which is mathematics (Parno et al., 2020; Walfajri, 2019). Independent learning can help students hone their logical thinking skills in solving a problem (Jayusman & Shavab, 2020; Rangga et al., 2016; Sobri et al., 2020). Independent learning needs to be applied in learning activities to be active and motivated in building their competencies in solving a problem (Sobri et al., 2020; Wijayanto et al., 2017). Teachers must be able to master the class in learning activities. Classroom management is a teacher's skill in learning activities to achieve learning objectives (Bdiwi et al., 2019; König et al., 2020; Kraft & Rogers, 2015). Teachers' understanding of the curriculum also affects the quality of learning (Rohita et al., 2018; Syahputra et al., 2017). Good classroom management can motivate students in the spirit of learning (Nurtanto et al., 2021; Purwawidodo, 2017). Teachers must create a happy and fun learning atmosphere in the school environment that can give students the ability to think in solving a problem. Problem-based learning is one of the learning models that can be applied. Problem-based learning is one way to open students to think creatively and develop self-efficacy (Aiman & Ahmad, 2020; Yuliati, 2016). Applying problem-based learning is a stimulus and focuses students' attention (Haryani et al., 2017; Nurtanto et al., 2020; Phungsuk et al., 2017). The application of independent learning is one of the renewals in learning. With this independent study, students can hone their thinking skills in a structured manner.

The effect of problem-based learning models with scaffolding techniques has previously been carried out to see the effect on students thinking skills and conceptual understanding abilities (Mardaleni et al., 2018; Yuliastanti et al., 2014). The same research regarding problem-based learning in students had previously been conducted to improve students' mathematical problem-solving abilities and scientific literacy for fifth-grade elementary school students (Sumartini, 2016). Research on student learning independence has previously been conducted discussing the Comparison of Student Learning Outcomes with Independent and Cooperative Learning Models of Group Investigation Type on the Reproductive System and the effectiveness of the Mindmapping-Assisted Master-Type Independent Learning Model on Mathematics Learning Outcomes of Class IV Students by (Putri, 2018). Meanwhile, the research will be carried out to apply problem-based learning with scaffolding techniques to see student learning independence and student learning outcomes. The novelty in this research is contained in the variables that will be measured in this study. In addition, this research has a novelty in the use of media as the material for this research. The results of this study will later see student learning outcomes. The research that will be carried out has a purpose: to examine the effect of the problem-based learning model of scaffolding technique and the effect of independent learning on student learning outcomes.

2. METHOD

This research was conducted with a quantitative type of research, using a quasi-experimental design (quasi-experimental) with a 3 x 3 factorial design. Empirically quasi-experimental research was designed to determine whether the results of something called a "question" were questioned. This study uses this design to rely on other techniques to control or reduce threats to internal validity. This method compares the improvement in student learning outcomes who receive learning using problem-based learning models and problem-based learning using scaffolding techniques with conventional learning and measure the effectiveness of student learning independence. The research design used a Nonequivalent control group design (pretest-posttest).

The sample in this study was all fifth-grade students at SDN 64/I Muara Bulian, which consisted of 4 classes with 77 students. Sampling was carried out randomly, and experimental class 1 was class VB, experimental class 2 was class VD, the control class was class VC, and class VA was designated as the test class of the instrument. The instrument in this study used a problem-based learning model test (Problem Based Learning Model) with scaffolding techniques to measure student learning outcomes. The data obtained in this study used instruments and learning tests for problem-based learning with scaffolding

techniques, conventional learning tests to see comparisons in measuring the effect of student learning independence. The study was conducted using quantitative data obtained from questionnaires and surveys. Survey research is carried out using a basic theory and ends with analyzing the measurement data (Yusuf, 2017). The questionnaire used is a learning independence questionnaire and student learning outcomes. Instruments in independent learning and social studies learning outcomes for students are used in grids and objective test sheets. The following is a grid of student learning independence towards the problem-based learning model presented in Table 1.

Table 1. Learning Independence Questionnaire Grid

Indicator	Sub Indicator	Number of Items
Able to manage learning strategies	The learning method used	1,3, 4
	Learning media used	
	Allocation of study time	
	Habit of using study time	
Able to manage study time	Using study time	12
	Study time sharing	
Able to arrange study space	At home	5, 6
	In the office	
	In library	
Able to assess learning activities	Readiness in learning	14
	Tenacity in learning	
	Learning endurance	
Overcoming difficulties in understanding teaching materials	Discussion among teaching participants	2, 10
	Utilize learning resources	
Measuring ability from learning	Doing TM exercises	8, 9
	Learning outcomes from TM	
Choose appropriate learning resources including tutors	Study results from the final exam	11
	Modules, magazines, other literature	
	Audio cassette, VCD	
	Access the internet/website	
Have teaching materials	Tutor's knowledge ability	18, 17
	Buying modules, cassettes, VCD	
	Other supporting literature	
Interaction of teaching participants with teaching materials	Internet printout	15, 16, 19, 20
	Length of study Perseverance / concentration of study	
	Read the module introduction	
	Reading descriptions and examples	
	Doing exercises	
	Carry out follow-up	
Total		20

In addition to student independence questionnaires using problem-based learning models and to determine student success in learning social studies, the instrument used is social studies questions after implementing problem-based learning models.

Table 3. Grid of Social Studies Subjects for Class V

No	Assessment Aspect	Number of Items
1	The Factors of Indonesian Colonialism and Indonesia's Efforts to Maintain Sovereignty	3
2	History of Islam	4
3	Natural resources	4
4	Ethnic differences based on geographic environment	4
Total		15

The instrument was tested and analyzed for reliability. For the reliability, it was calculated using the Cronbach alpha formula. The reliability coefficient of the questionnaire for the application of problem-

based learning models using the scaffolding technique is obtained. The reliability coefficient on the social studies questions grid for class V to see learning independence and student learning outcomes is 0.780 and 0.720. Thus the instrument can be said to be reliable. The form of the questionnaire used is a closed type of questionnaire, where for each question, there are several answer options for respondents to choose from using a Likert scale category, namely five ratings. Likert scale with the type of scale is very bad (STB), not good (TB), moderate (C), good (B), and very good (SB). Each positive item in the instrument has a score of: STB = 5, TB = 4, C = 3, B = 2, and SB = 1. Scores are reversed for negative items. The technique used to analyze the data is a descriptive qualitative, quantitative, and statistical inferential analysis.

3. RESULT AND DISCUSSION

Result

Students' learning independence test results were obtained from tests conducted before the learning model was applied to the experimental class 1, experiment 2, and control class. This test aims to determine students' level of learning independence and how the differences in student learning outcomes are based on the level of learning independence after applying the applied learning model. The learning independence of the sample class students varied, and the average student had a moderate level of independence, while students who had a high level of learning independence were only slightly independent. In experimental class 1, there are five students with high learning independence. In experimental class 2, 6 students have high learning independence, while the control class has the same number as the experimental class 1, five people for high-level students.

Data on learning test results on inappropriate material were obtained from final tests conducted in experimental class 1 with a problem-based learning model, experiment 2 with a problem-based learning model with scaffolding technique, and control class with a conventional learning model. This test is carried out after the learning model is applied, aiming to see the learning outcomes after the learning model is applied from the final test results conducted by the three sample classes. The average difference in learning outcomes after treatment in experimental class 2 was 26.35 higher than the experimental class 1, which was 23.06, and the control class was 20.72. Meanwhile, experimental class 1 was 23.06 higher than the control class, 20.72. It can be seen that the results of learning mathematics in the equation material are based on student learning independence and the learning model used. The average score of students who have high learning independence in the experimental group 2 who apply Problem Based Learning with the Scaffolding technique gets the highest score of 30.33, while the lowest average score obtained by students with low learning independence in conventional learning is 14.50. The homogeneity test table shows the value (significance) of Sig. 0.292 where > 0.05 , so it can be said that the variance between groups is significantly different.

The t-test was used to determine the effect of applying the Problem Based Learning model with the Scaffolding Technique on student learning outcomes on similarity materials. The t-test in this study was conducted with a significance level of 0.05. While the table value = 0.05: 2 = 0.025 (two-tailed test) with degrees of freedom (df) $n = \text{number of samples}$ and $k = \text{number of independent and dependent variables}$, then obtained $56 - 3 = 53$ tables from 2006. Based on the results of the t-test (partial), which can be seen in the SPSS output table above, it is known that the application of the Problem Based Learning model with the Scaffolding Technique has a significant effect on student learning outcomes on the similarity material. The value of $t_{\text{count}} (5,497) > t_{\text{table}} (2,006)$ with sig 0.000 $< (\alpha) 0.05$ or with a significance level of less than 0.05 or equal to 0.000, so H_0 is rejected, and H_1 is accepted. It means that partially applying the Problem Based Learning model with the Scaffolding technique has a significant effect on student learning outcomes on the similarity material. Tcount is positive, meaning that applying the Problem Based Learning model with the Scaffolding Technique has a positive effect on student learning outcomes on similarity materials. If applying the Problem Based Learning model with the Scaffolding Technique is getting better, it will also improve student learning outcomes on similar materials.

The t-test was then used to determine the effect of independent learning on student learning outcomes on similarity materials. The t-test in this study was conducted with a significance level of 0.05. While t table value = 0.05 : 2 = 0.025 (two-tailed test) with degrees of freedom (df) nk where $n = \text{number of samples}$ and $k = \text{number of independent and dependent variables}$, then $56 - 3 = 53$ obtained t table of 2,006. Based on the results of the t-test (partial) shown in the SPSS output table above, it is known that learning independence has a significant effect on student learning outcomes on similarity materials. The value of $t_{\text{count}} (7989) > t_{\text{table}} (2,006)$ with sig 0.000 $< (\alpha)$ with a significance level of 0.05 or less than 0.05 or 0.000, so H_0 is rejected, and H_1 is accepted. It means that independent learning partially has a significant effect on student learning outcomes on similar materials. Tcount positive means that learning independence

positively affects student learning outcomes on similar materials. If students' learning independence is getting better, then student learning outcomes on similar materials will also increase.

The F-test was used to determine whether the independent variable regression model consisting of a problem-based learning model with scaffolding techniques and learning independence simultaneously (together) had a significant effect on the dependent variable, namely student learning outcomes on similarity material. Based on the ANOVA output, it can be seen that the calculated F value is 46,282, more significant than the table F of 2,780 with Sig < 0.005. So H₀ is rejected, and H₁ accepts. So it can be concluded that the problem-based learning model with scaffolding technique (X₁) and independent learning (X₂) simultaneously has a positive and significant effect on student learning outcomes (Y) on the similarity material. The coefficient of determination (R²) is used to see how big the contribution of the independent variables' influence consists of problem-based learning models of scaffolding techniques and independent learning simultaneously on the dependent variable of student learning outcomes on congruence material.

Based on the output summary of the model above, it can be seen that the R Square value is 0.636 or 63.6%. The magnitude of this value indicates the proportion of influence that can be explained by the variable problem-based learning model with scaffolding techniques and independent learning together on the magnitude of variation (fluctuation) in student learning outcomes variables. The dependent variable (Y) can be explained by the two independent variables by 63.6%, while other dimensions outside the study influence the remaining 36.4%. R Squared shows the value of multiple determination of all independent variables with an extreme dependence. It is known that the value of R Squared above is 0.636, which is close to 1. Based on the two-way ANOVA test results using the SPSS 21 application to determine the difference in learning outcomes between students who applied problem-based learning models and problem-based learning models with scaffolding techniques rather than conventional learning models on similarity materials, the following results were: obtained. The results of the F test show that there is a significant difference or accept H₁. Then this ANOVA test must be continued to the next stage, namely the Post Hoc Test. Students who apply the Problem Based Learning model get a score of -3.29* compared to Problem Based Learning with the Scaffolding technique, whereas when compared to the conventional model, there is no difference with a score of 2.33. It means that students who use the Problem Based Learning model are far behind students who apply Problem Based Learning with the Scaffolding technique, which is -3.29*. Students who apply Problem Based Learning with the Scaffolding technique compared to Problem Based Learning have a higher difference value of 3.29 *. When compared to conventional, there is a vast difference of 5.63 *. Students who apply the conventional model have a significant difference even though there is a difference of -2.33. When compared with Problem Based Learning with Scaffolding technique, there is a significant difference, namely -5.63*.

It can be said that there are significant differences in student learning outcomes using the Problem Based Learning model with the Scaffolding technique when compared with the learning outcomes in the Problem Based Learning and conventional models. The application of problem-based learning with conventional learning models does not significantly differ. The application of the Problem Based Learning model with the Scaffolding technique obtains the best learning outcomes compared to other learning models. Based on the Post Hoc Test results, determine the level of differences in learning outcomes between students who have high, medium, and low learning independence on similarity materials. The learning outcomes of students who have high learning independence are significantly different from students who have moderate learning independence, namely 6.69.*, as well as when compared to students who have low learning independence, namely 9.85 *. The learning outcomes of students who have moderate learning independence are significantly different from those of students who have high learning independence, namely -6.69 *. In contrast, when compared with the learning outcomes of students with low learning independence, there is also a significant difference, namely 3.17 *. Students with low learning independence were significantly different from the learning outcomes of students with high and moderate learning independence, namely -9.85 * and -3.17 *.

Discussion

Students' success in learning activities is due to the education given by their parents. Students only memorize so that their understanding of the concept is lacking in solving a problem (Nurani et al., 2020; Sartono et al., 2018). Classroom management carried out well by the teacher will provide a conducive and innovative learning atmosphere (Effendi & Hendriyani, 2020; Ginting, 2016; Nurmanita et al., 2019). More advanced students can advance an understanding of ethics in learning activities that impact student learning outcomes. A teacher is forced to understand the times when creating learning activities that can increase interest and motivation (Setiawan et al., 2020; Tse et al., 2019). Monotonous learning activities will affect student learning outcomes, so the teacher must be good at processing the class. Problem-based learning is related to using intelligence from individuals who are in a group of people or the environment

to solve meaningful, relevant, and contextual problems (Effendi & Hendriyani, 2020; Yuniawardani & Mawardi, 2018). Problem-based learning is also defined as a learning model that challenges students to learn, work together in groups to find solutions to real problems (Nurmanita et al., 2019; Safithri et al., 2021). The focus on learning activities strengthens the skills, ethics, and integrity that lie at the forefront of Education. Based on some of the expert opinions above, it can be concluded that the Problem Based Learning model is a learning model that presents real problems to be solved by students individually or in groups so that it can stimulate students to think critically and train for independent learning. Independent learning will also improve student learning outcomes (Kaniati & Kusmayadi, 2013; Rangga et al., 2016; Sobri et al., 2020).

The results of previous studies also state that the problem-based learning model can help students learn (Aprilianingrum & Wardani, 2021; Kimianti & Prasetyo, 2019; Sulani et al., 2020). Other studies also state that scaffolding techniques can make learning easier for students (Maksić & Jošić, 2021; Royanto, 2012; Sun & Hsu, 2019). PBL learning produces better performance than direct learning. This research has a novelty in a study where the novelty is found in the variables studied, namely learning independence and student learning outcomes, where to find out the researchers used a Problem-Based learning model. The limitations of this study are in the learning model used where the researcher uses only one learning model that focuses on problem-based learning models to see student learning independence and student learning outcomes. The implication of this research is the relationship between students' independence in learning and the learning outcomes that students get with a problem-based learning model. Where in this way is to find out how students solve a problem in learning activities that can allow students to think.

4. CONCLUSION

The application of the Problem Based Learning model with the Scaffolding technique obtained the best learning outcomes compared to other learning models. In the level of learning independence, there are differences in learning outcomes. There are differences in student learning outcomes between students who have high, medium, and low learning independence, students who have high learning independence, get the highest results compared to students who have moderate and low learning independence.

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