Application of Learning Model: Problem-based Learning to Increase Learning Outcomes in Budget Plan Subject

Wardhana Rizqi Aminulloh[1], Heri Suryaman[2]*
[1,2]Faculty Of Engineering, Universitas Negeri Surabaya, Indonesia
[1]wardhanaaminulloh@mhs.unesa.ac.id, [2]*herisuryaman@unesa.ac.id

Abstract: This study aims to describe instrument validity, learning outcomes using conventional learning models, learning outcomes using Problem Based Learning models, and differences in learning outcomes between the two learning models on the subject of Budget Plan at SMKN 1 Glagah Banyuwangi. This type of research is quantitative with a quasi-experimental method. The experimental design refers to the Non-equivalent Control Group Design model. The sample involved was 60 students taken from class XI DPIB SMKN 1 Glagah Banyuwangi and divided into 2 classes, namely the experimental and control classes. The number of students per class is 30 students. Data collection in this study was carried out through instrument validation questionnaires and post-tests. Data analysis was carried out through normality test as a prerequisite test and paired samples test as hypothesis testing. This study shows the results in the form of the validity of the instruments used, which are in very good agreement with the syllabus validation of 87%, lesson plans of 85%, and post-test questions of 85%. The learning outcomes of the control class were categorized with an average of 84.33, while the experimental class was 90 which was included in the good category. The application of the Problem Based Learning learning model that was carried out in the experimental class got a higher score with a difference of 5.67. Paired samples test through SPSS software showed a significance result of 0.002 or less than 0.005. Based on the results of hypothesis testing, it can be concluded that H_a is accepted which indicates a significant influence between the implementation of Problem Based Learning and conventional learning

Keywords: Learning Outcomes; Plan Budget Cost; Problem Based Learning.

Abstrak: Penelitian ini bertujuan untuk mendeskripsikan validitas insrument, hasil belajar dengan pembelajaran konvensional, hasil belajar dengan pembelajaran *Problem Based Learning,* dan perbedaan hasil belajar antara kedua pembelajaran pada mata pelajaran Rencana Anggaran Biaya di SMKN 1 Glagah Banyuwangi. Jenis penelitian ini adalah kuantitatif dengan metode *quasi experimental*. Rancangan eksperimen mengacu pada model *Non-equivalent Control Group Design*. Sampel yang terlibat berjumlah 60 siswa yang diambil dari kelas XI DPIB SMKN 1 Glagah Banyuwangi dan dibagi ke dalam 2 kelas, yakni kelas eksperimen dan kontrol. Jumlah siswa tiap kelas adalah sebanyak 30 siswa. Pengumpulan data pada penelitian ini dilakukan melalui instrumen angket validasi instrumen dan post-test. Analisis data dilakukan melalui uji normalitas sebagai pengujian prasyarat dan uji *paired samples test* sebagai pengujian hipotesis. Penelitian ini menunjukkan hasil berupa validitas instrumen yang digunakan termasuk ke dalam sangat sesuai dengan validasi silabus sebesar 87%, RPP 85%, dan soal Post-test 85%. Hasil belajar kelas kontrol mendapat kategori dengan rata-rata 84,33, sedangkan kelas eksperimen sebesar 90 yang termasuk ke dalam kategori baik. Pengaplikasian model pembelajaran *Problem Based Learning* yang dilaksanakan di kelas eksperimen mendapat nilai yang lebih tinggi dengan selisih 5,67. Uji *paired samples test* melalui software SPSS menunjukkan hasil signifikansi sebesar 0,002 atau kurang dari 0,005. Berdasarkan hasil uji hipotesis, dapat disimpulkan bahwa H_a diterima yang menandakan adanya pengaruh secara signifikan antara diterapkannya pembelajaran *Problem Based Learning* dan konvensional.

Kata kunci: Hasil Belajar; Problem Based Learning (PBL); Rencana Anggaran Biaya.

INTRODUCTION

Developments in the era of globalization require qualified human resources, so the revised 2013 curriculum is improving the education quality so that the resources quality can be improved. Permendikbud Number 70 of 2013 explains that the 2013 curriculum aims to shape the character of the nation's children to create skills to compete with other countries. To achieve this goal, the teacher's role as an educator is needed in choosing the proper learning method or model. This selection is very influential in the knowledge transfer process carried out in schools. In addition, teacher innovation is also needed to create a more creative, interactive, and effective teaching and learning atmosphere (Hidayat, 2012; Mahfud & Wulansari, 2018; Shahrin et al., 2021).

There are various indicators to determine the effectiveness of a lesson. According to (Hariyanto, 2014), learning is declared effective if the learning objectives are achieved, the teaching and learning atmosphere is not dull, and it has a clear learning direction. The role of learning is significant to produce quality students. Furthermore, learning is a plan or design to deliver material to students (Sanjaya, 2015). One of the efforts made by the teacher in conveying the material is by developing teaching aids so that learning can be effective so as to increase student motivation and understanding (Pambudi et al., 2018).

The implemented teaching method encourages student to improve learning outcomes. In Indonesia, many learning models are applied to create the process of learning and teaching more creative, interactive, and effective. One method or teaching style that can be used is Problem Based Learning (Amaya Chávez, D., Gámiz-Sánchez, V. M., & Cañas Vargas, 2020). Furthermore, problem-based learning is a teaching style designed to solve the problems presented. According to (Arends, 2014), problem-based learning is also a teaching style that offers a variety of authentic issues which serve as a springboard for investigation and investigation. This learning model can assist students on their critical-thinking and problem-solving ability (Yin, Q., Guo, C., Dong, C., & Wang, 2021). The result of problem-based learning is that students can solve problems with investigative skills (Ariyanto et al., 2020; Meilasari & Yelianti, 2020; Silvi et al., 2020). According to (Sanjaya, 2014), problem-based learning has some benefits, namely: (1) stimulating the ability of students on discovering new things; (2) suitable for deepening the material; (3) improving student learning activities; (4) displaying the concept of thinking in a material; (5) develop critical thinking skills; and (6) the material taught can be applied to the real world. While the disadvantages of problem-based learning are: (1) students who lack self-confidence will be reluctant to try because the material is considered difficult; (2) takes longer; and (3) without a solid basis on why students must study the material, students will find it difficult to follow the lesson (Lidinillah, 2013).

The problem-based learning method are bound to be appropriate when used in materials requiring skill of critical thinking. The problem-based learning method will be put on the material which requires critical-thinking skills and foresight. The cost budget plan estimates the costs used in project activity. It is in line with (Firmansyah et al., 2013), which states that the budget plan is a lesson that uses skills in calculating the required costs in the number of materials and wages, and other costs. Furthermore, the material for the budget plan in the Revised 2013 Curriculum is included in the C3 category. This category relates to skills programs in Vocational High Schools.

This research is related to the Application of Problem Based Learning Model to Determine Student Learning Outcomes on Drawing Materials and Calculating Budget Plans for Class XI Drawing and Building Engineering" (Burhanuddin, 2016). Burhanuddin's research aims to use problem-based learning to determine student reactions, learning trajectories, and learning outcomes. Quasi-experimental was used as the research design in design of Non-equivalent Control Group. Furthermore, Burhanuddin's sample was 64, including 32 students of class of control and others in class of experiment. The treatment applied in the experimental class is the problem-based learning method. Burhanuddin's research results show that the implementation of learning has increased, both when problem-based learning is applied and not. The average learning outcomes of the class of experiment got score average of 78.44, and the class of control

got average score of 71.13. This research and Burhanuddin's research is on the treatment used, namely the problem-based learning. While difference is in the material used, where Burhanuddin uses drawing material and calculates the budget plan, and this research only uses the budget plan material. In addition, the place of research is also different, where Burhanuddin conducts research at SMKN 2 Surabaya and this research at SMK Glagah 1 Banyuwangi.

This research is related to "The Application of Problem Based Learning (PBL) Model with Mockup Media to Calculate the Budget Plan for Class XI SMKN 3 Surabaya" (Aditya, 2018). The purpose of Aditya's research is to find the results of student learning and implementation of learning outcomes after being processed by a mock media problem-based learning learning model to calculate budget plans in SMK Negeri 3 Surabaya. In addition, an experimental method using static comparison: Designed for randomized controls only. The Aditya survey sample consisted of 66 students, 34 students in the class of experimental, and 32 students in the class of control. The difference between the two classes lies in the mock media. Here, the experiment class applies to mock media, but the control class does not. In addition, both classes use the same learning method: problem-based learning. According to Aditya's findings, the average learning score for the experimental class was 77.18, while the average learning score for the control class was 70.07. The average learning outcome shows the difference in learning outcome between both classes. The difference between the Aditya survey and this survey lies in the learning media that Aditya uses when using mockups, but this survey does not include learning media.

This research is related to "Application of Mockup Media Using Problem Based Learning Model on Drawing Competence of Reinforced Concrete Construction for Budget Plan" (Masfirah, 2018). This study aims to determine students' activities in the classroom with the implementation of mock media using a problem-based learning model. Masrifah's research method uses an experimental approach with a one-shot study case design. Masrifah's research sample amounted to 72 students of class XI TGB SMK Negeri 5 Surabaya in the 2017/2018 academic year. The treatment or treatment in masrifah research is applying a problem-based learning in the experimental class, namely class XI TGB 3. In contrast, the control class, namely XI TGB 2, uses a conventional learning model. Masrifah's research results show that the average value of student learning outcomes in the control class is 76.65, and the experimental class is 81.06. The results of the t-test are t count = 2.76 > t table = 1.67 (significant, = 5%), which indicates H_a is accepted or the average value is more significant than minimum criteria of mastery learning (75) after applying the Problem Based Learning through media mockup. The difference between Masrifah's research and this research is in the research location where this research took place at SMK Glagah 1 Banyuwangi. In contrast, Masfirah's research took place at SMK Negeri 5 Surabaya.

This research is related to "Problem Based Learning Model Approach (Problem Based Learning) to Increase Learning Results Calculating Student Cost Estimates Class XI Technique Construction SMKN 1 Balige"(Tambunan, 2017). Tambunan's research is a classroom action research (CAR) aimed at applying learning models that can improve the learning outcomes of cost budget planning calculations for construction volume and work unit price estimation indicators. According to a Tambunan study, students' learning outcomes increased in the first cycle, with an average score of 76.85, a percentage of integrity of 44.44%, and an increase in the second cycle, with an average score of 85.77, of completeness. The percentages were shown to be 81,48. % Based on the results of these studies, applying a problem-based learning can improve outcomes of learning in budget planning for class XI students in the concrete block construction department of SMK Negeri1 Balige. The difference between this study and Tambunan lies in the method used when this study uses an experimental approach, whereas the Tambunan study is a classroom behavioral study.

The relevant research results prove that the problem-based learning model affect positively and significantly on application-based learning: the budget plan. Furthermore, the formulation of the research problem is as follows:

1. How is the validity of the Problem Based Learning learning model instrument and the learning outcomes of control class students in the subject of budget planning using conventional learning models?
2. How are the experimental class students' learning outcomes in the subject of budget planning using the Problem Based Learning method?
3. How is the difference between student learning outcomes with Problem Based Learning and conventional learning models in the subject of budget planning?

The aim of the research based on the problem formulation that has been determined is as follows:

1. Describe the validity of the Problem Based Learning learning model instrument and control class student learning outcomes in the subject of budget planning using conventional learning models;
2. Describe the learning outcomes of experimental class students in the subject of budget planning using the Problem Based Learning method;
3. Describe the differences in student learning outcomes with Problem Based Learning and conventional learning models in the subject of budget planning.

METHODS

The method used is a quantitative type with quasi-experimental procedures. A study design using a non-equivalent control group design in which only the experimental group was treated in the form of a problem-based learning learning model.

$$
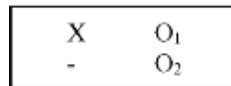\begin{array}{ll}
X & O_1 \\
- & O_2
\end{array}
$$

Figure 1. Research Design

The research was conducted in November 2021 at SMKN 1 Glagah Banyuwangi. Furthermore, this study is a population study because it uses the entire population as a sample. The sample in this study was the study group for class XI DPIB SMK Negeri 1 Glagah, totaling 60 students who were divided into two classes, namely the experimental and control class. Role of the sample in this study is as a source of data because the data used is in the form of grades. The validation sheet is used as a reference in determining the feasibility of the learning device to be used. The validators involved in instrument validation are lecturers from the Department of Civil Engineering at Unesa and teachers at SMKN 1 Glagah. The feasibility of learning tools to be implemented in learning is 81%. Instruments tested for validity included the syllabus, lesson plans, and posttest questions.

Table 1. Syllabus Validation

No	Assessment Aspect	Indicator Number	Amount of Indicators
1	Appearance and Layout	1,2,3,4	4
2	Core	5,6,7,8,9,10,11,12	8
3	Language	13,14	2
	Total		14

Table 2. Lesson Plans Validation

No	Assessment Aspect	Indicator Number	Amount of Indicators
1	Appearance and Layout	1,2,3	3

No	Assessment Aspect	Indicator Number	Amount of Indicators
2	Core	4,5,6,7,8,9,10	7
3	Learning Activities	11,12,13,14,15	5
4	Assessment of Learning Outcomes	16,17,18	3
5	Language	19,20	2
	Total		20

Table 3. Posttest Validation

No	Assessment Aspect	Indicator Number	Amount of Indicators
A	Core	1,2,3,4	4
B	Language	5,6,7	3
C	Matter	8,9	2
	Total		9

The answers to the validation questionnaire used a Likert scale as a scoring technique with the following details: one stated "not appropriate," two said "not appropriate," three stated "quite appropriate," four said "appropriate," and five said "very appropriate." Data from the questionnaire, calculated using the equation below:

$$Average\ Percentage = \frac{Total\ Score}{Maximum\ Score}\ x\ 100\% \qquad (1)$$

$$Validation\ Results = \frac{Number\ of\ Mean\ Persentage}{Number\ of\ Aspects\ Measured} \qquad (2)$$

The results of the instruments validation are interpreted as in the score criteria below:

Table 4. Category of Instruments Assessment Score

Percentage	Category
0% - 20%	Very Inappropriate
21% - 40%	Not Suitable
41% - 60%	Quite Appropriate
61% - 80%	Appropriate
81% - 100%	Very Appropriate

Learning tools first to 2 experts. Then the activities carried out after the instrument was valid were giving treatment and collecting data through post-test. This test was carried out at the third meeting after students were given Problem Based Learning. The post-test questions are in the form of multiple choice as many as 20 questions. Data analysis in the form of learning outcomes was carried out through the normality test as a prerequisite test and t test. The purpose of knowing normality is as a prerequisite test to find out the data is distributed or normally distributed or the next step in data analysis cannot be known. After the data is normally distributed, the hypothesis is tested. This test is carried out through a t-test or paired t-test which aims to determine a certain value where there is a significant difference between the results and the average of a sample. Paired t-test using the right-hand criteria, namely as a determinant of student learning outcomes in the DPIB class at SMKN 1 Glagah Banyuwangi, which is greater than the minimum completeness criteria (75) after applying the Problem Based Learning learning model to the budget plan subject. The hypothesis in this study refers to the results of paired t-test, where Ha is accepted if the value of Sig. (2-tailed) <0.05 which indicates a significant difference in the two

classes while H0 is accepted if the Sig. (2-tailed) > 0.05 which indicates that there is no significant difference between the two classes.

The stages of research on the application of Problem Based Learning use five phases in each meeting, namely: (1) the first phase of introducing students to problems; (2) The second phase is student organizing activities; (3) The third phase is to conduct research guidance in groups and individually; (4) The fourth phase is to present and develop the findings; and (5) the last phase is to analyze and evaluate the results of problem solving. Data collection in this study was carried out for 3 learning meetings. Each meeting with a learning time of 100 minutes.

RESULT AND DISCUSSION

Result

The results research conducted are that the usage of problem-based learning is able to increase the learning value of cost budget planning topics. Based on the validation results, the value of the validation of the instruments was obtained, as shown in Table 5.

Table 5. The Result of Syllabus Validation

| No | Assessment Aspect | Percentage (%) | | | Category |
		Lecturer	Teacher	Mean	
1	Appearance and Layout	100%	95%	98%	very appropriate
2	Core	80%	88%	84%	very appropriate
3	Language	80%	80%	80%	appropriate
	Total Mean			87%	very appropriate

The results of the syllabus validation based on the above calculations were obtained by 87%. Furthermore, the results of the analysis above fall into the 81%-100% interval with a very feasible category, meaning that the syllabus can be used in learning activities in class (Arikunto, 2013). At the same time, the the lesson plan validation result are listed in Table 6.

Table 6. The Result of Lesson Plan Validation

| No | Assessment Aspect | Percentage (%) | | | Category |
		Lecturer	Teacher	Mean	
1	Appearance and Layout	100%	100%	100%	very appropriate
2	Core	77%	83%	80%	very appropriate
3	Learning Activities	80%	88%	84%	very appropriate
4	Assessment of Learning Outcomes	73%	93%	83%	very appropriate
5	Language	80%	80%	80%	appropriate
	Total Mean			85%	very appropriate

The results of lesson plan validation based on the above calculations are obtained by 85%, which is in the 81%-100% interval. These results indicate that the lesson plans are included in the very feasible category, meaning that the syllabus can be used in learning and teaching schemes. While the results of the validation of the syllabus are as follows:

Table 7. The Result of Posttest Validation

| No | Assessment Aspect | Percentage (%) | | | Category |
		Lecturer	Teacher	Mean	
1	Core	87%	80%	83%	very appropriate
2	Language	80%	96%	88%	very appropriate

No	Assessment Aspect	Percentage (%)			Category
		Lecturer	Teacher	Mean	
3	Matter	80%	87%	83%	very appropriate
	Total Mean			85%	very appropriate

The results of the validation of the syllabus based on the above calculations are obtained by 85%, which is included in the 81%-100% interval category so that it indicates the syllabus used is very feasible, meaning that the syllabus can be used in learning activities. After validating the instrument, namely the syllabus, lesson plans, and posttest questions to be used, treatment and posttest were carried out. The treatment was applied for two meetings. At the first meeting, the material on the analysis of the budget design and calculating the volume of sloof and column work was given. Then at the second meeting, the material was presented about summing the analysis and recapitulation of the budget plan for sloof and column work. Both materials are taught in equal portions in both classes (Hastjarjo, 2019). The differences between two classes is in the treatment used, where the experimental class applies a problem-based learning, while control class applies a conventional learning. Stages of the problem-based learning used in the class of experimental is in Figure 2.
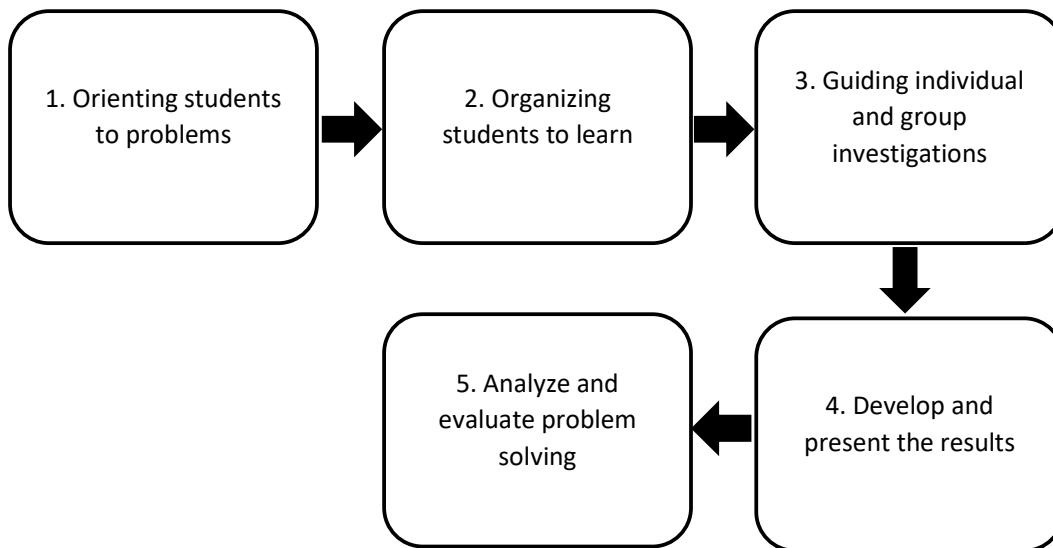

Figure 2. The Stages of Problem-Based Learning Model

The application of Problem Based Learning is divided into five phases (Fathurrohman, 2019). The first phase of activity is the introduction of students to the problems that will be presented for 10 minutes. The teacher's role in this phase is to provide an explanation of the learning objectives, equipment needed, describe events or phenomena or demonstrations as problems to be solved, and motivate students to solve problems (problem solving). Students in this phase only listen and understand what the teacher says so that they can follow the lesson well. The second phase is an activity to organize students for 5 minutes. In this phase the teacher groups students into several small groups and provides students with assistance in organizing and defining the problem or task that has been given. The role of students in this phase is to clarify problems, define problems, conduct discussions between students based on students' understanding, and determine what is needed and done to solve problems. The third phase is to conduct investigation guidance in groups and individually for 30 minutes. In the third phase, the teacher has a role in encouraging students to collect information and experiment in finding solutions to problems. The role of students in this phase is to conduct individual studies related

to the problems to be solved through sources on the internet, libraries, and observations. The fourth phase is to present and develop the findings given for 20 minutes. The role of the teacher in this phase is to assist students in preparing reports and dividing tasks into groups. The role of students is to exchange information and work in solving problems. The last phase is to analyze and evaluate the results of problem solving, the time is given for 20 minutes. In the fifth phase the teacher helps students to develop the process and results of problem solving, while students play a role in evaluating learning related to learning and all the information obtained.

The steps taken after giving the material were Post-test in both classes. The post-test was conducted to determine whether or not there were differences in learning outcomes (Elizabeth & Sigahitong, 2018). This step is carried out at the second meeting after giving the material. This research activity was carried out in 2 learning meetings. The results of the post-test in the two classes that have been carried out at SMKN 1 Glagah Banyuwangi are listed in Table 8.

Table 8. The Results of Posttest in Control and Experiment Class

Roll Number	Experiment Class		Control Class	
	Score	Category	Score	Category
1	90	Good	80	Good
2	95	Very Good	75	Enough
3	90	Good	80	Good
4	100	Very Good	75	Enough
5	100	Very Good	95	Very Good
6	80	Good	85	Good
7	80	Good	75	Enough
8	95	Good	90	Good
9	90	Good	95	Good
10	100	Very Good	75	Cukup
11	95	Very Good	75	Cukup
12	100	Very Good	90	Good
13	100	Very Good	90	Good
14	80	Good	75	Enough
15	90	Good	90	Good
16	95	Very Good	90	Good
17	90	Good	85	Good
18	80	Good	95	Very Good
19	90	Good	95	Very Good
20	85	Good	85	Good
21	85	Good	80	Good
22	85	Good	85	Good
23	90	Good	85	Good
24	85	Good	80	Good
25	95	Very Good	90	Good
26	90	Good	85	Good
27	95	Very Good	80	Good
28	85	Good	80	Good
29	85	Good	85	Good
30	80	Good	85	Good
Mean	**90**	**Good**	**84.33**	**Good**

The above results exhibit that the average learning score of two classes utilizing the question-based learning and traditional method are above the passing score (75). In addition, the experimental class using the question-based learning method achieved a higher score (90) than the control class 84.33. The application of problem-based learning methods affects students' scores. The descriptive statistical test result confirms the results of these calculations by the SPSS application in Figure 3.

Descriptives

KELAS				Statistic	Std. Error
HASIL	Eksperimen	Mean		90.00	1.222
		95% Confidence Interval for Mean	Lower Bound	87.50	
			Upper Bound	92.50	
		5% Trimmed Mean		90.00	
		Median		90.00	
		Variance		44.828	
		Std. Deviation		6.695	
		Minimum		80	
		Maximum		100	
		Range		20	
		Interquartile Range		10	
		Skewness		.000	.427
		Kurtosis		-1.068	.833
	Kontrol	Mean		84.33	1.216
		95% Confidence Interval for Mean	Lower Bound	81.85	
			Upper Bound	86.82	
		5% Trimmed Mean		84.26	
		Median		85.00	
		Variance		44.368	
		Std. Deviation		6.661	
		Minimum		75	
		Maximum		95	
		Range		20	

Figure 3. The Result of Experiment and Control Class' Descriptive Statistic Test

Based on Figure 3, results the both class have the same number (N), which is 30 students. Furthermore, the lowest score in the class of experiment is 80, while the highest was a perfect score or 100. Meanwhile, class of control's students got the lowest score of 75, and the highest was 95. Although there was a difference in the lowest and highest scores, both classes achieved scores above the minimum criteria of mastery learning and were declared complete. The data from the two classes are fairly normal, which can be seen from the standard deviation (std. deviation). The experimental and control classes have smaller standard deviation results than the average obtained, indicating good results. The next step is to perform a normality test as a prerequisite test. The next test can be determined if the results of the prerequisite test are known. If the data is normal, then a paired sample t-test is performed, while the Mann-Whitney test will be performed if it is not normal (Aini & Inayah, 2021). The result of normality test results for the both classes is in Figure 4.

Tests of Normality

	KELAS	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
HASIL	Eksperimen	.139	30	.144	.909	30	.014
	Kontrol	.142	30	.124	.908	30	.013

Figure 4. The Result of Experiment and Control Class' Normality Test

Since the sample size exceeds 30, the Kolmogorov-Smirnov test was utilized as the normality test results (Oktaviani & Notobroto, 2014). In addition, Sig. If the value is> 0.05, the data is considered to be normally distributed. Based on the results of the normality test with SPSS software in Figure 4, we found significant numbers of 0.144 in the class of experiment and class of control is 0.124, indicating that both classes had Sig scores above 0.05. These results show that the data in both classes are normally distributed. The normal distribution data is used to test the paired samples. This test seeks to find out the importance of the difference between implementing and not implementing problem-based learning. The results of the pair sample test are as follows:

Paired Samples Test

		Paired ...				
		95% Confidence ...				
		Upper	t	df	Sig. (2-tailed)
Pair 1	Kontrol - Eksperimen	-2.31485	-3.458	29	.002

Figure 5. The Result of Experiment and Control Class' Paired SamplesTest

Paired sample test's decision-making is as follows:
1. If the significance value is < 0.05, then there is a significant correlation between experiment and control class learning outcomes,
2. If the significance value is > 0.05, then there is no significant correlation of learning outcomes between experiment and control class.

Figure 5 shows the significance value is 0.002, where the value is less than 0.005. Based on decision-making, It is concluded that the correlation between the value of the treatment class learning outcomes and the non-treatment learning outcomes class scores has a significant correlation.

Discussion

The syllabus validity value obtained is 87% and is in the very appropriate category. The value of the validity of the lesson plan is 85% and is in the very appropriate category. The validation value of the post-test is 85% and is included in the very appropriate category. The three instruments are categorized as very suitable so that they can be applied in data collection for this research. Instruments that have been valid are in accordance with the validator's assessment which is then used as a guide for teaching and learning activities (Yusup, 2018). This experimental research was conducted by involving the control class and the experimental class. The difference between the two classes is in the applied learning model, where the experimental class applies Problem Based Learning and the control class applies conventional methods.

Learning outcomes in the control class are included in the good category with an average of 84.33. The learning outcomes of the experimental class that apply the Problem Based Learning (PBL) learning model are included in the good category with an average of 90. Teachers are expected to be able to convince students to solve the problems given. This is due to the lack of a

Problem Based Learning learning model centered on students. If students feel less confident in solving problems and do not know why they are studying this material, then the Problem Based Learning learning model does not give maximum results (Sanjaya, 2014). The same thing also happened in the control class, where teaching and learning activities were carried out as usual without any group division. Although the learning conditions are not much different, there are different learning outcomes between the two classes. One of the many factors that influence student learning outcomes is the learning model used in learning. These factors are classified as student external factors and are able to increase student motivation in learning (Slameto, 2015).

Learning using the Problem Based Learning model has a contribution in learning, one of which is in improving learning outcomes in the subject of budget planning at SMKN 1 Glagah Banyuwangi. These results are in line with research (Aditya, 2018) which proves that the Problem Based Learning learning model plays a role in increasing student scores in the material for calculating the Budget Plan. The difference between this study and Aditya's research is in the use of learning media, where Aditya uses mock-up media while this study does not involve learning media. Research (Masfirah, 2018)states the same thing, namely the application of Problem Based Learning has an effect on increasing student learning outcomes. The difference between Masrifah's research and this research lies in the place where the research is carried out. This research took place at SMK Glagah 1 Banyuwangi while Masfirah's research took place at SMKN 5 Surabaya. While research (Tambunan, 2017) also states that there is an increase in learning outcomes through Problem Based Learning after going through 3 cycles. The difference between this study and Tambunan lies in the method. The quasi-experimental method is the method used in this study, while Tambunan uses CAR. The results of the study using the Problem Based Learning learning model have an effect, one of which can improve student learning outcomes when used in the subject of calculating the budget plan.

CONCLUSION AND SUGGESTIONS

The conclusions based on the research conducted are as follows: (1) The validation results of the three instruments are included in the appropriate category so that they can be used in this study. In more detail, the validation of the syllabus is 87%, the validation of lesson plans is 85%, and the validation of posttest questions is 85% which are categorized as very feasible; (2) The control class learning outcomes that apply conventional learning models are included in the good category with an average of 84.33; (3) The learning outcomes of the experimental class that involves the problem-based learning model are included in the good category with an average of 90; (4) The results of the paired samples test using SPSS version 24, obtained a significant result of less than 0.005, namely 0.002, which indicates that H1 is accepted or there is a significant difference. This suggests that learning with a problem-based learning model improves learning outcomes in budget planning at SMK Negeri 1 Glagah Banyuwangi. These results are in line with previous studies (Burhanuddin, 2016), (Masfirah, 2018), and (Aditya, 2018) respectively, showing an increase in learning outcomes with a percentage of 7.31%; 2.35%, and 7.11%.

Suggestions from the conclusions that can be conveyed are as follows: (1) For further research, student respondents are used from several vocational schools; and (2) further research is conducted regarding the factors that influence the improvement of vocational students' learning outcomes. The limitation of this study is that it does not measure students' responses to the implementation of the learning carried out.

REFERENCE

Aditya, A. E. (2018). Penerapan Model Pembelajaran Problem Based Learning (PBL) Dengan Media Maket Untuk Menghitung Rencana Anggaran Biaya Kelas XI SMK Negeri 3 Surabaya. *Jurnal Kajian Pendidikan Teknik Bangunan*, *1*, 238–245.

Aini, N., & Inayah, Z. (2021). *Biostatistika Dan Aplikasi Program*. CV Literasi Nusantara Abadi.

Amaya Chávez, D., Gámiz-Sánchez, V. M., & Cañas Vargas, A. (2020). Problem-based learning: Effects on academic performance and perceptions of engineering students in computer sciences. *JOTSE: Journal of Technology and Science Education*, *10*(2), 306–328.

Arends, R. (2014). *Learning to Teach*. Pustaka Pelajar.

Arikunto, S. (2013). *Prosedur Penelitian: Suatu Pendekatan Praktik*. Rineka Cipta.

Ariyanto, S. R., Lestari, I. W. P., Hasanah, S. U., Rahmah, L., & Purwanto, D. V. (2020). Problem Based Learning dan Argumentation Sebagai Solusi dalam Meningkatkan Kemampuan Berpikir Kritis Siswa SMK. *Jurnal Kependidikan: Jurnal Hasil Penelitian Dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran Dan Pembelajaran*, *6*(2), 197–205.

Burhanuddin, M. (2016). Penerapan Model Pembelajaran Problem Based Learning Untuk Mengetahui Hasil Belajar Siswa Pada Materi Menggambar dan Menghitung Rencana Anggaran Biaya Kelas XI TGB. *Jurnal Kajian Pendidikan Teknik Bangunan*, *1*(1), 1–23.

Elizabeth, A., & Sigahitong, M. M. (2018). Pengaruh Model Problem Based Learning Terhadap Kemampuan Berpikir Kreatif Peserta Didik SMA. *Prisma Sains: Jurnal Pengkajian Ilmu Dan Pembelajaran Matematika Dan IPA IKIP Mataram*, *6*(2), 66–76.

Fathurrohman, M. (2019). *Model-Model Pembelajaran Inovatif*. Ar-Ruzz Media.

Firmansyah, A. ., Widodo, A. ., & Sukmaji, A. (2013). Rancang Bangun Aplikasi Rencana Anggaran Biaya Dalam Pembangunan Rumah. In *Jurnal Sistem Informasi VOL.* (Vol. 11). STIKOM.

Hariyanto. (2014). *Asessmen Pendidikan*. PT Remaja Rosdakarya.

Hastjarjo, T. D. (2019). Rancangan Eksperimen-Kuasi. *Buletin Psikologi*, *27*(2), 187. https://doi.org/10.22146/buletinpsikologi.38619

Hidayat, A. (2012). Konsep Pembelajaran Aktif, Inovatif, Kreatif, Efektif, dan Menyenangkan (Paikem). *AN NUR: Jurnal Studi Islam*, *4*(1), 39–50.

Lidinillah, D. A. M. (2013). Pembelajaran berbasis masalah (problem based learning). *Jurnal Pendidikan Inovatif*, *5*(1), 17.

Mahfud, M. N., & Wulansari, A. (2018). *Penggunaan Gadget untuk Menciptakan Pembelajaran yang Efektif*.

Masfirah. (2018). Penerapan Media Maket Menggunakan Model Pembelajaran Problem Based Learning (PBL) Pada Kompetensi Menggambar Konstruksi Beton Bertulang Untuk Rencana Anggaran Biaya. *Jurnal Kajian Pendidikan Teknik Bangunan*, *2*(2), 1–6.

Meilasari, S., & Yelianti, U. (2020). Kajian Model Pembelajaran Problem Based Learning (PBL) dalam Pembelajaran di Sekolah. *BIOEDUSAINS: Jurnal Pendidikan Biologi Dan Sains*, *3*(2), 195–207.

Oktaviani, M. A., & Notobroto, H. B. (2014). Perbandingan tingkat konsistensi normalitas distribusi metode kolmogorov-smirnov, lilliefors, shapiro-wilk, dan skewness-kurtosis. *Jurnal Biometrika Dan Kependudukan*, *3*(2), 127–135.

Pambudi, B., Efendi, R. B., Novianti, L. A., Novitasari, D., & Ngazizah, N. (2018). Pengembangan alat peraga IPA dari barang bekas untuk meningkatkan motivasi belajar dan pemahaman siswa sekolah dasar. *Indonesian Journal of Primary Education*, *2*(2), 28–33.

Sanjaya, W. (2015). *Perencanaan dan desain sistem pembelajaran*. Kencana.

Shahrin, S., Rosli, A., Haidiezul, M., & Ab, J. (2021). A Theoretical Framework of Secure Environment Of Virtual Reality Application in Tertiary TVET Education using Blockchain Technology Suhaimi. *Journal of Contemporary Social Sciences Studies*, *1*(1), 39–46.

Silvi, F., Witarsa, R., & Ananda, R. (2020). Kajian Literatur tentang Kemampuan Pemecahan Masalah Matematika dengan Model Problem Based Learning pada Siswa Sekolah Dasar.

Jurnal Pendidikan Tambusai, *4*(3), 3360–3368.

Slameto. (2015). *Belajar dan Faktor-Faktor yang Mempengaruhinya*. Rineka Cipta.

Tambunan, J. (2017). Penerapan Model Pembelajaran Berbasih Masalah (Problem Based Learning) Untuk Meningkatkan Hasil Belajar Menghitung Rencana Anggaran Biaya Siswa Kelas XI TKBB SMKN 1 Balige. *Jurnal UNIMED*, 2017.

Yin, Q., Guo, C., Dong, C., & Wang, T. (2021). May problem-based learning get higher evaluation from student?. *International Journal of Crowd Science.*

Yusup, F. (2018). Uji validitas dan reliabilitas instrumen penelitian kuantitatif. *Tarbiyah: Jurnal Ilmiah Kependidikan*, *7*(1).