



THE EFFECT OF PROBLEM BASED LEARNING (PBL) STRATEGY, AND LEARNING MOTIVATION ON STUDENTS' CHEMISTRY LEARNING OUTCOMES

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ABSTRACT

The purpose of this study was to determine the test results: (1) The Effect of Problem Based Learning (PBL) Strategies and Expository Methods on Students' Chemistry Learning Outcomes, (2) The Effect of High and Low Learning Motivation on Students' Chemistry Learning Outcomes, (3) Interaction Between Problem Based Learning (PBL) Strategy and Learning Motivation on Students' Chemistry Learning Outcomes. This experimental research was carried out using a 2x2 factorial design. The subjects in this study were students of class XI which consisted of four classes with 120 students. The subjects that became the focus of the experiment were classically randomized, namely four ABCD classes from SMAN 1 Sangkapura. The research hypothesis was tested using the Analysis of Variant (Anova) statistical test. The results of the calculation show that: (1) Chemistry Learning Outcomes of students who are taught with Problem Based Learning (PBL) Strategy, namely Based on the table it turns out to be $0.000 < 0.05$, it can be said to be significant, (2) Chemistry Learning Outcomes of students who have high learning motivation and have Learning motivation is low, that is, based on the table, it turns out $0.013 < 0.05$, it can be said to be significant, and (3). Based on the table, $0.000 < 0.05$, it can be said that there is an interaction between Problem Based Learning (PBL) Strategy, Expository Method, and Learning Motivation on Chemistry Learning Outcomes. Based on the results of the study, it was concluded that by using the Problem Based Learning (PBL) Strategy, the Expository Method, and Learning Motivation could improve students' Chemistry Learning Outcomes.

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1. Introduction

One of the tough challenges of the Indonesian nation is to prepare quality human resources, namely intelligent, superior and competitive human beings. These Indonesian human qualities can be produced through the provision of quality education (Azis, 2014; Hernandeni et al., 2018; Nur Salim, 2018). Education must be able to equip students with life skills that are in accordance with the needs of students' lives and their environment (Astuti et al., 2020; Awwaliyah & Arcana, 2021; Syarifudin, 2020).

Conditions of learning are teacher centered, active teachers, and students tend to be passive so that the learning process does not involve the role of students physically and mentally in learning activities. Students as learning subjects are programmed to obtain better learning outcomes, but in reality the condition of students is described as one of the objects in learning that must listen, pay attention, understand, record, store and retrieve information conveyed by the teacher during the test. Such a learning process encourages students to be passive, ignorant, lazy, sleepy, and bored so that learning outcomes tend to be low (Nugroho & Harida, 2020; Savira et al., 2020; Sihombing et al., 2020; Subdari et al., 2020).

Expository or conventional strategies that have been used by teachers, namely the lecture strategy followed by giving assignments and drills to students have not brought much change in improving chemistry learning outcomes. This teaching strategy does not provide opportunities for students to build their own knowledge through activities in seeking and finding new knowledge or solving chemistry problems (Maulidah & Kamal, 2020; Suryani, 2020; Wahab & Rizuan, 2020).



Departing from the conditions and some of the existing learning problems, it is necessary for the teacher's continuous and systematic efforts to improve the effectiveness of learning chemistry subjects at SMAN 1 Sangkapura. One of the efforts that can be done is the need to apply learning strategies that provide broad opportunities for students in the learning process. One of the learning strategies that provide opportunities for students that directly leads to solving problems faced by students in participating in learning activities is the Problem Based Learning strategy (Fatimah et al., 2017; Herdianto et al., 2021; Kurniawati, 2018).

Problem Based Learning strategies in the learning process provide opportunities for students to learn optimally, this implies that the treatment applied in the teaching and learning process uses thinking power and creative thinking effectively and efficiently in order to achieve learning objectives (Hafizah & Nurhaliza, 2021; Janah, 2020; Sumarni et al., 2016). The process skills approach using the Problem Based Learning strategy is applied by looking at students and their activities as whole human beings, translated into teaching and learning activities that pay attention to the development of knowledge, life values and attitudes, feelings and skills as a unified whole both as a goal and as a form of training. which ultimately all of these activities and results are realized in the form of creativity (Hafizah & Nurhaliza, 2021; Janah, 2020; Purwati et al., 2021; Rewah et al., 2021; Sumarni et al., 2016; Ulfah et al., 2021).

Problem Based Learning Strategy is one of the alternative learning strategies applied in the learning process of Chemistry subjects (Herdianto et al., 2021; Laamena et al., 2021; Sumarni et al., 2016). Problem Based Learning strategies emphasize more on activities centered on problem solving and the development of student learning creativity (Fatimah et al., 2017; Herdianto et al., 2021; Kurniawati, 2018). The application of Problem Based Learning strategies can assist teachers in delivering learning materials by creating conducive learning conditions in fostering student motivation to learn more deeply, will encourage further student curiosity and encourage students to think critically. The development of curiosity, critical thinking, analysis and a sense of satisfaction in student learning may be used in managing the learning process in order to achieve optimal learning outcomes (Chen et al., 2021; Leggett & Harrington, 2021; Parno et al., 2020).

2. Methods

This research is basically a quasi-experimental quantitative research (quasi-experimental design) with a nonequivalent control group design. The type of research analysis design used is 2x2 Factorial Design. The independent variable of the research is Problem Based Learning (PBL) Strategy and there are 2 moderator variables, namely high learning motivation and low learning motivation. The dependent variable is student learning outcomes in PPKn subjects. The relationship between group determination in this study was carried out by cluster sampling where the Problem Based Learning (PBL) Strategy and Expository Strategy were applied to groups of students who had high learning motivation and groups of students who had low learning motivation experienced the same treatment.

In this study, the population taken was students in grades 6A, 6B, 6C and 6 D in the odd semester of the 2021/2022 academic year, a total of 4 study groups or 120 students. The sampling technique that will be used in this research is using probability sampling technique with the type of sampling that is cluster sampling. Because in this study the number of samples was quite large, namely 120, the data analysis technique was not calculated manually but using the help of SPSS (Statistical Package For Social Science) for Windows version 25.0 or better known as SPSS 25.0.

The data analysis technique used Two Way ANOVA, which was used to answer hypotheses 1, 2, and 3 in this study. Before being analyzed using Two-Way ANOVA, the data was first tested for normality, and tested for homogeneity. The level of significance for this study is planned at 5% or the confidence level of 95%. Furthermore, the results of data processing with Two-Way ANOVA are used as a basis for interpreting research results or drawing research conclusions.

3. Results and Discussion

3.1 Results

Overall statistical descriptive data regarding learning methods, learning motivation, and learning outcomes can be seen in the following table.

Table 1. Descriptive Statistics

Descriptive Statistics				
Dependent Variable: HASIL BELAJAR KIMIA				
METODE	MOTIVASI BELAJAR	Mean	Std. Deviation	N
Strategi Problem Based Learning (PBL)	TINGGI	71.1944	6.95627	36
	RENDAH	75.8750	5.84817	24
	Total	73.0667	6.88370	60
Metode Ekspositori	TINGGI	62.3077	1.79743	13
	RENDAH	62.6170	1.87145	47
	Total	62.5500	1.84506	60
Total	TINGGI	68.8367	7.19765	49
	RENDAH	67.0986	7.30979	71
	Total	67.8083	7.28449	120

Statistical data from the results of SPSS 25 calculations between learning methods, learning motivation, and learning outcomes with the number of students as many as 120 students obtained the following results: (1) Chemistry learning outcomes against Problem Based Learning (PBL) strategies obtained an average (mean) of 73.0667 and standard deviation 6.88370. While the Expository Strategy obtained an average (mean) of 62.5500 and a standard deviation of 18.4506, (2) High learning motivation in Problem Based Learning (PBL) Strategy obtained N: 36 and low learning motivation obtained N: 24. While the high learning motivation on the Expository Strategy was obtained N.13 and the low learning motivation was obtained N: 47, and (3) the total results of studying Chemistry with high learning motivation was obtained N: 49 and the low learning motivation was obtained N:71.

The research hypothesis was tested using two-way analysis of variance. The researcher used SPSS 25 to perform the two-way analysis of variance test calculations. In SPSS 25, the hypothesis test was obtained from the results of the Tests of Between-Subjects Effects. From the print out in detail, we can find out the results of hypothesis testing 1, 2 and 3. A summary of the results of these calculations can be presented in the following table.

Table 2. Summary of Calculation Results of Two-Way Analysis of Variance

Tests of Between-Subjects Effects					
Dependent Variable: HASIL BELAJAR KIMIA					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3634.452 ^a	3	1211.484	52.435	.000
Intercept	441296.857	1	441296.857	19099.915	.000
METODE	2925.179	1	2925.179	126.606	.000
MOTIVASI	148.523	1	148.523	6.428	.013
METODE * MOTIVASI	113.977	1	113.977	4.933	.028
Error	2680.140	116	23.105		
Total	558071.000	120			
Corrected Total	6314.592	119			

a. R Squared = .576 (Adjusted R Squared = .565)

Data analysis to test hypotheses 1, 2 and 3 are as follows.

a. Hypothesis Testing 1

The calculation of SPSS 25 regarding the learning method obtained a significance level of 0.000 and the value of 0.000 is less than 0.05, it can be concluded that Ho is rejected and Ha is accepted. Which means that there is a significant effect of using Problem Based Learning (PBL) Strategy and Expository Strategy on Chemistry learning outcomes in Class XI students of SMAN 1 Sangkapura.

b. Hypothesis Testing 2

Calculation of the results of SPSS 25 for learning motivation obtained a significance value of 0.000 and a value of 0.013 is less than 0.05, it can be concluded that Ho is rejected and Ha is accepted. Which means that there is a significant effect on learning outcomes in Chemistry between students who have high learning motivation and students who have low learning motivation in Class XI students of SMAN 1 Sangkapura.

c. Hypothesis Testing 3

The results of the calculation of the interaction between learning methods and learning motivation using SPSS 25 obtained a significance value of 0.027 and the value of 0.028 is less than 0.05, it can be concluded that H_0 is rejected and H_a is accepted. Which means that there is a significant interaction between the use of Problem Based Learning (PBL) Strategy and Expository Strategy with learning motivation on Chemistry learning outcomes in Class XI students of SMAN 1 Sangkapura.

The results of the three hypothesis tests carried out using SPSS 25, then all the hypotheses proposed in this study were all proven, because the results of data analysis showed significant figures.

There is a significant result that there is an interaction between the implementation of Problem Based Learning (PBL) Strategy and Expository Strategy with learning motivation on Chemistry learning outcomes which is also reinforced by Figure 1, as follows:

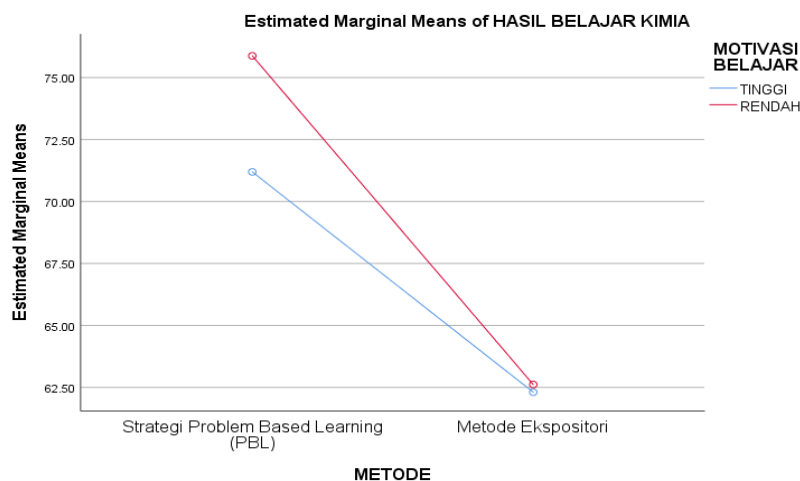


Figure 1. Interaction of PBL Strategy and Learning Motivation

Figure 1. shows that there is a meeting line or intersection of chemistry learning outcomes data between low and high learning motivation in the control group (Expository Strategy) and the experimental group Problem Based Learning Strategy (PBL).

3.2 Discussion

a. Effect of Problem Based Learning (PBL) Strategy and Expository Method on Learning Outcomes.

The learning model is one of the determining elements of whether or not graduates are produced by an education system. It is like the heart of the learning process. Good learning tends to produce graduates with good learning outcomes as well. Vice versa.

The application of Problem Based Learning (PBL) strategies in learning will be able to develop children's thinking skills. Children will be active in using their minds to find various concepts or principles from a material. As stated by (Chan & Ho, 2021; Ibnu, 2020; Rachmawati & Rosy, 2021) that in teaching with Problem Based Learning (PBL) strategies, children's discoveries will use their minds to carry out various concepts or principles.

Problem Based Learning (PBL) strategy is an assimilation of various intellectual skills that can be applied to the learning process. Piaget (Abdulah et al., 2021; Syamina et al., 2021; Wondo & Meke, 2021) suggests that children's learning outcomes will develop if they are communicated clearly and carefully which can be presented in the form of graphs, diagrams, tables, pictures or other sign language. .

The implementation of the Problem Based Learning (PBL) strategy through this research was carried out by providing students with various kinds of skills in learning. The skills provided through the Problem Based Learning (PBL) Strategy include:

1. Observing, namely the skill of collecting data or information through application with the senses based on the activities carried out.
2. Interpreting is the skill to make an analogy of an experiment with an existing concept.
3. Discuss, namely the skills to be able to work in teams to discuss problems.



4. Analyzing, namely the ability to be able to analyze problems based on observing skills that have been carried out.
5. Summarizing the results of the research, namely the skills to draw a conclusion from a series of activities that have been carried out after analysis and discussion.
6. Applying, namely applying learning outcomes in the form of information, conclusions, concepts, laws, theories, and skills.
7. Communicating, namely conveying the acquisition or learning outcomes to others in the form of writing, pictures, motion, action, or appearance

The seven skills are given to students through the following activities: (a) observations or observations made by students, (b) classification activities from observations, (c) taking measurements, (d) communicating the results of observations and measurements, (e)) inference, (f) predicting or estimating, (g) connecting space and time, and (h) through activities that introduce the relationship of numbers,

From the description above, there is a significant difference between students who are taught using Problem Based Learning (PBL) strategies and students who are taught using the Expository Method on learning outcomes.

b. The Effect of Learning Motivation on Students' Chemistry Learning Outcomes

Learning motivation is one of the students' enthusiasm in learning. Learning motivation is an encouragement that emphasizes the results possessed by students. In terms of problem solving approach (Atmaja, 2021; Syarif, 2013; Wahyugi & Fatmariza, 2021).

One dimension of Learning Motivation that specifically needs to be considered in education, especially Chemistry subject is Learning Motivation which is distinguished based on psychological differences, namely: High and low Learning Motivation (Fitriani et al., 2020; Harahap et al., 2021; Winata, 2021).).

In this regard (Baiti et al., 2020; Mudzakir, 2020; Yanti et al., 2021) say that Learning Motivation has been used in large studies, much in demand and controversy. He is also more in demand by researchers in the subject of Chemistry. A similar opinion was expressed by (Choiriyah & Mustaji, 2021; Dewi et al., 2020; Kristianti et al., 2021) that field-independent correlates with spatial ability and ability in Chemistry when IQ is controlled.

The implications of learning motivation based on psychological differences in students in learning according to (Mu'azarotul Husna, 2018; Nurwahid, 2021; Setiaji et al., 2021) are as follows: (a) students who have learning motivation tend to choose individual learning, respond well , and independent. Besides, they can achieve goals with intrinsic motivation. (b) Students who have learning motivation tend to choose to study in groups and interact with the teacher as often as possible, requiring extrinsic reinforcement.

Thus, according to the theory, students who have high learning motivation will succeed in learning compared to students who have low learning motivation, as well as this study, which has shown the same results as the theory. In order for learning to succeed as expected by the teacher, it is necessary to understand the differences in student motivation to help teachers choose learning strategies (Dewanti, 2021; Rahma & Safarati, 2021; Rosyadi, 2019).

c. The Interaction Between Learning Models and Learning Motivation on Student Learning Outcomes

Chemistry learning will be easier to understand when learning is carried out by doing real learning activities so that students will get direct learning experiences. By doing direct activities, students will be given the opportunity to find concepts, facts, or principles through themselves. Such learning will be more meaningful than just memorizing a concept or principle. One of the learning approaches that can be applied to make learning more meaningful and easy to remember by students is the Problem Based Learning (PBL) Strategy. Problem Based Learning (PBL) strategy is a learning approach that allows students to develop various skills (Darmawan, 2021; Diastuti & Sulton, 2021; Faqih, 2021).

The implementation of Problem Based Learning (PBL) Strategy will have an impact on increasing student activity. This is because in this learning activity students are given the freedom to explore their physical and mental abilities to the fullest and are supported by an assessment system that is not only based on test results but also refers to the results of activity data carried out by students during learning (Et al., 2021; Kim , 2021; Leggett & Harrington, 2021).

The learning model approach requires students to play an active role in learning, participate actively in experimenting, be active in discussions, and work together with friends in a group, for example in doing worksheets. By doing LKS systematically according to the instructions, students can make theoretical formulations based on the experiments they carry out. This is because the worksheets have been designed with steps that lead students to find a theory according to the experiment.

Increased activity in the Problem Based Learning (PBL) Strategy will have an impact on increasing student learning outcomes, especially the cognitive domain. By conducting experiments, students will get real experiences. These experiences will be easy to remember and students' memory will be longer than if students only read books or take notes (Hamid et al., 2021; Kurniawati, 2018; Laamena et al., 2021).

The student's memory is very valuable as a student's knowledge capital and will certainly have an impact on improving student learning outcomes. Finally, learning released with Problem Based Learning (PBL) strategies will be able to increase students' activities and learning outcomes in Chemistry (Herdianto et al., 2021; Isabela, Miftahus Surur, 2021; Lestari et al., 2021).

The use of a process approach that can induce activity will be appropriate for students who have learning motivation and will ultimately affect student learning outcomes. This study concludes that there is an interaction between the use of learning models and learning motivation with the chemistry learning outcomes of class XI students at SMAN 1 Sangkapura.

4. Conclusion

From the research that the author conducted on student learning outcomes by using Problem Based Learning (PBL) strategies and by using the Expository Method. Based on the distribution of the questionnaire and analysis of the data obtained, it can be concluded that: (1) There are differences in Problem Based Learning (PBL) Strategy with the Expository Method on student chemistry learning outcomes, (2) there are differences in learning motivation on student chemistry subjects, and (3) There is an interaction of Problem Based Learning (PBL) Strategy with the Expository Method and Learning Motivation on the students' chemistry subject learning outcomes.

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