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Application Of Problem-Based Learning Model To Improve Students' Ability To Develop Business Ethics And True Entrepreneurial Professionalism

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Abstract

This study aims to determine the effect of the Problem-Based Learning (PBL) model on students' ability to find alternative solutions, both through group work and independently. The method used in this study is a quantitative method with an experimental design. The research sample consisted of 99 students enrolled in the 2022 Business and Professional Ethics course at Malang State University, divided into three classes, N, P, and O. The experimental group used the PBL model, while the control group used the conventional learning model. Data were collected through observation and PBL assignments in accordance with the DNA criteria of Malang State University. The analysis technique used statistical tests with the help of SPSS software. The results showed that there was a significant difference between the experimental and control groups in terms of the ability to find alternative solutions. The PBL model proved to be more effective in improving this ability, both in the context of group work and independent learning.

Keywords: PBL, ethics, entrepreneurship

INTRODUCTION

21st century education requires students to have critical thinking and creative skills, and to be able to solve problems independently and collaboratively. Problem Based Learning (PBL) is one learning model that focuses on developing these skills. In this model, students are given real problems that must be analyzed and solved through group discussions and individual reflection.

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However, there has not been much research specifically examining the effect of PBL on the ability to find alternative solutions in the context of group work and independent work simultaneously. Higher education plays a crucial role in producing graduates who not only master theory but are also able to apply their knowledge to solve real-world problems.

However, initial observations show that students often face difficulties in formulating various solutions when faced with a problem. Conventional learning approaches that tend to be teacher-centered are often ineffective in facilitating the development of these skills. Students tend to be passive and lack the motivation to think deeply and seek various perspectives.

The Problem-Based Learning (PBL) model offers a solution by placing problems as the starting point for learning. In PBL, students are presented with problem scenarios relevant to their field of study, then encouraged to seek information, discuss, and develop solutions. This process not only improves conceptual understanding but also trains analytical, synthesis, and evaluation skills. In addition, PBL facilitates group work, where students learn to collaborate, share ideas, and appreciate different points of view, all of which contribute to finding more comprehensive alternative solutions. On the other hand, PBL also requires students to be independent in managing their own learning, seeking resources, and taking the initiative in problem solving.

Previous studies have extensively examined the effectiveness of PBL in improving various student competencies. For example, a study by Haryati (2023) on economics education students showed that the application of PBL significantly improved critical thinking and problem-solving skills. Similarly, research by Saputri and Kurniawan (2024) indicated that group work within the PBL framework can increase students' creativity in finding innovative solutions. However, research that specifically examines the influence of PBL on improving the ability to find alternative solutions simultaneously through group work and independent work, particularly in the context of economics education students at Malang State University, is still limited.

METHODOLOGY

This study used a quantitative approach with a quasi-experimental design. The population in this study were final semester students in the management study program. The research sample consisted of 99 respondents who were students of Economics Education at the Faculty of Economics and Business, State University of Malang, Offering N, O and P. The sampling technique used was purposive sampling. The research instruments included observation sheets, solution-finding ability tests, and student perception questionnaires. The data were analyzed using t-tests and ANCOVA to determine the significance of the differences between the

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experimental groups.

RESULTS AND DISCUSSION

The results show that students who participate in PBL learning have better abilities in finding alternative solutions compared to those who participate in conventional learning. In addition, this ability is significant both when students work in groups and independently. Group discussions help enrich perspectives, while independent work encourages students to think more deeply and reflectively. The results of the analysis using ANCOVA can be seen below

Table 1. Result Analysis Between-Subjects Factors

		Value Label	N
Kode_PBL	1	Class N	45
	2	Class O	26
	3	Class P	28

Sources: processed by researcher, 2025

Descriptive Statistics

Table 2. Descriptive Statistics

Dependent Variable: Learning Outcomes			
Code_PBL	Mean	Std. Deviation	N
Class N	82.71	1.342	45
Class O	81.88	2.286	26
Class P	83.18	1.806	28
Total	82.63	1.810	99

Sources: processed by researcher, 2025

Based on the results of descriptive statistical analysis of the Learning Outcomes variable in three classes that used the Problem Based Learning (PBL) approach, the following information was obtained: Class P had the highest average learning outcome of 83.18 with a standard deviation of 1.806 and a total of 28 students. Class N ranked second with an average learning outcome of 82.71, a standard deviation of 1.342, and a total of 45 students. Meanwhile, Class O showed the lowest average learning outcome of 81.88 with a standard deviation of 2.286 and a total of 26 students. In terms of standard deviation, Class N showed the smallest variation in learning outcomes (SD = 1.342), indicating that the students' scores in this class were more

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homogeneous or tended to be uniform. Conversely, Class O had the highest standard deviation (SD = 2.286), indicating greater variation in scores among students in that class. Overall, the average learning outcome of the three classes was 82.63 with a standard deviation of 1.810 from a total of 99 students. These findings show that, in general, student learning outcomes are in the good category, with relatively small differences in averages between classes. These differences can be an initial indicator of the influence of variations in the application of the PBL model in each class on learning outcomes, which needs to be further analyzed using inferential tests such as ANOVA to determine the significance of the differences.

Table 3. Levene's Test of Equality of Error Variances[a]

Dependent Variable: Learning Outcomes			
F	df1	df2	Sig.
4.257	2	96	.017
Tests the null hypothesis that the error variance of the dependent variable is equal across groups.			
a. Design: Intercept + Covariance_ learning_model _PBL + Code_PBL			

Sources: processed by researcher, 2025

From the results we obtained, the F value is 4.257 with degrees of freedom of 2 and 96, and most importantly, the significance value (or p-value) is 0.017. This test tells us whether the distribution of learning outcome data is “equally distributed” across all the treatment groups we compared. The null hypothesis (which we would expect to be true if there were no difference) is that the variances are equal. However, with a p-value of 0.017, which is less than the significance threshold of 0.05, we are forced to reject the null hypothesis. This means that, statistically, we find strong evidence that the variances in learning outcomes among our groups are not uniform or homogeneous. There is a significant difference in the distribution of learning outcome data between groups.

This finding is important to note, as this violation of the assumption of homogeneity indicates that we need to be cautious when interpreting the results of subsequent inferential statistical tests, such as ANOVA or ANCOVA, which we may perform. We recognize that this condition could affect the power of our tests, and therefore, we may need to consider a more robust approach or appropriate statistical corrections to address this issue of variance heterogeneity so that our conclusions remain accurate and unbiased.

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Table 4. F Test for Heteroskedasticity[a,b,c]			
F	df1	df2	Sig.
.673	1	97	.414
a. Dependent variable: Learning Outcomes			
b. Tests the null hypothesis that the variance of the errors does not depend on the values of the independent variables.			
c. Predicted values from design: Intercept + Covariance__ learning_model _PBL + Code_PBL			

Sources: processed by researcher, 2025

To ensure the validity of the regression model used in this study, a heteroscedasticity test was conducted to determine whether there were differences in the variance of the residuals at various predictor values. This test is important because the basic assumption in regression analysis is that the residuals must have a constant variance (homoscedasticity).

Based on the results of the F test for heteroscedasticity, an F value of 0.673 was obtained with df1 = 1 and df2 = 97, and a significance value (Sig.) of 0.414. This significance value is much greater than the critical limit of 0.05, so it can be concluded that there is insufficient evidence to reject the null hypothesis (H_o) which states that the error variance is constant, or in other words, there is no heteroscedasticity in the regression model used.

Thus, the assumption of homoscedasticity is satisfied, which means that the regression model is suitable for use in drawing conclusions because there is no indication that the error variance depends on the value of the variable.

Table 5. Tests of Between-Subjects Effects						
Dependent Variable: Learning Outcomes						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	64.769[a]	3	21.590	7.999	.000	.202
Intercept	89.963	1	89.963	33.332	.000	.260
Covariance_learning_model _PBL	41.603	1	41.603	15.414	.000	.140
Code_PBL	9.046	2	4.523	1.676	.193	.034
Error	256.402	95	2.699			
Total	676204.000	99				

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Corrected Total	321.172	98				
a. R Squared = .202 (Adjusted R Squared = .176)						

Sources: processed by researcher, 2025

Based on the analysis results, a calculated F value of 7.999 with a significance value of p = 0.000 was obtained in the Corrected Model, indicating that the model as a whole is significant. This means that the combination of independent variables used in this model, namely the PBL learning model and class code, together influence student learning outcomes.

Furthermore, the Covariance_learning_model _PBL variable shows a significant effect on learning outcomes, with an F value of 15.414 and p = 0.000. This means that the problem-based learning approach contributes significantly to improving student learning outcomes. The effect of this variable can also be seen from the Partial Eta Squared value of 0.140, which shows that approximately 14% of the variation in learning outcomes can be explained by the variation in the PBL learning model. This value is in the moderate effect category according to Cohen's interpretation guidelines.

Meanwhile, the Code_PBL variable, which represents the differences between classes (Class N, O, and P), has an F value of 1.676 with a significance of p = 0.193, which means it is not significant. In other words, there are no statistically significant differences in learning outcomes between the three classes. This is also supported by a very small Partial Eta Squared value (0.034), which indicates that only about 3.4% of the variation in learning outcomes is explained by class differences.

Overall, the R Squared value of 0.202 shows that the model can explain about 20.2% of the variation in student learning outcomes, and the Adjusted R Squared value of 0.176 shows that the model is moderately strong after adjusting for the number of predictors and samples. However, there is still 79.8% of other variation influenced by factors outside this model, which provides opportunities for further research.

Thus, these results provide empirical evidence that the application of the Problem-Based Learning (PBL) model has a significant contribution to improving student learning outcomes, regardless of class or group differences. This reinforces the urgency for educators to integrate the PBL approach into the learning process in order to improve students' academic abilities more evenly and deeply.

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Table 6. Parameter Estimates							
Dependent Variable: Learning Outcomes							
Parameter	B	Std. Error	t	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower Bound	Upper Bound	
Intercept	49.472	8.591	5.759	.000	32.417	66.527	.259
Covariance_learning_model _PBL	.406	.103	3.926	.000	.201	.611	.140
[Kode_PBL=1]	-.141	.404	-.349	.728	-.943	.661	.001
[Kode_PBL=2]	-.781	.466	-1.676	.097	-1.707	.144	.029
[Kode_PBL=3]	0[a]	.	.	.	.	.	.
a. This parameter is set to zero because it is redundant.							

Sources: processed by researcher, 2025

The results of the advanced regression analysis show that the PBL learning model variable has a significant contribution to student learning outcomes. The regression coefficient value for Covariance_ learning_model _ PBL is B = 0.406 with a significance value (p) = 0.000. This means that every one-unit increase in the PBL learning model application score will increase student learning outcomes by 0.406 points. This value is also supported by a 95% confidence interval ranging from 0.201 to 0.611, which indicates that the effect is stable and not coincidental. In addition, the Partial Eta Squared value of 0.140 indicates a moderate effect of the learning model on learning outcomes, which supports the effectiveness of the Problem Based Learning approach in this context.

The results of the analysis for the PBL Code variable, which represents the differences between classes (Class N, O, and P), show that the differences between groups do not have a significant effect on learning outcomes. For the PBL Code = 1 category, the regression coefficient is B = -0.141 with a p value of 0.728, which means it is not significant. Similarly, for PBL Code = 2, the value of B = -0.781 and p = 0.097, which is close to significance but still above the threshold of 0.05. The low Partial Eta Squared values in both categories (0.001 and 0.029) indicate that the variation between classes contributes very little to learning outcomes.

Thus, these results reinforce that the effectiveness of learning is determined more by the quality of the implementation of the Problem-Based Learning model than by the differences between classes themselves. This finding is an important note for educators that the main key to improving learning outcomes lies in the pedagogical approach used, not in the structure of

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classes or student groups. The PBL approach has been proven to have a positive influence on improving students' conceptual understanding and critical thinking skills, making it very feasible to be integrated more widely into higher education curricula, especially in Economics Education study programs.

Table 7. Lack of Fit Tests

Dependent Variable: Learning Outcomes

Source	Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Lack of Fit	73.585	17	4.329	1.847	.036	.287
Pure Error	182.817	78	2.344			

Sources: processed by researcher, 2025

Based on the results of the Lack of Fit test, an F value of 1.847 was obtained with a significance (p) of 0.036. Since the significance value is below the critical limit of 0.05, it can be concluded that there are indications that the regression model has shortcomings in perfectly adjusting the data. In other words, the model used does not fully explain the existing data variation, so caution is needed in interpreting the regression results as a whole.

This is reinforced by the Partial Eta Squared value of 0.287, which indicates that approximately 28.7% of the error variation can be explained by the model's mismatch with the data. However, it is important to understand that these results do not necessarily invalidate the model, but signal that there may be other patterns in the data that have not been captured by the independent variables currently used.

This finding is a critical reflection for researchers and education practitioners that although Problem Based Learning has been proven to have a significant effect on student learning outcomes, there are still other factors that may be relevant but have not been included in the model. Therefore, further research is highly recommended to expand the model by considering other supporting variables, such as learning motivation, independent learning strategies, or even academic environmental factors.

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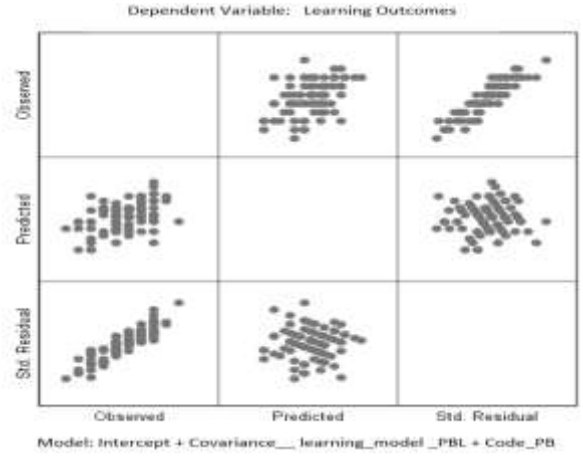


Figure 1. Matrix Scatterplot

Based on the results of the matrix scatterplot, it can be seen that the relationship between the actual observed values and the model predictions shows a tendency to form a fairly consistent diagonal pattern. This indicates that the model has an adequate level of prediction accuracy in explaining the variability of student learning outcomes. However, there is a density of data points in certain areas, which reflects limitations in the range of learning outcomes among respondents.

The distribution of points on the plot between predicted and standardized residuals does not show a specific pattern, which indicates that the assumption of homoscedasticity is fulfilled. In other words, prediction errors are evenly distributed across all predicted values, which is an important requirement for the validity of a regression model. Similarly, in the graph between the observed and standardized residual values, no systematic pattern was found that indicated the existence of autocorrelation or bias, so that the residuals can be considered to be randomly distributed.

These results reinforce that the regression model containing the problem-based learning (PBL) model variable and class classification has met most of the classical assumptions required for reliable analysis interpretation. However, the previous Lack of Fit test showed that there is still some data variation that cannot be fully explained by the model. Thus, this scatterplot visualization supports the finding that although the model performs quite well, there is room for improvement through the addition of other relevant variables or the development of a more complex model.

In general, these results contribute significantly to strengthening the validity of the model, while also providing a basis for researchers to consider other dimensions that may

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influence student learning outcomes, particularly in the application of the Problem-Based Learning approach in higher education.

DISCUSSION

This study proves that the application of the Problem Based Learning (PBL) model can significantly improve students' ability to formulate various alternative solutions, both when working collaboratively and when studying independently. This problem-based learning process does not merely transfer information from lecturers to students, but stimulates students to develop critical and systematic thinking. Students are encouraged to examine real-world problems, discuss them with their peers, and reflect on the results individually, making the learning process more meaningful. These results are in line with research by Haryati (2023), Susanto and Lestari (2021), and Rahmawati and Yuliana (2020), which concluded that PBL can improve students' analytical thinking skills in various disciplines. In addition, Prasetyo and Kusumawati (2024) also show that PBL has a positive influence on learning outcomes through an approach that emphasizes active student participation in problem solving.

The striking difference in results between students who learn through PBL and those who follow conventional learning illustrates a fundamental difference in how students approach problems. The traditional approach, which is dominated by lectures from lecturers, often makes students passive and only receive information without deep thinking. These findings are supported by studies by Ningsih and Rachman (2021) and Jannah and Suryani (2022), which mention that students in conventional learning tend to have difficulty exploring ideas when faced with real-life cases. Similarly, Putra and Handayani (2023) found that learning models with minimal active participation from students have a negative effect on motivation and creativity. Research by Fitri and Nugroho (2020) also reinforces this by stating that PBL is able to create a more dynamic learning space and encourage students to actively think and contribute to the learning process.

One interesting finding from this study is that the difference in scores between classes (N, O, and P) was not statistically significant, even though the average scores between classes varied. This indicates that the main strength of PBL does not lie in the class structure, but rather in how the model is implemented consistently and with quality. Saputri and Kurniawan (2024) explain that learning outcomes in PBL are greatly influenced by the facilitator's ability to construct contextual problems and guide meaningful discussions. Research by Wulandari and Hidayat (2020) also supports that lecturers' competence in facilitating discussions greatly determines the success of PBL. Furthermore, studies by Andriani et al. (2023) and Santosa and

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Widodo (2022) show that the quality of scenarios and group discussion dynamics are important keys that influence the effectiveness of problem-based learning.

These findings are theoretically closely related to constructivism and Vygotsky's social learning theory, which place collaboration and social interaction as key elements in shaping understanding. In this context, PBL provides space for students to actively construct knowledge through experience, group discussions, and independent information seeking. Research by Putri et al. (2022), Kartika and Firmansyah (2021), and Rizqi and Maulida (2023) shows that students who are actively involved in group discussions show significant improvements in critical thinking skills and the ability to convey ideas. In addition, a study by Dewi and Arsyad (2020) also found that PBL can develop soft skills such as effective communication, leadership in groups, and strong time management skills, which are very much needed in the world of work.

Although statistically the PBL model shows a significant influence on student learning outcomes, the Lack of Fit test in this study signals that there are still other variables that have not been included in the model. This means that problem-based learning cannot stand alone, but also needs to be supported by other factors that support the holistic learning process. Lestari (2024) notes that learning motivation, students' perceptions of the role of lecturers, and technological readiness also influence the success of PBL. This is reinforced by the findings of Oktaviani and Hasanah (2023), who argue that the learning environment and academic culture also contribute to the effectiveness of the learning model. In addition, studies by Ahmad and Fauzan (2022) and Wicaksono et al. (2021) also confirm that the role of technology and equitable access to information are determinants of PBL success, especially in the context of online or hybrid learning.

In general, the results of this study are consistent with the trend of findings in recent years, which show that PBL is a learning strategy that can encourage critical thinking, problem-solving, and collaboration among students. However, the successful implementation of PBL is greatly influenced by the readiness of lecturers, the clarity of the problem design, and the readiness of students to be actively involved and take responsibility in the learning process. Research by Ramadhani and Sutrisno (2020), Arifin and Liana (2021), and Hakim and Setyawan (2023) confirms that training lecturers in designing and managing PBL is crucial so that its implementation does not become a mere formality. Meanwhile, a study by Nabila and Kusuma (2024) shows that students who are given systematic guidance and direction in the PBL process tend to be more prepared and motivated in undergoing the learning process. Therefore, higher education institutions need to strengthen systemic support so that PBL can be implemented sustainably and effectively.

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CONCLUSION AND RECOMMENDATIONS

Based on the results of the analysis and discussion, it can be concluded that the Problem-Based Learning (PBL) model has a significant positive impact on improving students' ability to find alternative solutions, both in the context of group work and individually. Students who participate in PBL-based learning are proven to be more capable of critical and creative thinking, as well as being better trained in managing information to formulate solutions to real problems encountered during the learning process.

The application of PBL not only strengthens students' conceptual understanding, but also encourages them to actively discuss, exchange ideas, and reflect on their thoughts independently. This provides a more comprehensive and meaningful learning experience. The results of this study also show that the differences in learning outcomes between classes (N, O, and P) are not significant, indicating that the effectiveness of PBL is determined more by the quality of its implementation than by structural factors in the classroom.

These findings emphasize the importance of the role of lecturers in designing and facilitating problem-based learning so that it can run optimally. Therefore, the PBL approach is very suitable to be integrated more widely into higher education curricula, especially in courses that require critical thinking and problem-solving skills. In the future, it is important for educational institutions to continue to support the development of the capacity of lecturers and students in implementing PBL sustainably.

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