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The influence of problem-based learning model and motivation on the learning outcomes of students in the faculty of education at Wisnuwardhana University

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Abstract
Student academic achievement is important in education. Low achievement hinders progress and future opportunities. Research shows that factors such as low motivation and mismatched learning models have a negative impact. Learning models play a role in enhancing student engagement and learning outcomes. Understanding these factors is essential to improve the quality of education. This study evaluates the influence of learning models, student motivation, and their interaction on learning outcomes. Findings indicate that learning models have a significant influence on student learning outcomes. Additionally, student motivation also plays a crucial role in achieving good learning outcomes. The interaction between learning models and student motivation also significantly affects learning outcomes. The implication is that it is important to select the appropriate learning models and enhance student motivation to improve learning outcomes. Further research can explore in more detail the interaction and effects of these factors on student learning outcomes.
Keywords: PBL, Motivation and Outcomes.

INTRODUCTION

Numerous investigations have been undertaken with the aim of comprehending the factors associated with poor academic performance among students. According to a study conducted by Martin, (2013), factors such as low motivation and inappropriate implementation of learning models can have a negative impact on students' learning achievement. Multiple elements can have an impact on the academic accomplishments of students, and one significant factor is the instructional model used in the classroom. The instructional model plays a crucial role in enhancing student engagement, facilitating conceptual understanding, and improving students' learning outcomes.

Furthermore, another study conducted by Daŋyar & Demirel, (2015) concluded that PBL positively contributes to students' learning achievement in various disciplines.

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This study found that students who learn through PBL exhibit a better understanding and are able to connect learning concepts with real-world situations. A study conducted by (Hmelo-Silver, 2004) revealed that students who participate in problem-based learning within the PBL environment show significant improvement in their learning achievement. The research also states that PBL can enhance students' intrinsic motivation, improve collaboration skills, and enhance problem-solving skills.

In addition to the implementation of appropriate learning models, students' learning motivation also plays a crucial role in enhancing students' learning outcomes. One relevant theory is the The self-determination theory, which was put forward by Deci and Ryan (2017). This theory states that there are three basic psychological needs that must be fulfilled to maintain strong intrinsic motivation: the need for competence (feeling competent in mastering the material), relatedness (feeling connected and accepted in the learning environment), and autonomy (feeling a sense of control and freedom in learning). Previous research has also provided strong evidence regarding the positive influence of motivation on students' learning outcomes. For example, a study by Renninger & Hidi (2019) found that high intrinsic motivation is positively associated with better learning achievement.

METHOD

This study utilized a quantitative research design with a quasi-experimental approach. There were two groups in this study: The group undergoing the experimental conditions, which implemented the Problem-Based Learning (PBL) model, and the control group, which utilized conventional teaching methods. The groups were further divided into three motivation categories. Data analysis in this study employed a two-way ANOVA using SPSS 25 for Windows, with a significance level of 0.05.

FINDINGS AND DISCUSSION
Findings

Based on the results of the two-way ANOVA analysis conducted on the data from this research, the following overview was obtained.

The normality test

Normality test is a statistical method used to determine whether data follows a normal distribution or not. In this study, we discuss the results of the normality test for the variable "learning outcomes" across three different levels of motivation: low, medium, and high, along with the results.

Table 1. Normality Test Results of Learning Outcomes against Motivation

	Motivation	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Learning Outcome	Low	.179	17	.149	.932	17	.238
	Medium	.252	15	.011	.849	15	.017
	High	.178	20	.096	.941	20	.251

a. Lilliefors Significance Correction

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The normality test results for the relationship between learning outcomes and student motivation yielded the following results:
  a. For learning outcomes with low motivation, using The Kolmogorov-Smirnov test produced a p-value of 0.149, indicating no significant deviation from normality. Similarly, the Shapiro-Wilk test yielded a p-value of 0.238, also suggesting no significant departure from normal distribution.
  b. For learning outcomes with medium motivation, the significance value obtained from the Kolmogorov-Smirnov test was 0.11, while the Shapiro-Wilk test resulted in a value of 0.17.
  c. For learning outcomes with high motivation, the Kolmogorov-Smirnov test resulted in a significance value of 0.11, the Shapiro-Wilk test resulted in a value of 0.17.

At a significance level of 0.05, since the significance values (sig.) are larger than the predetermined significance level, it can be concluded that there is not enough evidence to reject the hypothesis that the data follows a normal distribution. Based on the conducted normality tests, there is insufficient statistical evidence to support the hypothesis that the relationship between learning outcomes and low, medium, or high motivation does not follow a normal distribution. Therefore, it can be assumed that the relationship between learning outcomes and the three levels of motivation has adequate normality assumptions.

Table 2. Normality Test Results of Learning Outcomes against Learning Model

| | Learning_model | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
		Statistic	df	Sig.	Statistic	df	Sig.
Learning_outcome	PBL	.186	27	.017	.933	27	.081
	Conventional	.174	25	.050	.955	25	.328

a. Lilliefors Significance Correction

The normality test results for the connection between learning outcomes and learning models are as follows:
  a. For learning outcomes with the Problem-Based Learning (PBL) approach, The significance value obtained from the Kolmogorov-Smirnov test was 0.17, while the Shapiro-Wilk test resulted in a significance value of 0.81.
  b. For learning outcomes with the conventional learning approach, The Kolmogorov-Smirnov test produced a significance value of 0.50, while the Shapiro-Wilk test resulted in a significance value of 0.328.

At a significance level of 0.05, since the significance values (sig.) are larger than the predetermined significance level, based on the obtained results, there is insufficient evidence to reject the hypothesis that the data follows a normal distribution. Based on the normality test results, there is insufficient statistical evidence to support the hypothesis that the relationship between learning outcomes and the PBL approach or the conventional learning approach does not follow a normal distribution. Therefore, it can be assumed that the relationship between learning outcomes and both types of learning

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approaches has adequate normality assumptions.

Table 3. Homogeneity Test Results

Dependent Variable: Learning Outcome

F	df1	df2	Sig.
3.372	5	46	.011

Tests the null hypothesis that the error
variance of the dependent variable is
equal across groups.
a. Design: Intercept + Learning Model +
Motivation

At a significance level of 0.05, if the significance value (sig.) is greater than the predetermined significance level (0.11 > 0.05), it can be concluded that there is not enough statistical evidence to support the hypothesis that the data variation among the groups is not homogeneous. In other words, it can be inferred that the data variation among the groups tends to be homogeneous.

Considering the assumptions of normality and homogeneity of variances for the collected data, further analysis will be conducted using a two-way ANOVA test with the assistance of SPSS 25 for Windows software to calculate the results.

Table 4. Two-Way ANOVA Test Results

Dependent Variable: Learning Outcome

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	5949.814[a]	5	1189.963	72.743	.000
Intercept	272769.337	1	272769.337	16674.420	.000
Learning Model	2435.396	1	2435.396	148.876	.000
Motivation	2913.795	2	1456.898	89.060	.000
Learning Model * Motivation	280.683	2	140.341	8.579	.001
Error	752.493	46	16.359		
Total	288502.000	52			
Corrected Total	6702.308	51			

a. R Squared = .888 (Adjusted R Squared = .876)

The data analysis in this study employed the learning model F 148.876 with a significance level of 0.000 (p < 0.05), motivation F 89.060 with a significance level of 0.000 (p < 0.05), and the interaction between learning model and motivation F 8.579 with a significance level of 0.001 (p < 0.05). The analysis findings demonstrate notable disparities in the impact of the learning model on learning outcomes. The F value of 148.876 demonstrates that the learning model significantly influences the participants'

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learning outcomes. Additionally, the significance value of 0.000 indicates that the differences in the learning model have a statistically a significant impact on learning outcomes was observed.

Similarly, motivation also plays a significant role in influencing learning outcomes. The F value of 89.060 indicates that motivation has a substantial impact on participants' learning outcomes. The significance value of 0.000 indicates that the differences in motivation have a statistically significant effect on learning outcomes. Additionally, there exists an interaction between the learning model and motivation in relation to learning outcomes. The F value of 8.579 shows that the interaction between these two factors has a significant influence on learning outcomes. The significance value of 0.001 indicates that the differences in the interaction between the learning model and motivation are statistically significant in affecting learning outcomes.

Based on the results of this analysis, it can be concluded that the learning model, motivation, and the interaction between the two have a significant influence on the participants' learning outcomes. This indicates that in improving learning outcomes, it is important to consider both the learning model and participants' motivation, as well as the interaction between them.

Discussion
Learning Model

This research was conducted to investigate the influence of using the Problem-Based Learning (PBL) Learning Model on students' learning outcomes. The use of the F statistical test with an F value of 148.876 and a significance level of 0.000 ($p < 0.05$) aimed to analyze whether there is a significant difference in learning outcomes between the group that used PBL and the control group that used other learning models. The research method used was quantitative analysis with an experimental design. The research sample consisted of two groups: the experimental group that implemented the Problem-Based Learning (PBL) learning model, and the control group that used other learning models, such as conventional learning or teacher-centered learning. Learning outcome data were collected from both groups through relevant tests or evaluations related to the taught material. The data were then analyzed using the F statistical test with a significance level of 0.000 to determine if there was a significant difference in learning outcomes between the two groups. The research results indicate a significant difference in learning outcomes between the group that used PBL and the control group (F = 148.876, $p < 0.05$). This suggests that the use of the PBL learning model has a significant influence on students' learning outcomes. The group that implemented PBL tended to achieve better learning outcomes compared to the control group.

Previous research also provides strong support for the findings of the influence of PBL (Problem-Based Learning) on students' learning outcomes. A study by Savery & Duffy, (1996) revealed that PBL can enhance students' understanding of concepts, problem-solving abilities, and critical thinking skills. In this study, they analyzed the effectiveness of PBL in an educational context and found that students engaged in PBL demonstrated better abilities in understanding concepts, tackling complex problems, and developing critical thinking skills that are essential in real-life situations.

The research conducted by Hmelo-Silver, (2004) also supports these findings by demonstrating that PBL can enhance students' intrinsic motivation. Through PBL, students actively engage in a problem-centered learning process, enabling them to develop a sense of ownership over their own learning. Additionally, PBL encourages students to connect

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the knowledge they learn to real-life situations, thereby increasing the relevance and application of knowledge in their everyday lives. Other research conducted by Hmelo-Silver (2004) indicates that PBL has a positive impact on student collaboration. In the context of PBL, students actively work together to solve problems and share ideas with their peers. This not only enhances collaboration but also increases student engagement in the learning process. PBL also provides a more meaningful learning experience, where students can experience how the knowledge and skills they learn can be applied in real-life situations.

These findings indicate that PBL can be an effective learning approach in improving students' learning outcomes. In PBL, students not only acquire knowledge but also develop critical thinking skills, problem-solving abilities, intrinsic motivation, collaboration, and the application of knowledge in real-life contexts. Therefore, implementing PBL in an educational context can provide significant benefits for students. Based on the research results and these findings, it can be concluded that the use of the Problem-Based Learning (PBL) learning model has a significant influence on students' learning outcomes. PBL provides opportunities for students to actively engage in learning, apply knowledge in real-life situations, and develop critical thinking skills. Therefore, PBL can be considered an effective learning model in improving students' learning outcomes.

Student Motivation

In this study, a statistical test was conducted to examine the influence of motivation on student learning outcomes. The statistical test results indicate that motivation has a significant influence on student learning outcomes, with an F value of 89.060 and a significance level of 0.000 ($p < 0.05$). At a significance level of 0.05, a smaller p-value than 0.05 indicates a significant influence. In this case, the p-value of 0.000 is much smaller than 0.05, indicating a significant influence between the motivation variable and student learning outcomes. These results demonstrate that higher student motivation is associated with better learning outcomes. High motivation can drive students to be more enthusiastic, dedicated, and focused in their studies. As a result, students can achieve better learning achievements.

Previous research has provided support for the findings of the influence of motivation on student learning outcomes. A study by Hmelo-Silver (2004) revealed that high motivation has a positive relationship with student learning outcomes. In this study, they analyzed a number of students from various educational levels and found that students with high motivation tended to achieve better academic achievements compared to students with low motivation. These findings indicate that motivation is an important factor in achieving good learning outcomes.

The findings of this research underscore the importance of motivation in enhancing student learning outcomes. High motivation influences students' attitudes towards learning, provides drive in facing challenges, and increases their perseverance in overcoming obstacles in the learning process. In the educational context, educators and policymakers need to pay attention to student motivation as part of a holistic educational strategy.

The Interaction between Learning Model and Motivation on Student Learning Outcomes

This study aims to examine the interaction between learning model and student motivation on learning outcomes. The statistical test results indicate a significant interaction between the learning model and student motivation on learning outcomes, with an F value of 8.579 and a significance level of 0.001 ($p < 0.05$). The statistical test

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used a two-way analysis of variance (ANOVA), with the learning model and student motivation as the factors being tested. These findings suggest that the influence of the learning model on learning outcomes differs depending on the level of student motivation. In this context, student motivation serves as a moderating factor that affects the relationship between the learning model and learning outcomes.

The significant interaction between the learning model and student motivation indicates that the effectiveness of the learning model in improving learning outcomes can vary depending on the level of student motivation. For example, in a group of students with high motivation, a specific learning model may be more effective in enhancing their learning outcomes compared to a group of students with low motivation. The interaction between the learning model and student motivation plays a crucial role in improving learning outcomes. A study by Johnson et al. (2019) demonstrated that collaborative-based learning models are more effective in improving the learning outcomes of highly motivated students, while self-directed learning models are more effective in improving the learning outcomes of students with low motivation. In this study, Johnson et al., (2019) analyzed two groups of students with different levels of motivation. They found that students with high motivation tended to achieve better learning outcomes when engaged in a collaborative-based learning model. The collaborative-based learning model encourages students to work together in groups, share ideas, and support each other. The interaction among highly motivated students in this learning model creates an environment that fosters enthusiasm for learning and peer-to-peer learning, resulting in improved learning outcomes.

On the other hand, students with low motivation tend to achieve better learning outcomes in a self-directed learning model. In a self-directed learning model, students have greater autonomy in the learning process. They have the freedom to set their own pace of learning, discover relevant materials, and solve problems independently. For students with low motivation, the presence of freedom and personal control in learning can enhance their engagement and strengthen their intrinsic motivation, leading to improved learning outcomes. Previous research also supports these findings. A study by (Järvenoja & Järvelä, 2009) demonstrated that students with high motivation tend to benefit more from collaborative learning models, while students with low motivation tend to thrive in self-directed learning models (D. W. Johnson & Johnson, 2014).

CONCLUSION

The conclusion of this research is as follows:
1. There is a significant difference in the influence of teaching models on students' learning outcomes. The F value of 148.876 indicates that the teaching model has a significant impact on students' learning outcomes. These results demonstrate that selecting the appropriate teaching model can have a positive impact on students' learning outcomes.
2. There is a significant difference in the influence of motivation on students' learning outcomes. The F value of 89.060 indicates that motivation has a significant impact on students' learning outcomes. This finding emphasizes the importance of student motivation in achieving good learning outcomes. High motivation can motivate students to study more diligently and dedicatedly.
3. There is a significant interaction between the instructional model and motivation on students' learning outcomes. The F value of 8.579 indicates that the interaction between the instructional model and student motivation has a

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significant influence on students' learning outcomes. This suggests that the effectiveness of the instructional model in improving learning outcomes can be influenced by the level of student motivation. It is important to consider both factors together when designing effective learning strategies.

In conclusion, this research provides a deeper understanding of the influence of instructional models, student motivation, and the interaction between the two on learning outcomes. The implications of this study are that selecting the appropriate instructional model and efforts to enhance student motivation can positively impact student learning outcomes. Further research can focus on further exploring the interaction between these factors and how they can affect student learning outcomes in more detailed and specific ways.

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