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The Influence of the Problem Based Learning Model on Student Activity and Learning Outcomes in Business Economics Elements

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Keywords: Problem Based Learning;
learning outcomes; student activity;
vocational education

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Abstract

The low level of student engagement and achievement in vocational economics learning necessitates the application of innovative instructional models. This study aims to examine the effect of the Problem Based Learning (PBL) model on student learning activity and outcomes in the Economic Business subject. A quasi-experimental design with a pretest-posttest control group was employed. The participants were 61 tenth-grade students from SMK Negeri 1 Painan, selected through purposive sampling. Data were collected using validated instruments: learning outcome tests and observation sheets. Descriptive and inferential statistics, including independent samples t-tests, were used for data analysis. Results show that the experimental group, which received PBL treatment, had significantly higher posttest scores ($M = 89.90$) and N-Gain (0.72) compared to the control group ($M = 76.68$; N-Gain = 0.35). Student activity in the experimental group also increased steadily across sessions. Statistical tests confirmed that the differences in both outcomes and activity were significant ($p < 0.05$). These findings support the effectiveness of PBL in promoting active learning and improving student achievement in vocational education.

INTRODUCTION

In the current landscape of vocational education, there is a growing demand for teaching strategies that can not only improve students' academic performance but also develop their practical problem-solving abilities (Aslam et al., 2021; Rafiq et al., 2023). Traditional lecture-based learning often fails to stimulate students' cognitive engagement or foster independent thinking, especially in complex subjects such as economic business. As vocational students are being prepared to meet the

challenges of real-world industry settings, there is a pressing need for pedagogical innovations that emphasize both conceptual understanding and skill application (Yanto et al., 2022).

Problem Based Learning (PBL) is one such instructional model that has gained international recognition for its ability to engage students in real-life problem-solving activities. Rooted in constructivist learning theory, PBL encourages students to become active participants in their learning process by exploring authentic problems, collaborating in teams, and generating solutions. Studies such as Barrows and Tamblyn (1980), Ghani et al., (2021); Nurtanto et al., (2020) have shown that PBL enhances higher-order thinking, communication, and self-directed learning skills that are especially valuable in vocational education.

In the Indonesian context, however, research on PBL has predominantly focused on general education settings such as mathematics, science, and language learning (Mutohhari et al., 2021; Numonjonov, 2020). Limited empirical evidence exists concerning the implementation of PBL in vocational subjects, particularly in the domain of economic business within secondary-level vocational schools (SMK). This gap restricts educators' ability to adopt proven models with confidence, especially when dealing with specialized competencies required in the workforce.

While several studies have confirmed the positive impact of PBL on academic achievement, few have simultaneously investigated its influence on student learning activity as a behavioral outcome. In vocational education, student engagement is just as crucial as cognitive achievement because it reflects students' readiness to participate in collaborative and practical work environments. Therefore, a more holistic understanding of how PBL affects both cognitive and behavioral learning outcomes is warranted (Dahalan et al., 2024; Nurkhin & Pramusinto, 2020).

The current study seeks to address these gaps by implementing and evaluating the PBL model in an SMK setting with a focus on the Economic Business subject. This field-specific approach allows for more contextualized application of the PBL model, making the results more relevant and generalizable to vocational training programs. It also contributes to the body of knowledge regarding instructional effectiveness in applied learning contexts (Rabiman et al., 2020; Smith et al., 2023).

The novelty of this research lies in its dual focus on both student learning outcomes and learning activity, analyzed through a rigorous quasi-experimental design. By comparing experimental and control groups with matched characteristics, the study is able to offer a valid measurement of the impact of PBL on both academic performance and student engagement. This dual analysis provides a more comprehensive evaluation of the learning process and outcomes than previous studies.

Moreover, the study uses robust statistical techniques including pretest-posttest comparisons, normalized gain analysis, and independent t-tests to evaluate the effectiveness of the PBL model. These methods provide empirical evidence of not only statistical significance but also practical relevance in the context of classroom learning (Mann et al., 2021). The use of validated instruments further ensures the reliability and validity of the findings.

In summary, this research aims to investigate the effect of Problem Based Learning on both student achievement and learning activity in a vocational education setting. By addressing existing research gaps and offering new insights into the application of PBL in economic business education, the study contributes to the advancement of teaching practices aligned with 21st-century vocational learning goals.

METHODS

This study employed a quantitative approach using a quasi-experimental design, specifically a *Pretest-Posttest Control Group Design*. It aimed to investigate the effect of the Problem Based Learning (PBL) model on students' learning activity and achievement in economic business subjects. The sample consisted of 61 Grade X students from SMK Negeri 1 Painan, divided into two groups: one experimental group using the PBL model and one control group using conventional learning. The sample selection was done purposively based on similar average academic performance, class size, and subject matter, while group assignment was randomized.

Three research instruments were used: a learning outcome test, an observation sheet for student activity, and a PBL-based teaching module. The test comprised 20 multiple-choice items and was validated using Pearson correlation and KR-20, yielding high validity and excellent reliability (KR-20 = 0.967). Observation sheets were tailored for each teaching method, assessing five key indicators of student activity using a Likert scale. The teaching module integrated PBL principles aligned with the vocational curriculum and was validated by an expert teacher.

All instruments underwent a validation process to ensure relevance, clarity, and content alignment. The test items were found to be valid, moderately difficult, and discriminative, with most items falling within good to excellent quality. Observational indicators were also deemed appropriate for assessing student engagement. The instruments were used to collect both pretest and posttest data, along with observational data over three classroom sessions.

Data were analyzed using descriptive and inferential statistics. Descriptive statistics included mean, median, mode, standard deviation, variance, and normalized gain (N-Gain). Inferential analysis involved tests for normality (Lilliefors), homogeneity (F-test), and hypothesis testing using independent sample t-tests. These analyses were used to determine whether the PBL model had a statistically significant effect on students' learning outcomes and classroom engagement, with significance set at $\alpha = 0.05$.

RESULT AND DISCUSSION

This section presents the findings obtained from statistical analyses of students' learning outcomes and learning activities in both the experimental and control classes.

Table 1. Comparison of Pretest, Posttest, and N-Gain Between Groups

Group	Pretest Mean	Posttest Mean	N-Gain
Experimental	63.33	89.90	0.72
Control	63.58	76.68	0.35

Table 1 reveals a significant difference in learning performance between the experimental and control groups. Although both groups had similar initial abilities (Pretest: 63.33 vs. 63.58), the experimental group, which used the Problem Based Learning (PBL) model, showed a higher posttest score (89.90) compared to the control group (76.68). The N-Gain score of 0.72 (high category) in the experimental group indicates a substantial improvement, whereas the control group only reached 0.35 (moderate category), indicating that conventional teaching methods were less effective.

Table 2. Mean Scores of Student Learning Activity (Experimental Group)

Meeting	Mean Activity Score
Meeting 1	9.94
Meeting 2	12.84
Meeting 3	13.94

Table 2 shows the trend of student engagement throughout three PBL-based sessions. There was a continuous increase in activity scores, reflecting improved student participation and involvement. From an initial score of 9.94 in Meeting 1, students' activity rose to 13.94 by Meeting 3. This indicates that the PBL approach successfully motivated students to engage more actively, especially in collaborative problem-solving, discussions, and presentations.

Table 3. Independent Samples t-Test Results

Variable	t-Value	p-Value	Conclusion
Learning Activity	12.54	0.00	Significant difference ($p < 0.05$)
Learning Outcomes	18.11	0.00	Significant difference ($p < 0.05$)

Table 3 presents the results of independent t-tests comparing the experimental and control groups. Both tests show statistically significant differences in learning activity and learning outcomes. The high t-values and p-values below 0.05 confirm that the implementation of the PBL model had a significant positive effect on student learning outcomes and engagement. These findings validate the study's hypothesis and demonstrate the pedagogical advantage of PBL in vocational education settings.

Discussion

The findings of this study demonstrate a significant improvement in both learning outcomes and learning activity among students who were taught using the Problem Based Learning (PBL) model. The experimental group showed a notable increase in posttest scores and N-Gain values compared to the control group. This supports the assertion that PBL is a more effective instructional model for enhancing cognitive outcomes in vocational school settings, particularly in the subject of economic business. The high N-Gain value (0.72) in the experimental group signifies a high level of conceptual understanding gained through active engagement and problem-solving practices (Burgess et al., 2020; Zhao et al., 2020).

The improvement in learning activity among students in the experimental group further highlights the impact of the PBL model. Activity scores increased consistently across three sessions, indicating growing involvement in collaborative learning processes. Students were observed to participate more actively in group discussions, problem analysis, and solution presentations. This aligns with constructivist learning theory, which emphasizes student-centered approaches that promote autonomy, inquiry, and interaction, all of which are fostered through PBL (Saldo & Walag, 2020).

The results also confirm previous studies which have found that PBL enhances not only content mastery but also essential soft skills such as communication, critical thinking, and teamwork. Compared to the conventional method applied in the control group, which relied primarily on lectures and individual exercises, the PBL model provided a dynamic environment for learners to explore real-world problems. The superior performance of the experimental group supports the view that contextual and interactive learning environments are more effective in

fostering deeper learning, especially in vocational education where practical skills are emphasized (Amerstorfer & Freiin von Münster-Kistner, 2021; Chen et al., 2021).

The statistical analysis confirmed the significance of these findings. The independent t-test results for both learning outcomes and student activity revealed p-values below 0.05, confirming that the observed differences were not due to chance. This empirical evidence strengthens the theoretical rationale for using PBL in classroom instruction and affirms its relevance for 21st-century education, where critical thinking and problem-solving are essential competencies.

the implementation of the PBL model significantly influenced students' academic performance and engagement (Distyasa et al., 2021; Hursen, 2021). This model not only improved students' conceptual understanding but also motivated them to become active participants in their own learning. These findings advocate for broader application of PBL in vocational and technical education curricula, particularly for subjects requiring analytical and collaborative skills. Future research could explore the long-term retention effects of PBL and its adaptability across diverse educational contexts and student profiles.

CONCLUSIONS

Based on the findings of this study, it can be concluded that the implementation of the Problem Based Learning (PBL) model has a significant and positive effect on both student learning outcomes and learning activity in vocational education, specifically in the Economic Business subject. The experimental group demonstrated higher posttest scores and greater engagement compared to the control group, indicating that PBL not only enhances students' conceptual understanding but also promotes active participation in the learning process. These results affirm the effectiveness of PBL as an innovative instructional approach capable of addressing the demands of 21st-century vocational education.

CONFLICTS OF INTEREST STATEMENT

Regarding this study, the author declares that there is no conflict of interest.

AUTHOR CONTRIBUTIONS

Study concept and design: Mila Ladia Facma. Acquisition of data: Zuwirna Zuwirna. Analysis and interpretation of data: Ramalis Hakim. Drafting the manuscript: Mila Ladia Facma. Critical revision of the manuscript for important intellectual content: Rayendra Rayendra. Statistical analysis: Mila Ladia Facma.

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