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The Effect of the Educaplay Assisted Learning Problem Based Learning Model on Students' Mathematical Problem-Solving Ability in SPLDV Class X Material of SMA Negeri 1 Medan

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Abstract
This study aims to determine the effect of the application of the Problem Based Learning (PBL) model assisted by Educaplay media on students' mathematical problem-solving ability in the Two-Variable Linear Equation System (SPLDV) material. This study uses a quantitative approach with the experimental method and the One Group Pretest-Posttest design. The subject of the study is 30 students. The instrument used is a mathematical problem-solving ability test in the form of description questions. The data were analyzed using the Shapiro-Wilk normality test, the paired sample t-test, the Wilcoxon test, and the N-Gain analysis. The results showed that there was an increase in the average score from the pretest of 41.7 to 67.1 in the posttest. The results of the hypothesis test showed a significant difference between the pretest and the posttest ($p < 0.001$) with an effect size value of 4.55 which is in the very large category. Thus, it can be concluded that the Educaplay-assisted PBL model has a significant and effective effect in improving students' mathematical problem-solving skills.
Keywords: Problem Based Learning, Educaplay, mathematical problem solving, SPLDV

INTRODUCTION

Mathematics is one of the subjects that has an important role in developing logical, critical, systematic, and creative thinking skills in students. In addition, mathematics learning also aims to equip students with the ability to solve various problems related to daily life. Mathematical problem-solving skills are one of the main competencies that must be possessed by students in facing the challenges of the 21st century which require higher-order thinking skills (Hanifah et al., 2024). This ability is not only related to the ability to calculate, but also involves the ability to understand problems, design solution strategies, implement plans, and evaluate the results obtained. Therefore, this ability is an important indicator in the success of mathematics learning. However, in reality, students' mathematical problem-solving skills are still relatively low. Various studies show that students have difficulty understanding story-form problems, determining mathematical models, and solving problems appropriately. Research by (Wahyuni et al., 2024) shows that most students have not been able to solve non-routine problems optimally. This is strengthened by research (Zahara et al., 2024) which states that low problem-solving skills are caused by a lack of active involvement of students in the learning process. In addition, teacher-centered learning causes students to tend to be passive and lack a deep understanding of concepts.

These problems are increasingly seen in the material on the Two-Variable Linear Equation System (SPLDV). This material requires an understanding of concepts and the ability to apply them in contextual problems. However, many students have difficulty converting story problems into mathematical models and determining the right solution methods, such as

substitution, elimination, and graph methods. Research (Ammelia et al., 2025) shows that this difficulty is caused by low understanding of concepts and the lack of effective learning used. To overcome these problems, a learning model is needed that can increase student activity while practicing mathematical problem-solving skills. One model that can be used is Problem Based Learning (PBL). This model emphasizes real problem-based learning as the starting point of learning so that students are encouraged to think critically, work together, and find solutions independently.

In addition to the learning model, the use of interactive learning media is also important to support the learning process. One of the media that can be used is Educaplay, which is a game-based learning platform that provides various activities such as quizzes, matching, and interactive puzzles. The use of Educaplay can help increase student involvement, provide interesting practice questions, and support the active problem-solving process in SPLDV learning. Thus, the low mathematical problem-solving ability of students and the lack of optimal learning models and media are the basis for this research. Therefore, the researcher is interested in examining the influence of the Problem Based Learning model on students' mathematical problem-solving ability in the Two-Variable Linear Equation System (SPLDV) material with the support of interactive learning media.

RESEARCH METHODS

This study uses a quantitative approach with the aim of determining the effect of the application of *the Problem Based Learning* (PBL) learning model assisted by Educaplay media on students' mathematical problem-solving skills. The method used is an experiment with *a pre-experimental* design, namely *One Group Pretest-Posttest Design*, where research is conducted on one group without a comparison group. The subject of the study is a grade X student at SMA Negeri 1 Tanjung Morawa who is studying the Two-Variable Linear Equation System (SPLDV) material. The sample selection was carried out using *a purposive sampling technique* by considering the suitability of the material, the availability of time, and the readiness of students to participate in learning. The research procedure begins with the provision *of a pretest* to determine the student's initial ability, then continues with the provision of treatment in the form of learning using *the Problem Based Learning* (PBL) model combined with Educaplay media as a means of quizzes or interactive games to help students understand and solve problems. After the treatment is given, students then do a *posttest* to find out their mathematical problem-solving skills after learning. Comparison of *pretest* and *posttest results* is used to see the improvement of students' abilities.

The variables in this study consist of independent variables, namely the *Problem Based Learning* (PBL) learning model assisted by Educaplay, and bound variables, namely students' mathematical problem-solving skills. The research instrument used is a mathematical problem-solving ability test in the form of an essay question which is compiled based on indicators of problem-solving ability, namely understanding problems, planning solutions, solving problems, and re-examining results. To maintain the objectivity of the assessment, an assessment rubric that is in accordance with these indicators is used. Data collection techniques are carried out through tests and documentation. The test consists of *a pretest* and *posttest*, while documentation is used as supporting data which includes student data and the learning activity process. Data analysis is carried out through a normality test using Shapiro-Wilk and a hypothesis test using *a paired sample t-test* to determine the difference in results before and after treatment. The entire data analysis process is carried out with the help of Jamovi software.

RESEARCH RESULTS AND DISCUSSION

The results of the descriptive analysis showed that the average score of the posttest was higher than the pretest, which indicated an improvement in students' critical thinking skills after the application of *the Problem Based Learning* (PBL) model assisted by the Educaplay application. A summary of descriptive statistics is presented in Table 1.

Table 1. Descriptive Statistics

Variable	N	Red	SD	Min	Max
Pretest	30	41,7	8,18	28	55
Posttest	30	67,1	10,9	48	89
Differences	30	25,4	5,58	20	35

To test the normality of the data, Shapito-Wilk was used. The results of the normality test are presented in Table 2.

Table 2. Normality Test

	Pretest	Posttest	Pre and Post Difference
N	30	30	30
Missing	0	0	0
Red	41.7	67.1	25.4
Median	41.5	65.0	22.0
Standard deviation	8.18	10.9	5.58
Minimum	28	48	20
Maximum	55	89	35
Shapiro-Wilk W	0.938	0.961	0.767
Shapiro-Wilk p	.082	.320	<.001

The normality test of the difference data using Shapiro-Wilk showed that the data was not normally distributed ($p < 0.001$). Therefore, in addition to using the parametric *paired samples t-test*, this study also used the non-parametric Wilcoxon Signed-Rank Test as a supporting test. To test the research hypothesis, the *paired samples t-test was used*. The test results are presented in Table 3.

Table 3. Uji Paired T-Test

Paired Samples T-Test							
			Statistic	df	p		Effect Size
Pretest	Posttest	Student's t	-24.9	29.0	<.001	Cohen's d	-4.55
		Wilcoxon W	0.00		<.001	Rank biserial correlation	-1.00
Note. H_a $\mu_{Measure\ 1 - Measure\ 2} < 0$							

The results of *the paired samples t-test* showed that there was a significant difference between the pretest and posttest values ($t = -24.9$; $p < 0.001$). This result was reinforced by the Wilcoxon test which also showed significant results ($p < 0.001$). Thus, it can be concluded that the application of the application-assisted PBL model has a significant influence on students' critical thinking skills. In addition, the *effect size* value (Cohen's d) of 4.55 indicates that the influence provided by the treatment is in the very large category.

Discussion

The results of the study show that the application of the Problem Based Learning (PBL) model assisted by the Educaplay application is effective in improving students' critical thinking skills. This is shown by the significant difference between the results of the pretest and posttest. In addition, the very large value of the effect size shows that the effect of the treatment is not

only statistically significant, but also strong practically. Thus, the applied learning model has high effectiveness in the context of this study. This success is inseparable from the characteristics of the PBL model which emphasizes problem-based learning. In the process, students are encouraged to be actively involved in analyzing problems, evaluating solutions, and developing solution strategies. This activity directly trains high-level thinking skills, especially in the aspects of analysis, evaluation, and development. Therefore, PBL is very relevant to be used to improve students' critical thinking skills. The use of the Educaplay application as a learning medium also strengthens the effectiveness of the PBL model. The application provides a variety of interactive features, such as game-based quizzes, practice varied questions, and direct feedback on students' answers. These features allow students to actively learn and have a more engaging learning experience. Thus, students become easier to understand concepts and engage in the learning process. The integration between the PBL model and the learning application creates a more interactive and meaningful learning environment. Students not only play the role of recipients of information, but also as individuals who are active in solving problems.

This condition encourages students to think systematically and logically in solving mathematical problems. Therefore, the combination of this model and learning media is able to improve the quality of the student learning process. Although the results of the normality test show that the data is not normally distributed, the use of the t-test in this study is still acceptable. This is due to the adequate sample size and the relatively robust nature of the t-test against violations of normality assumptions. In addition, the consistent results of the Wilcoxon test show significance further strengthening the validity of the research findings. Thus, the results of the analysis obtained can be declared valid and reliable. Overall, the results of this study show that the application of the PBL model assisted by the Educaplay application has a strong impact on improving students' critical thinking skills. This effectiveness can be seen both from the results of statistical analysis and from the characteristics of the learning process that takes place. Therefore, this model can be used as an innovative and effective learning alternative in mathematics learning. With the right application, this model has the potential to improve the quality of learning more broadly.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the application *of the Problem Based Learning* (PBL) model assisted by Educaplay media has a significant influence on improving students' mathematical problem-solving abilities in SPLDV materials. This is shown by a significant increase in learning outcomes between pretest and posttest and supported by a very large effect size value. The PBL model combined with Educaplay interactive media is able to encourage student activity, increase understanding of concepts, and train critical and systematic thinking skills. Therefore, this learning model can be used as an effective and innovative alternative in mathematics learning.

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