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THE EFFECT OF PROBLEM-BASED LEARNING MODEL ASSISTED BY LKPD CANVA TO IMPROVE THE MATHEMATICAL UNDERSTANDING SKILL OF SMK STUDENTS

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ABSTRACT

This study aims to determine the differences in students' mathematical understanding abilities before and after applying learning with a problem-based learning model assisted by LKPD Canva. Experimental research is the research method used in this study. A total of 16 students from class X Hospitality at SMK LPPM RI Padalarang participated as the only subjects in this study. A pre-experimental design approach was used to analyze the data using a one-group pretest-posttest approach. The instrument used in this study was a description test related to SPLDV content and processed using SPSS application. The research findings show that the problem-based learning approach affects students' skill in mathematical understanding. The results of "Test Statics" show that there is a difference between students' mathematical understanding skill before and after using a problem-based learning model with Canva LKPD to help students learn SPLDV material.

Penelitian ini bertujuan untuk mengetahui perbedaan kemampuan pemahaman matematis siswa sebelum dan sesudah menerapkan pembelajaran dengan model pembelajaran berbasis masalah berbantuan LKPD Canva. Metode penelitian yang digunakan dalam penelitian ini adalah penelitian eksperimen. Sebanyak 16 siswa kelas X Perhotelan SMK LPPM RI Padalarang menjadi satu-satunya subjek dalam penelitian ini. Pendekatan pre-eksperimental design digunakan untuk menganalisis data dengan menggunakan pendekatan one-group pretest-posttest. Instrumen yang digunakan dalam penelitian ini adalah tes uraian terkait konten SPLDV dan diolah menggunakan aplikasi SPSS. Hasil penelitian menunjukkan bahwa pendekatan pembelajaran berbasis masalah berpengaruh terhadap keterampilan pemahaman matematis siswa. Hasil uji statistik menunjukkan bahwa terdapat perbedaan kemampuan pemahaman matematis siswa sebelum dan sesudah menggunakan model pembelajaran berbasis masalah berbantuan LKPD Canva untuk membantu siswa mempelajari materi SPLDV.

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INTRODUCTION

Education is an effort that is carried out consciously and organized to create a teaching and learning environment that allows students to have an active role in growing their potential. This will help them become individuals with inner strength, the skill to control themselves, a positive

personality, intelligence, noble character, and skills needed for the interests of individuals, communities, nations, and countries (Depdiknas, 2003). Therefore, education must be able to prepare students to handle and solve real, everyday problems using the understanding gained from education.

Mathematical concept understanding skills are skills to master concepts or theories in mathematics, relate them to other concepts, restate theories to mathematical forms, and create problem solution algorithms using their own language. Furthermore, this skill can be applied to solve everyday problems (Sengkey et al., 2023). Mathematics learning is strongly influenced by an understanding of basic theories. If students are able to master various concepts or theories, students will find it easier to develop a solution to a problem, because the solution of a problem requires a strong basis from the theories that have been learned. (Umam & Zulkarnaen, 2022).

One of the chapters in mathematics material that focuses on understanding is the System of Linear Equations of Two Variables (SPLDV) material. Based on the Merdeka Curriculum, it is known that SPLDV subject matter is found in class X SMK. SPLDV is one of the subjects that has a lot to do with everyday problems (Diana et al., 2021). According to Bey and Asriani, the SPLDV concept can be used to find solutions to various problems faced in daily activities. Examples include money, age, business, and others. (Nurcahyandi et al., 2022). In SPLDV material, students are directed to understand the concept and then apply it to a similar problem.

However, in reality, students' mathematical understanding of SPLDV subject matter is still low. The low level of students' skill can be seen from previous research conducted by Rochim et al. (2021), students still have difficulties in explaining a concept, understanding the various meanings and analysis of concepts, and differentiating these concepts. Research by At Taufiq & Basuki's (2022) show that students are often still hampered when solving story problems, especially at the stage of building a mathematical model and applying steps to solve the problem. In addition, factors such as inconsistent learning habits, low levels of student concentration, and uninteresting teaching methods are the main causes of students' difficulty in understanding mathematical concepts (Umam & Zulkarnaen, 2022). These statements are reinforced by the results of discussions with one of the mathematics teachers at SMK LPPM RI Padalarang which shows that students' mastery of mathematical concepts in the SPLDV chapter, especially class X-Perhotelan, is low. The main cause is that students do not understand the concept of the material, especially in the algebraic part. Students are often wrong when operating algebraic problems, especially in basic algebraic operations where errors from the beginning of the answer cause errors for the next stage when solving SPLDV problems.

From the results of these interviews and initial observations, it is necessary to hold teaching and learning activities that are more fun and help students to better understand the material. Where, the teacher is only a facilitator and students become the center of learning so that students can understand the concepts being taught by analyzing the initial problems presented by the teacher. This is in line with the syntax of the problem-based learning model, where students are given real problems as a framework for learning and acquiring knowledge to improve their learning outcomes (Ananda & Amry, 2024). This problem-based learning process will focus on students, which aims to familiarize students to prepare themselves to face problems and find solutions independently (Novianti et al., 2020).

By considering the problems that have been described, it is hoped that the Problem Based Learning model assisted by LKPD Canva will support improving students' mathematical understanding skill, because, this model has a close relationship with students' mathematical

understanding skill. A person is declared to have the right mathematical knowledge if he can understand the concept accurately can explain the concept again well and can apply it to the problems faced (Giawa et al., 2022). Where the skill of restating concepts that have been learned is part of the syntax of the problem-based learning model (Umam & Zulkarnaen, 2022).

From the statements that have been described, researchers are interested in conducting a study on the effect of the Problem Based Learning learning model assisted by LKPD Canva on SPLDV material for vocational students, which aims to evaluate differences in students' mathematical understanding abilities before and after participating in teaching and learning activities using the Problem Based Learning model assisted by LKPD Canva. With a research focus on developing a problem-based learning model with the help of LKPD Canva.

METHOD

Experimental research aims to evaluate whether the learning model used can improve students' mathematical understanding. The pre-experimental design method followed by a one-group pre-test - post-test research design was used in this research. According to Sugiyono in (Prawiyogi et al., 2022), Pre-experimental design is a design that involves one group or class that is tested before and after the experiment is conducted. The research design is further described according to the table below:

Table 1. Research Design

Pre Test	Treatment	Post Test
X1	Y	X2

A group of experiments that carry out the learning process with the problem-based learning model is the only subject in this study. Population is the entire research object used as a source of data that has certain characteristics in a study, while the sample is part of the population members taken using sampling techniques (Purwanza et al., 2022). The population in this study were all X-Hotel class students of SMK LPPM RI Padalarang in the odd academic year 2023/2024. The subjects used were students of class X-Hotel at SMK LPPM RI Padalarang in the odd school year 2023/2024, totaling 16 people. The sampling technique used by researchers is saturated sampling. Saturated sampling is used where the sample is all members of the population, this technique is suitable for use when there are few members of the population, less than 30 people (Suriani et al., 2023).

The data collection method is in the form of a description question test which is carried out in two stages, namely the initial test (pre-test) and the final test (post-test). The description questions used for both tests are the same and consist of 5 questions. Both are done to measure students' mathematical understanding skill in the SPLDV chapter both before and after treatment. According to Rochim et al., (2021), The indicators of mathematical understanding skill are: (1) the subject can identify and make examples and non-examples of a concept, (2) the subject can use symbols to present concepts, (3) the subject can identify properties of concepts and recognize conditions that determine concepts, (4) the subject can recognize various meanings and interpretations of concepts, and (5) the subject can compare and contrast concepts.

The data analysis method begins with a descriptive data test to determine the average value (mean) of the data used. Continued with the data normality test which is applied as a first step to determine whether the data is normally distributed or not (Usmadi, 2020). After the

prerequisite test is completed, because the results of the data normality test say that the data is not normally distributed, the non-parametric paired sample test, namely the Wilcoxon test is used as a reference to test the hypothesis which aims to determine whether or not there is a difference in the mean in the related sample group (Tanjung et al., 2023).

RESULTS AND DISCUSSION

Result

First, a pre-test will be conducted on students related to SPLDV material to measure students' initial mathematical understanding abilities. Furthermore, the preparation of mathematics teaching tools at SMK LPPM RI Padalarang for class X-Hotel in SPLDV material with a problem-based learning model with the support of Canva LKPD is carried out. After the preparation of learning tools is complete and ready to use, the learning process is carried out for students by researchers together with the mathematics teacher of SMK LPPM RI Padalarang. At the end of the treatment, a post-test will be conducted on students with similar questions during the pre-test to measure differences in students' abilities in mathematical understanding with the results of the descriptive data analysis below:

Table 2. Descriptive Data Table

	N	Minimum	Maximum	Sum	Mean	Std. Deviation
Pretest Score	15	0	20	95	6.33	7.188
Posttest Score	15	5	80	330	22	18.205
Valid N (listwise)	15					

Based on the table above, there is evidence that student scores have increased, namely scores that are getting better from previously having an average of 6.33 and then increasing when it becomes 22.00. Furthermore, the prerequisite test is carried out first to determine whether or not there is a difference in student learning outcomes before and after using the learning model under study.

Table 3. Table of Normality Test Results

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest Score	0.278	15	0.003	0.793	15	0.003

It can be seen that the Sig. number for the pre-test value is 0.003 and the Sig. number for the final test value (post-test) is 0.000, both of which are <0.05. Therefore, it was concluded that both values were not normally distributed. So, the sample test continued non-parametrically with the Wilcoxon test. The hypothetical formulation in this study is:

Table 4. Hypothesis Formulation Table

H_0	There is no difference in students' mathematical understanding skill before and after using the problem-based learning model
H_a	There is a difference in students' mathematical understanding skill before and after using the problem-based learning model

Table 5. Table of Non-Parametric Test Results Wilcoxon Test (*Output 1)*

		N	Mean Rank	Sum of Ranks
Posttest Score – Pretest Score	Negative Ranks	0[a]	0	0
	Positive Ranks	12[b]	6.5	78
	Ties	3[c]		
	Total	15		

Based on the data above, there are 12 positive data (N) which indicates that no student's score decreased from the initial test to the final test score. It can be seen that there are 12 positive values (N) which means that there are 12 students whose scores increased from the pre-test to the post-test. The total score is 78.00, with an average increase of 6.50. The ties section shows the number 3, meaning that three students have the same score on both tests.

Table 6. Table of Non-Parametric Test Results Wilcoxon Test (*Output 2)*

	Posttest Score - Pretest Score
Z	-3.078[b]
Asymp. Sig. (2-tailed)	0.002

It can be seen that the Asymp Sig (2-tailed) value is 0.002 <0.05, then H_0 is rejected and H_a is accepted, so, it is concluded that there is a difference in the understanding skill of students after and before implementing learning with a problem-based learning model.

Discussion

Teaching and learning activities take place in line with the teaching module and run smoothly, but some obstacles can still be overcome. Some of the obstacles experienced are the lack of student attention to the teacher when delivering the introduction to the material, as a result only some students understand well, the lack of student involvement in the learning process, either during the question and answer process or during the presentation, the lack of student attention to the material problems presented, so that some groups still find it difficult to find solutions to problems in the Canva LKPD, most students do not understand the concept of algebra well, so that when completing the main stages in SPLDV material, the initial stages are correct, but the algebraic calculations are wrong so that in the next stage the answer becomes incorrect.

The obstacles that have been mentioned show that student involvement during the learning process is needed so that the learning material will be conveyed properly. Thus, a learning model is needed that can train students' readiness to provide knowledge that they have or obtain independently and train students' readiness to respond to solving problems. One of the learning models that does not emphasize the delivery of knowledge by the teacher, but by students, especially in group activities, is the problem-based learning model. (Novianti et al., 2020). This learning model is closely related to students' mathematical understanding skill. A person is declared to understand a concept well if he understands the concept correctly and can explain the concept again well and can apply it to the problems faced (Giawa et al., 2022). This is in line with the indicator of the Problem Based Learning model, namely the skill of reexpressing the theory that has been learned (Umam & Zulkarnaen, 2022).

This research focuses on students' mathematical understanding by applying the Problem Based Learning learning model supported by Canva's LKPD. Researchers hope that this teaching model will help students play more roles during teaching and learning activities so that the teacher's task as a guide to the learning process, namely helping and guiding student learning which is the goal of this model is well achieved. Based on the results of the study, there was an increase in the comparison results of the two student tests before and after carrying out teaching and learning activities with the Problem Based Learning model on SPLDV material.

The learning process in this study was conducted over two meetings. Learning for 2 meetings runs according to the learning module. After being given LKPD, there was an increase in students' mathematical understanding of SPLDV material, seen from the results of descriptive data analysis which showed an increase in the average student test scores. In this cycle, the researcher became a facilitator, helping and guiding students to solve problems on the LKPD, so that students were able to understand and draw conclusions. In its implementation, the teacher carried out the learning module, students have begun to get used to the problem-based learning model as seen from the skill of students to understand the concept of SPLDV when working on LKPD in groups, but students are still often mistaken when doing algebraic operations.

This study looks at one group receiving treatment and looks at the results. First, a pre-test will be conducted on students related to SPLDV material to measure students' initial mathematical understanding skill. The purpose of conducting a pre-test is to ensure that the data is collected appropriately so that the results before and after the treatment can be compared appropriately. This research applies a type of experimental research that uses a pre-test as part of the research procedure. Furthermore, researchers carried out teaching and learning activities using a problem-based learning model supported by Canva's LKPD. After that, a final test was conducted with similar questions as in the initial test for students.

The findings of the descriptive data analysis showed a difference in students' mathematical understanding skills after using the learning model studied, seen from the average score of students in the post-test which increased compared to the results during the pre-test. After that, the normality test was carried out with the results of the data used not normally distributed, so data processing continued using non-parametric tests with the Wilcoxon test. The conclusion obtained is that the mathematical understanding skill of students after and before using the problem-based learning model in the SPLDV chapter is different, in line with previous studies by Sopanda et al., (2022), that the use of a problem based learning model is more effective than traditional learning. This conclusion occurs because students are given independent and group time to gain knowledge and examine ideas about the material being discussed, find solutions to problems independently, and are allowed to ask questions if they do not understand the problems being analyzed, then conclude about what they are learning into a solution that is produced independently.

From the results of hypothesis testing, it can be concluded that there is an increase in participants' mathematical understanding skills after being given treatment with the learning model under study. The research is in accordance with previous studies by Kurniawan et al. (2023) proved that the implementation of the problem-based learning model can improve students' mathematical understanding skills. In addition, it is necessary to make teaching and learning activities more enjoyable and help students more easily understand teaching materials, namely by using technology-based learning media. With the help of LKPD Canva the material

presented becomes more interesting. Research by Abdulah et al. (2023), also shows that by using media that attracts students' curiosity, students' mathematical understanding can increase.

In this study, the learning syntax applied included orienting students to the problem, organizing students, guiding individual and group investigations, developing and presenting work, and analyzing and evaluating the problem-solving process (Ariyana et al., 2018). The process of learning activities begins with the presentation of real problems to students, then they are directed to be able to discuss with other students to produce and conclude the best problem solving from the problems that have been presented previously.

The difference seen from the application of this model is that students are proactive in learning activities. In conventional learning, students are less responsive because they only need to listen to the material explained by the teacher. Students are not required to think critically because they only rely on the material explained, not looking for what exactly the concept of the material being studied is. As a result, students cannot work on problems that are different from the examples explained by the teacher, even though the concept is still the same.

Math learning relies heavily on concept understanding. If students can interpret many concepts, they will be better at solving problems because solving problems requires provisions based on concepts that have been learned (Umam & Zulkarnaen, 2022). Math learning relies heavily on concept understanding. If students can interpret many concepts, they will be better at solving problems because solving problems requires provisions based on concepts that have been learned.

During this study, the obstacles that arose during teaching and learning activities were the less-than-optimal facilities at school. In addition, students are still in the adjustment stage to the new learning method, they are still comfortable with the lecture method which has an impact that they are often not active in learning which hinders the implementation of learning activities. However, over time, these obstacles can be overcome with encouragement from the teacher to make students more enthusiastic about learning. It is hoped that there will be more in-depth research with a longer duration to find out whether students are accustomed to the new learning method.

CONCLUSION

The conclusion obtained is that the problem-based learning model supported by LKPD Canva affects the mathematical understanding skill of class X-Hotel students of SMK LPPM RI Padalarang on SPLDV material. The conclusion was obtained by looking at the comparison of the average student scores, which increased where the average value during the post-test was greater than the pre-test. In addition, the results of non-parametric tests also show that students' mathematical understanding has a difference after using the teaching model studied. Referring to the above conclusions, the following additional recommendations can be conveyed, students, should be more enthusiastic during math learning activities, so that learning activities will feel more useful and meaningful. Then, for schools, there should be socialization of the use of various learning models to make learning more interesting and interactive. Finally, for future researchers, the application of Problem Based Learning model can be applied to the subject matter of SPLDV but in different samples and populations, especially with a larger number of meetings, More in-depth research with different samples and populations, especially with a larger number of meetings. For this reason, further research is needed in the development of this research

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