Jurnal PAJAR (Pendidikan dan Pengajaran)
Volume 9 Nomor 2 March 2025 | ISSN Cetak : 2580 - 8435 | ISSN Online : 2614 - 1337
DOI : http://dx.doi.org/10.33578/pjr.v9i2.10206

The Effect of Problem Based Learning Assisted by Spin Happy Media on Students' Conceptual Understanding

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ABSTRACT

This study aims to examine the effect of Problem-Based Learning (PBL) assisted by Spin Happy media on students' conceptual understanding. The research employed a quasi-experimental design with a pretest-posttest control group. The population consisted of elementary school students, with samples selected using purposive sampling. Data were collected through a conceptual understanding test and analyzed using an independent sample t-test and simple linear regression. The results indicated that students in the class implementing Problem-Based Learning Assisted by Spin Happy achieved significantly higher conceptual understanding scores compared to those in the conventional learning class, with the experimental group's mean score (89.77%) being higher than the control group's mean score (74.40%). This study suggests that integrating Problem-Based Learning with interactive media such as Spin Happy can enhance student engagement and conceptual understanding in learning.

Keywords*: *problem-based learning, spin happy, conceptual understanding

Submitted	Accepted	Published
15 February 2025	17 March 2025	30 March 2025

Citation	:	Setiawati, T.A., & Rizqi, H.Y. (2025). The Effect of Problem Based Learning Assisted by Spin Happy Media on Students' Conceptual Understanding. *Jurnal PAJAR (Pendidikan dan Pengajaran), 9*(2), 280-287. DOI: http://dx.doi.org/10.33578/pjr.v9i2.10206.

INTRODUCTION

Modern education demands innovative learning models that foster critical thinking, creativity, and deeper conceptual understanding. One of the approaches used is Problem-Based Learning (PBL), which places students in real-world problem-solving contexts to enhance conceptual understanding. However, a major challenge in implementing Problem-Based Learning is the lack of active student engagement in the learning process. To address this issue, interactive media such as Spin Happy can be utilized as a learning aid.

The implementation of the Problem-Based Learning (PBL) model is expected to address the challenge of low conceptual understanding among students. A learning model, as a conceptual framework and systematic procedure that organizes specific learning experiences, serves as a guide for instructional designers and teachers in planning and executing teaching and learning activities (Siregar, 2021). Problem-Based Learning, as an approach that uses real-world problems as a context for students to learn critical thinking and problem-solving skills, also facilitates the acquisition of essential knowledge and concepts from the course material or subject matter (Anugraheni, 2018). In the PBL process, students are guided to analyze and evaluate their problem-solving processes. This approach enables teachers to assess students' understanding and direct them toward correct concepts if misconceptions arise during the problem-solving process. Consequently, PBL not only enhances students' active participation in learning but also develops critical thinking skills, problem-solving abilities, and a deeper conceptual understanding.

Spin Happy is an instructional medium designed to assist students in solving problems during the learning process by engaging them in practice exercises. This media is developed with the expectation that students will become more interested and actively involved in understanding the material being studied. Spin

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Happy can serve as an effective tool for enhancing students' comprehension, particularly in the context of learning mathematics. By integrating the PBL model Assisted by Spin Happy, students are expected to grasp abstract mathematical concepts more easily through concrete learning experiences.

According to Anggraeni (2022), conceptual understanding is a crucial prerequisite for students' concept development. If students do not have a strong grasp of a concept, they will struggle to develop it independently and will require guidance from teachers. Therefore, mathematical understanding plays a vital role in the mathematics learning process. Nurlaela (2022) stated that conceptual understanding refers to students' ability to comprehend concepts and apply procedures or algorithms fluently, accurately, efficiently, and correctly.

Based on observations and a preliminary study on mathematics learning in Grade V at SDN Bandungan 01, student achievement tends to be low, particularly in terms of conceptual understanding. This is evident from the evaluation results, which indicate students' difficulties in comprehending mathematical problems. Supporting data from the preliminary study conducted in classes VA and VB, involving a total of 30 students, show the following average scores for each conceptual understanding indicator: Restating a concept (42.92%); Classifying objects based on specific properties according to the concept (42.08%); Providing examples and non-examples (42.50%); Representing concepts in various mathematical forms (45.83%); Developing necessary/sufficient conditions for a concept (37.92%); Using, utilizing, and selecting specific procedures (47.50%); and Applying concepts or algorithms to solve problems (48.33%). The overall average score for class VA was 40.1%, while for class VB, it was 47.6%. The low level of students' conceptual understanding has negatively impacted their learning outcomes, making them less optimal.

Referring to the explanation above, it is recommended to implement a new learning model that is relevant to the teaching material. As an alternative, the implementation of the Problem-Based Learning model assisted by Spin Happy media is proposed. Problem-Based Learning Assisted by Spin Happy is a learning approach in which students are encouraged to actively explore and discover knowledge through interaction with the Spin Happy teaching aid. This method engages students in an exploratory and discovery-based learning process facilitated by Spin Happy. This study aims to examine the effect of using the Problem-Based Learning model assisted by Spin Happy media on the conceptual understanding of elementary school students.

LITERATURE REVIEW

Problem-Based Learning

According to Anugraheni (2018), Problem-Based Learning (PBL) is a learning approach that uses real-world problems as a context for students to learn about critical thinking and problem-solving skills, as well as to acquire essential knowledge and concepts from lecture or subject materials. Wena (as cited in Sukmawati & Baharullah, 2023) states that Problem-Based Learning (PBL) is a learning strategy that presents students with practical problems as the foundation for learning, or in other words, students learn through problem-solving experiences. The Problem-Based Learning model is a learning approach in which teaching is conducted by presenting a problem, posing questions, facilitating investigations, and encouraging discussions.

According to Arends (as cited in Ngalimun, 2016), the implementation of Problem-Based Learning consists of five phases. The first phase is orienting students to the problem, which involves explaining learning objectives, providing new material, presenting problems, and motivating students to engage in the given problem-solving activity. The second phase is organizing students for learning, where students are assisted in defining and organizing their learning tasks related to the given problem. The third phase is guiding individual and group investigations, where students are encouraged to gather relevant information, conduct experiments to obtain explanations, and develop problem-solving strategies. The fourth phase is developing and presenting the final product, where students are supported in planning and preparing an appropriate product, such as a report, and are encouraged to share responsibilities with their peers. The final phase is

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analyzing and evaluating the problem-solving process, in which students are guided to evaluate their investigation and the methods they have used.

Spin Happy Media

According to Ulya Ahmad Iqbalul (2019), spin media is a learning tool that has been modified and equipped with questions related to the taught material. This spinning wheel-shaped media is circular and can rotate or move around, making it highly effective as a learning medium. Spin Happy is derived from two words: "spin," meaning to rotate, and "happy," meaning joyful; thus, Spin Happy refers to a fun spinning wheel. Spin Happy has been modified as a learning tool to make the learning process more engaging and easier to understand.

Spin Happy is a visual learning medium in the form of a spinning wheel that has been modified and equipped with pockets containing questions related to the taught material. Additionally, learning materials are provided via barcodes on the back of each question card. The Spin Happy media consists of a directional pointer and various numbers placed on the wheel, which are used during the learning process.

The steps for using Spin Happy media are as follows. First, students are divided into five groups. The leader of each group then plays hompimpa to determine which group will go first. A representative from the selected group will come forward and spin the wheel. Once the arrow stops at a specific number, students will view the learning material through the barcode on the back of the question card and answer the question on the spinning board. They may seek assistance from their group members if needed.

Conceptual Understanding

According to Laia (2023), conceptual understanding refers to mastery of learning materials that involve students' ability to restate concepts in a more easily comprehensible manner and apply them effectively. Nabila et al. (2022) state that conceptual understanding is an essential prerequisite for students' concept development. If students do not fully understand a concept, they will struggle to develop it independently and will require guidance from teachers. Therefore, mathematical understanding plays a crucial role in the mathematics learning process. It also serves as a fundamental basis for solving both mathematical problems and real-world issues.

Conceptual understanding involves students' ability to recognize, comprehend, and classify objects based on the given definition. According to Safitri and Rizqi (2024), conceptual understanding is a competency demonstrated by students in understanding concepts and accurately, efficiently, and effectively performing problem-solving procedures. It also encompasses students' ability to restate concepts in a simpler and more understandable way, as well as to apply those concepts in different contexts.

According to Kiki (2017), students with strong conceptual understanding skills can demonstrate indicators of conceptual comprehension through testing. Sumarmo (2014) identifies several indicators of conceptual understanding, including the ability to restate a concept, classify objects based on specific properties aligned with the concept, provide examples and non-examples of the concept, present concepts in various mathematical representations, develop necessary or sufficient conditions for a concept, utilize, apply, and select specific procedures or operations, and apply concepts or algorithms in problem-solving.

METHOD

This study employed a quasi-experimental design with a nonequivalent control group design. The research design included a pretest conducted before the learning process began. Subsequently, the subjects were given treatment using the Problem-Based Learning model assisted by Spin Happy media, which incorporates role-playing elements. The study concluded with a posttest to measure the difference in students' conceptual understanding improvement after each session.

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Population and Sample

The population of this study consists of all students at SD Negeri Bandungan 01. The researcher selected two classes as the sample after considering the nearly identical average number of students per class. Additionally, consultations were conducted with the classroom teacher. Based on these considerations, two classes were chosen as the sample: class VA, which had the lowest average score, was designated as the experimental class, while class VB served as the control class. The sample was selected using purposive sampling and applied a non-probability sampling technique, which does not provide an equal opportunity for each member of the population to be chosen as a sample member.

Data Collection Techniques and Instruments

The data collection technique used in this study was testing, which is a method employed for conducting measurement activities. It includes various questions or a series of tasks that must be completed or answered by students to assess their behavioral aspects. The research instrument used to collect data on students' conceptual understanding was administered to Grade V students twice: before the treatment (pretest) and after the treatment (posttest). The test instrument was in the form of an essay-based written test, which was used to evaluate students' ability to solve conceptual understanding problems.

Data Analysis Techniques

The data analysis technique involved conducting normality and homogeneity tests before performing statistical tests. An Independent Sample T-Test was used to analyze differences between pretest and posttest scores, while a simple linear regression test was employed to determine the effect of Problem-Based Learning assisted by Spin Happy media on students' conceptual understanding.

RESULTS AND DISCUSSION

Pretest and Posttest Results of Grade V

In a Grade V class consisting of 30 students, the researcher conducted tests to assess students' conceptual understanding. The testing process was carried out twice: before the treatment (pretest) and after the treatment (posttest). The test instrument was in the form of an essay-based written test, which was used to evaluate students' ability to solve conceptual understanding problems and was developed based on conceptual understanding ability indicators. The following are the students' pretest and posttest scores for conceptual understanding in Grade V.

Tabel 1. Students' Scores on Pretest and Posttest for Conceptual Understanding

No	Observed Aspect	Pretest Score	Posttest Score	Total	Category
1.	Restating a concept	47%	98%	73%	Very Good
2.	Classifying objects based on specific properties according to the concept	43%	98%	71%	Good
3.	Providing examples and non-examples of a concept	41%	94%	68%	Good
4.	Presenting concepts in various mathematical representations	40%	91%	66%	Good
5.	Developing necessary or sufficient conditions for a concept	36%	91%	64%	Good
6.	Using, utilizing, and	33%	87%	60%	Good

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	selecting specific procedures or operations				
7.	Applying concepts or algorithms in problem-solving	32%	75%	54%	Fair
	Total	39%	91%	65%	
	Category	Fair	Very Good	Good	

Based on Table 1, among the seven indicators of conceptual understanding examined, one indicator falls into the "very good" category, five indicators are classified as "good," and one indicator is categorized as "fair." The average percentage of posttest results is 91%, which is classified as "very good," while the average percentage of pretest results is only 39%, which falls into the "fair" category. Thus, it can be concluded that students' conceptual understanding has improved. The overall average score across all indicators is 65%, placing it in the "good" category.

Normality and Homogeneity Tests for Pretest and Posttest

The normality test in this data analysis aims to determine whether the collected research data are normally distributed. The normality test was conducted using SPSS version 25. The criterion for assessing normality is based on the Shapiro-Wilk significance value, where a significance value greater than 0.05 indicates that the population in the group follows a normal distribution. The results of the normality test are as follows:

Tabel 2. Normality Test for Pretest and Posttest

Tests of Normality

		Shapiro-Wilk			Conclusion
	Grade V	**Statistic**	**df**	**Sig.**	
Learning Outcome	Pre-Test	.963	30	.371	Normal Distribution
	Post-Test	.958	30	.269	Normal Distribution

Using the Shapiro-Wilk normality test data, the significance values for the pretest and posttest were found to be 0.371 and 0.269, respectively, both of which are greater than 0.05. As a result, a normal distribution is indicated by the Shapiro-Wilk value exceeding 0.05.

The homogeneity test in this data analysis was conducted to determine whether the selected sample was uniform or not. The data analysis for the homogeneity test was calculated using the Levene's test formula with the assistance of SPSS version 25. The criterion for this homogeneity test is that if the significance value is ≥ 0.05, it can be concluded that the population within the class is homogeneous or has similarities. The results of the homogeneity test are as follows:

Tabel 3. Homogeneity Test for Pretest and Posttest

Test of Homogeneity of Variance

	Levene Statistic	**df1**	**df2**	**Sig.**	**Description**
Pretest	.227	1	58	.273	Homogeneous
Postest	.302	1	58	.258	Homogeneous

The results of the homogeneity test for the pretest showed a significance value of 0.273, which is

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greater than the significance threshold of 0.05. Meanwhile, the posttest results indicated a significance value of 0.258, which is also greater than the significance threshold of 0.05.

Hypothesis Testing

a. Independent Sample T-Test

The independent sample t-test is used to compare two unrelated samples and determine differences in students' learning outcomes between the control and experimental classes. The decision-making criterion for the independent sample t-test is as follows: if the significance value is < 0.05, it indicates a significant difference between the experimental class and the control class. Conversely, if the significance value is > 0.05, it indicates no significant difference between the experimental class and the control class. The results of the independent sample t-test from this study are as follows:

Tabel 4. Independent Sample T-Test

No.	Class	Mean	Sig. (Calculated)
1	Control	74.40	0.000
2	Experimental	89.77	0.000

The table above shows that the calculated significance value (Sig.) is 0.000, which is less than 0.05. Therefore, the null hypothesis (H0) is rejected, and the alternative hypothesis (H1) is accepted. This indicates a significant difference in the mean scores between the experimental group and the control group. The results suggest a difference in the quality of learning between the Problem-Based Learning model assisted by Spin Happy and the standard Problem-Based Learning model in enhancing the conceptual understanding of Grade V students.

The experimental class achieved a higher average score (89.77) than the control class (74.40), with a mean difference of 15.37. This confirms that the Problem-Based Learning model Assisted by Spin Happy significantly enhances students' conceptual understanding. Based on the research findings, it was discovered that the Problem-Based Learning model assisted by Spin Happy is more effective in the teaching and learning process. This is evident from the data in Table 4, which shows that the average class score of students who underwent this treatment was higher than that of students who did not receive the treatment. This learning model has been proven effective in enhancing students' conceptual understanding.

b. Simple Linear Regression Test

Regression analysis is a statistical test used to determine whether an independent variable influences a dependent variable. The decision-making criterion in regression analysis is based on the significance value (Sig) obtained from SPSS 25. If the significance value (Sig) is < 0.05, it indicates a significant influence, whereas if the significance value (Sig) is > 0.05, it indicates no significant influence. The results of the simple linear regression test from this study are as follows.

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Tabel 5. Uji Regresi Linear Sederhana

Model	*Unstandardized Coefficients*		*Coefficients Standardized Coefficients*		
	B	Std.Error	Beta	t	Sig.
(Constant)	21.832	8.573		2.547	.021
Model PBL Spin Hsppy	0.732	0.092	0.887	7.929	0.000
Dependent Variable: Conceptual Understanding Ability					

The table above shows that the calculated t-value ($t_{calculated}$) is 7.929, which is greater than the t-table value (t_{table}) of 2.110, and the significance value is 0.000, which is less than 0.05. Thus, it can be concluded that the Problem-Based Learning model assisted by Spin Happy has a significant effect on improving the conceptual understanding ability of Grade V students at SDN Bandungan 01.

The results of the simple linear regression test also indicate an R-square (R^2) value of 0.787 (78.7%), meaning that the Problem-Based Learning model assisted by Spin Happy influences students' conceptual understanding ability by 78.7%, while the remaining 21.3% is influenced by other factors.

Based on the research findings, it is evident that the Problem-Based Learning model assisted by Spin Happy has a positive effect on students' conceptual understanding ability. This is reflected in the simple linear regression analysis, where the Problem-Based Learning model assisted by Spin Happy serves as the independent variable influencing students' conceptual understanding as the dependent variable. The use of this model allows students to optimize their ability to solve conceptual understanding problems more effectively.

CONCLUSIONS AND RECOMMENDATION

Based on the analysis and discussion regarding the effect of the Problem-Based Learning model assisted by Spin Happy, there is a significant difference in the use of this learning model on students' conceptual understanding ability. This is evidenced by the significance level of < 0.05, specifically 0.000 < 0.05, indicating a significant difference between the quality of learning in the experimental and control groups. The mean score for the experimental class (89.77) was higher than that of the control class (74.40). Implementing this model enhanced students' information literacy, allowing them to gather and process information more effectively to improve conceptual understanding. Meanwhile, students in the class that did not use the Spin Happy media were able to improve their conceptual understanding, but the learning process was less effective.

The Problem-Based Learning model assisted by Spin Happy significantly impacted students' conceptual understanding. This is evident from the t-value (7.929), which exceeds the t-table value (2.110), and a significance level of 0.000, which is below 0.05. Thus, it can be concluded that the Problem-Based Learning model assisted by Spin Happy influences conceptual understanding by 78.7%. Problem-Based Learning assisted by Spin Happy media has a positive effect on elementary school students' conceptual understanding. Integrating interactive media enhances student engagement and fosters deeper conceptual understanding.

Therefore, based on these findings, the researcher provides several recommendations.Teachers who aim to enhance students' conceptual understanding are encouraged to implement the Problem-Based Learning model assisted by Spin Happy. Students should be more active and confident in expressing their opinions during the learning process and expand their knowledge from various sources. This approach aims to develop conceptual understanding skills both inside and outside the classroom. Furthermore, for future researchers interested in studying the Problem-Based Learning model assisted by Spin Happy, it is recommended to prepare all necessary aspects carefully to ensure that the research can be conducted optimally.

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