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THE INFLUENCE OF A PROBLEM-BASED LEARNING MODEL ASSISTED BY SPIN WHEEL MEDIA ON THE CONCEPTUAL UNDERSTANDING ABILITY OF CLASS IV PRIMARY STUDENTS IN THE ENERGY SOURCES MATERIAL

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Abstract

This research aimed to (1) know the differences in conceptual understanding between students using a Problem-Based Learning (PBL) model assisted by spinning wheel media and students using the conventional method in energy resources material, (2) describe the influence of the PBL model assisted by Spin Wheel media 4th-grade elementary school students on the conceptual understanding ability of energy sources, and (3) describe students' responses on the implementation PBL model assisted by Spin Wheel media on energy source material. The type of research used was quasi-experimental research with a quantitative approach. The population in this study was all class IV students, totalling 57 students. Sampling used a total sampling technique. The sample selected in this research was class IV B students, totalling 29 students in the experimental class and 28 class IV A students in the control class. The instruments used in this research were conceptual understanding ability test sheets and student response questionnaires. The data analysis technique used a two-independent sample t-test, effect size, and percentage of student response questionnaires. The results of the research showed that (1) there was a difference in the conceptual understanding ability of students who used the PBL model assisted by Spin Wheel media with students who used the conventional method on energy source material with the result $t_{count} > t_{table} = 3.5146 > 2.004$, (2) the PBL model assisted by Spin Wheel media had a high influence on the conceptual understanding fourth-grade students on energy sources material with an effect size result of 0.967; (3) students response were positive to PBL model assisted by Spin Wheel media with a percentage of 93% in the very high category. So, the results from this study can be concluded that there was an influence of the PBL model assisted by Spin Wheel media on students' conceptual understanding ability on energy sources material.

Keywords: Problem-Based Learning Model, Spin Wheel Media, Conceptual Understanding Ability, Energy Sources

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INTRODUCTION

Natural science is a subject related to nature, the surrounding environment and students' real lives. Science subjects are also important subjects, where science subjects have been studied since elementary school. Science lessons are used by students to study the relationship between humans and nature by observing and collecting natural concepts in the form of facts and sequences (Ariyanto, 2016). Science can be referred to as a scientific concept that studies natural events related to daily human activities. Science learning can be understood well if students have a good understanding of the concept. Santa and Alverman (Samatoa, 2018) stated that through science learning students can understand and apply various concepts that explain events related to these concepts and can conduct a process of changing conceptions.

Understanding concepts is used to summarize, explain and clarify the material that students have received and also used to solve the problems they face. Understanding science concepts is an intellectual process that supports science concepts to be accepted and connected with prior knowledge so that they can form a new concept of knowledge (Triwahyuni, 2017). The impact of students' lack of understanding of concepts is that students have difficulty understanding material and difficulty in remembering material provided by the teacher (Savitri and Meilana, 2022). Students can have an ability about good understanding of science concepts if they can express ideas or can restate material that has been learned, seen, read or heard orally, in writing or in other forms of representation and can apply it. This is in line with the opinion of Minarni et al. (2020) that the ability to understand concepts is an ability that can be used in problem-solving. Therefore, the concept of understanding is an important part that must be possessed by students in science learning.

A study conducted at a State Primary School of Singkawang which recorded students' ability to understand concepts in science subjects showed that they did not achieve very satisfactory results.. This can be seen from the final semester assessment (PAS) scores for even T.A. 2022/2023 class III B on conceptual understanding skills, where only 45% of students reached the KKM and 55% of students did not reach the KKM. The KKM score applied is 65. The low level of completeness achieved by students is due to students' lack of understanding of concepts when learning science in class. One of them is characterized by a lack of student understanding which has a direct impact on the grades students get (Susilowati, 2019). The results of interviews with teachers revealed that when the learning process in class uses the PBL model but is not assisted by learning media which results in students' low understanding in receiving the lessons given by the teacher, students are less active in the learning process. The learning process only uses creative and innovative models but still does not use interesting learning media. The learning media used are textbooks, whiteboards and projectors so that learning is not interactive and only focuses on the teacher. This causes student responses to remain low because students only get information from the teacher without mastering the material and students are not active during the learning process.

Students will have a good understanding of concepts if the learning process carried out can stimulate students' learning abilities. Apart from that, by understanding concepts, students can understand and explain something about a concept obtained from the knowledge they have learned in their way, not just memorizing (Utami et al., 2022). To make it easier for students to understand concepts, innovative and creative learning models and media are needed so that students' understanding of concepts will increase to a higher level so that instilling concepts by connecting real contexts with the surrounding environment can increase understanding of concepts. concept itself. One of the learning models chosen by the author is Problem-Based Learning (PBL). PBL is a learning approach to solving real problems that can increase one's knowledge and develop quality so that students can become more independent and grow individual self-confidence (Hosnan, 2014).

The advantage of the PBL model is that students will have an open, reflective, critical, and active learning mindset, as well as facilitate successful problem-solving, communication, group work, and better interpersonal skills (Haryanti and Febriyanto, 2017). Individual learning of students can be handled through group work in the form of peer teaching. (Shoimin, 2016). Meanwhile, there are several disadvantages to this PBL model, including that the PBL model requires sufficient time for preparation (Yulianti & Gunawan, 2019), and is part of the teacher's active role in presenting the material (Shoimin, 2016).

Efforts can be made to overcome these deficiencies using the right media, namely Spin Wheel media. Spin Wheel is media shaped like a circle that can rotate and move at its centre point which can be used as a learning media (Sari, 2018). This media has advantages in the learning process, such as, (1) Students are focused on learning activities so that their ability to absorb knowledge can truly be understood and absorbed well, (2) Students are trained to be able to work together, (3) Students are trained in their understanding in

answering practice questions, because with this students' understanding of the material will improve, (4) It is a game with advantages that can be challenging, like many games that we know on television media, (5) Can be used as preparation before carrying out learning exams that can be prepared as well and as attractively as possible (Dabell, 2009).

One material that has the concept that must be well understood by students is energy sources. This material emphasizes that the basic concept that students must comprehend is to identify various sources of energy and their changes in everyday life. Therefore, students must be able to build on basic concepts that have been previously known so that basic conceptual errors or misconceptions do not occur in energy source materials (Sumarli et al., 2021). Therefore, the learning energy source material is very suitable as a study area in researching the PBL model on students' conceptual understanding abilities.

The use of the PBL model in learning based on research conducted by Amalida (2022) shows that science learning using the PBL model can improve students' understanding of science concepts as well as teacher and student activities. Furthermore, Yulianti and Gunawan (2019) stated the application of the PBL model has been shown to influence students' conceptual understanding and critical thinking. In addition, Eismawati, Koeswanti, & Radi (2019) stated that the PBL model is a learning model that can shape and advance students so that they have expertise in solving problems in learning activities and also to encourage students to develop thinking skills so they can think more critically.

Based on this description, the research was conducted with following objectives: (1) describe the differences in conceptual understanding between students using a PBL model assisted by spin wheel media and students using the conventional method in energy resources material, (2) describe the influence of the PBL model assisted by spin wheel media 4th-grade elementary school students to the conceptual understanding ability of energy sources, and (3) describe students' responses on the implementation of PBL model assisted by spin wheel media on energy source material. This research is important to improve students' conceptual understanding through a PBL assisted by spin wheel media.

METHOD

The Research methods used quantitative with a quasi-experimental. The research design used in the study was an aggregate sampling design using the entire population as a sample. (Sugiyono, 2020).

Experiment	X	O_1
Control	-	O_2

Figure 1. Research design

Information:

X = Given treatment using Spin Wheel media in the experimental class.

\- = No treatment was given.

O_1 = Test after being given treatment in the experimental class.

O_2 = test after being given treatment in the control class.

This research was carried out at a State Primary School in Singkawang. The population in this study were all class IV students, namely class IV A and IV B, obtained 57 students. The sample in this study was class IV A, obtained 28 students as the control class and class IV B, obtained 29 students as the experimental class.

Data collection techniques included test methods and questionnaire methods. The instruments used in this research were a test sheet for students' conceptual understanding and a questionnaire sheet for student responses to the PBL model assisted by spin wheel media. The analysis technique used in this study was a two-sample independent t-test, effect size, and percentage of student response questionnaires.

RESULTS AND DISCUSSION

Results

The description of the experimental class data obtained by the average value, standard deviation, variance, and highest and lowest scores is presented in Table 1.

Table 1. The result of post-test data calculation for the experimental class

Experimental Class	Post-Test
Average	62,8
Standard Deviation	16,1
Variance	258,1
Highest Score	93
Lowest Score	29

Differences in the Students' Conceptual Understanding Ability who Use a PBL model Assisted by Spin Wheel Media with the Students who Use Conventional Methods

1. Normality Test

In this study, a normality test was performed to determine if the collected data were normally distributed after the test scores. The results of post-test data normality analysis of students' conceptual understanding abilities in the experimental class and control classes can be seen in Table 2.

Table 2. Normality Test Calculations

Statistics	Class	
	Experiment	**Control**
χ^2 Count	2,71612	3,0521
The number of *students*	29	28
Level of Difficulty	5%	5%
χ^2 *Tabel*	7,815	7,815
Decision	Ho accepted	
Conclusion	Normally distributed	

Based on Table 2, it is known that the results of the normality test calculations on data in the experimental class obtained χ^2_{count} = 2.71612 ≤ χ^2_{table} = 7.815, so it can be seen that the experimental class had a normal distribution. Meanwhile, the results of calculations for control class data obtained χ^2_{count} = 3.0521 ≤ χ^2_{table} = 7.815, so the control class has a normal distribution too.

2. Homogeneity Test

After calculating the post-test data of the experimental group and the control group and obtaining the normal distribution data the next step is to use the formula f to check the homogeneity of the data. The results of the data homogeneity test calculation can be seen in Table 3.

Table 3. Data Homogeneity Test Calculation Results

Statistics	Class	
	Experiment	**Control**
Variance (V2)	258.096	232.793
f_{count}	1.053	
The number of students	29	28
Level of Difficulty	5%	5%
f_{table}	1.898	
Decision	Ho accepted	
Conclusion	Homogeneous data	

Based on Table 3, it is the experimental class variance was 258.096 greater than the control class variance of 232.793 with an f_{count} = 1.053 ≤ f_{table} = 1.898 with α = 5% or 0.05 and *df* in the numerator 28 and *df* in the denominator 27 obtained as 1.898. Thus the experimental class and the control class have equal or homogeneous variances. The hypothesis was tested because the performance data of the experimental class and the control class were normally and equally distributed.

Through tests of normality and homogeneity, it was found that the post-test data for the experimental and control groups were all normally distributed and the variances were equal or homogenous. Then next, a hypothesis test is carried out using a two-sample t-test to test the similarity of two class means. Two sample t-test calculation results can be seen in Table 4.

3. Hypothesis Test

Table 4. Two sample T-test calculation Results

Group	*df*	α	t_{count}	t_{table}	Decision
Experimental Class and Control Class	55	5% or 0.05	3.5146	2.004	Ha Accepted

Based on Table 4, it is known that t_{count} = 3.5146 > t_{table} = 2.004, So it is accepted and rejected. So we can conclude that there is a difference between the students. conceptual understanding ability who use a model for PBL assisted by spin wheel media with the students who use the conventional method on energy sources material.

The Influence Magnitude of A model for PBL Assisted by Spin Wheel Media on the Students' Conceptual Understanding Ability

To find out how much influence the PBL model assisted by spin wheel media has on the ability to understand the concepts of fourth-grade elementary school students regarding energy sources, use the Effect Size formula. The results of the Effect Size calculation can be seen in Table 5.

From Table 5, it can be seen that *ES* = 0.967 with the high criteria. This means that using the PBL model had a high influence on the student's conceptual understanding ability of fourth-grade elementary school students in the Energy Sources material.

Students Responses on A model for PBL Assisted by Spin Wheel Media

To determine the percentage of students' response to the PBL model on the conceptual understanding ability of fourth-grade students at SD Negeri 27 Singkawang, the average formula was used. The students' response questionnaire used was in the form of positive and negative statements obtaining 16 statements and consisting of 4 student response indicators, namely: (1) relevant, (2) attention, (3) satisfaction, and (4) self-confidence. Students are only asked to give a checklist mark (√) to one of the two options Yes or No. The student response questionnaire according to the indicators can be seen in Table 6.

Table 5. Effect Size Test Results

Statistics	Class	
	Experiment	Control
Average	62.89	48.14
Control Class Standard Deviation	15.25	
Effect Size	0.967	
Criteria	Tall	
Conclusion	A model for PBL Assisted by Spin Wheel media had a high influence on the student's conceptual understanding ability	

Table 6. Students Responses to A model for PBL Assisted by Spin Wheel Media

Percentage	The number of students	Criteria
75% < P ≤ 100%	28	Very high
50% < P ≤ 75%	1	High
25% < P ≤ 50%	-	Medium
0% ≤ P ≤ 25%	-	Low
Average percentage	93%	Very high
Highest percentage	100	Very high
Lowest percentage	69%	High

The category results of student responses to the PBL model can be seen in Table 7 with an average percentage of 93% in the very high category.

Table 7. Recapitulation of Student Response Indicators

No	Indicator	Percentage	Criteria
1.	Relevance	93%	Very high
2.	Attention	95%	Very high
3.	Satisfaction	99%	Very high
4.	Self-confidence	87%	Very high
	Average	**93%**	**Very high**

Based on Table 7, it is easier for students to learn, students are more skilled, and it makes it easier for students to understand the content of the material. Therefore, a percentage of 93% was obtained with very high criteria. In the aspect of attention, namely the statement that students feel more motivated, students are not sleepy, learning is more interesting and students did not hesitate in answering the questions given. Thus, a percentage of 95% was obtained with very high criteria. In the aspect of satisfaction, namely the statement that students make learning more fun, it does not make students stressed when studying, learning science and science is more useful, and the learning process

does not make students bored so a percentage of 99% is obtained with very high criteria. In the aspect of self-confidence, namely, students can confidently express their opinions during the learning process, making students more active and interested in the learning process, learning science and science is more useful, and making students confident in answering the questions given, so that a percentage of 87% is obtained with very high criteria. From all aspects of student responses, an average of 93% was obtained with a range of 75% $< P \leq 100\%$ is in the very high category. From the average results obtained, the students' response were positive towards a PBL model assisted by spin wheel media.

Discussion

There are differences in students conceptual understanding skills between the experimental class and the control class

Based on data from students' post-test results, it is known that there are differences in students' conceptual understanding abilities between the experimental class and the control class. In the PBL model experimental class, treatment was given using Spin Wheel media which was centered on students with a group collaboration method consisting of filling in questions and then students solving problems to reduce student activity. So that students can easily understand the material provided. In creating a learning atmosphere, using the PBL model assisted by Spin Wheel makes students more active, and enthusiastic and get good grades in the learning process. Meanwhile, controlling the learning process in classes using conventional methods, teachers only teach as usual. In this process, students were active, but when giving post-test questions, the scores obtained were not as good as in the experimental class.

This shows that learning using the PBL model assisted by Spin Wheel media on the ability to understand the concept of fourth-grade elementary school students regarding energy sources, there is a difference in the ability to understand students' concepts between the experimental and control classes. The calculation results of the two-sample T-test calculation are greater than the t-table so there is a difference between the experimental class and the control class This is in line with Rahmadani (2017), the PBL model has a significant impact on students' conceptual understanding. Based on the opinion of Amalida (2020) stated the use of the PBL model can improve students' understanding of science concepts as well as teacher and student activities.

PBL Model Assisted by Spin Wheel Media had a high influence on the Students' Conceptual Understanding Ability

Based on the results of the post-test data results carried out, there was an influence of using the PBL model on the ability to understand concepts. Of the seven indicators of conceptual understanding, the one with the highest average was the interpreting indicator of 1.7 with high criteria. In the interpreting indicator, students were able to explain the material being presented again. Meanwhile, the lowest indicator is the explaining indicator with an average of 0.8 with high criteria. The indicator explains that students are less able to explain the material presented, namely energy sources. so that the calculated effect size is 0.967 with high criteria.

This showed that learning using A PBL model Spin Wheel means has a high influence on the ability to understand concepts related to energy sources in high school. The effect size results were relatively high due to the use of trial classes. The PBL model is assisted by spin wheel media, which makes the learning process enjoyable. This research is in line with Yulianti and Gunawan (2019) who showed that the use of the PBL model has an impact on students' conceptual understanding and critical thinking. Amalida (2020) also stated the use of the PBL model influenced students' greater understanding of scientific concepts and teacher and student activities.

Students Responses were Positive to a PBL Model Assisted by Spin Wheel Media

Analysis of student responses to science learning using the PBL model assisted by Spin Wheel media shows a positive response. This is shown by the overall results of the student questionnaire responses with an average of 93% with very high criteria.

Based on student responses related to student learning experiences through the Spin Wheel that supports the PBL model. From the 4 indicators, the satisfaction indicator got the highest percentage, namely 99%, learning is more fun, learning is not stressful, can provide benefits and does not make students bored. From these 4 indicators, the low one is the self-confidence indicator with a percentage of 87% of students who are not confident to express opinions but learning is more useful for students and they can answer questions given by the teacher. This research is in line with the opinion of Nugraha et al. (Nini, 2019) who explained that students' positive responses can be used as a benchmark that students feel more comfortable with the learning media used in the learning process. Hadijah (2018) also explained

that learning media can provide a positive response to learning by using learning models and media.

CONCLUSION AND SUGGESTIONS

Based on the results and discussion in the previous chapter can be concluded that: (1) there were differences in the students' conceptual understanding abilities by using the PBL model assisted by Spin Wheel media with students using the conventional method of energy sources material with the result $t_{count} > t_{table}$, namely 3.5146 > 2.004; (2) PBL model assisted by Spin Wheel media had a high influence on the student's conceptual understanding abilities on energy sources material with an effect size of 0.967; (3) students response were positive to the PBL model assisted by Spin Wheel media on energy sources material with the percentage of 93%, very high criteria. So, there was an influence PBL model assisted by spin wheel media on students' conceptual understanding ability on energy sources material.

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