TRANSPUBLIKA INTERNATIONAL RESEARCH
IN EXACT SCIENCES
(TIRES)
VOLUME 1 ISSUE 1 (2022)

THE EFFECTIVENESS OF THE CHILDREN LEARNING IN SCIENCE (CLIS) LEARNING METHOD IN IMPROVING PHYSICS CONCEPT UNDERSTANDING

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Abstract

Physics learning in the classroom has a number of challenges, including a reliance on the Direct Instruction (DI) model, a lack of innovation on the part of the teacher, and a high student paradigm of memorizing formulas. As a result, The DI model currently in use is still centered on teachers who employ the lecture technique and do not fully engage students in the learning process. Therefore, it is necessary to develop a learning model that encourages students to be more active and to be more directly involved in the learning process in order to overcome these difficulties. This research aims to analyze the effectiveness of the Children Learning in Science (CLIS) learning method in improving physics concept understanding 9th grade students of SMP N 23 Malang. This quantitative research design was using the Pre-test and Post-test Control Group Design, in the research design both the control class and the experimental class were applied and only the experimental group received X treatment. The research population was all 9th grade students of SMP N 23 Malang. The sample collection technique used by the researcher is the Cluster random sampling technique. The finding reveals that the CLIS learning model has a significant effect on comprehending the concept of Physics in magnetic materials, as evidenced by the Pretest and Posttest results ranging from 47,83 to 80,16 on the Pretest and Posttest. In addition, the results of the Effect Size test, which obtained a result of 1,05, demxnstrate the validity of the findings.

Keywords: *Physics Learning, Learning Method, Children Learning in Science (CLIS)*

1. INTRODUCTION

In the classroom, physics learning is hampered by a number of issues, including learning that is based on the Direct Instruction (DI) model, a teacher's lack of creativity, and a high student paradigm of memorizing formulas (Wulandari et al., 2021). The DI model currently in use is still centered on teachers who employ the lecture technique and do not fully engage students in the learning process. Furthermore, students only pay attention to the material that is delivered by the teacher when using this method. This issue is created by the teacher's inability to comprehend the content that will be taught to the students. Students get disinterested and do not comprehend the information that has been provided as a result of this situation (Setiawan & Rusmana, 2018). Therefore, it is necessary to develop a learning model that encourages students to be more active and to be more directly involved in the learning process in order to overcome these difficulties. After improvements in model quality have been made, students should be able to shift their perception that learning Physics is not just about remembering formulas, but rather that students must understand a concept presented in the material before they can solve a problem (Sadiqin et al., 2017).

Understanding the concept of education by the competence of a qualified instructor aids in the formation of physics by the pupils themselves. In this situation, the teacher serves as a facilitator during the learning process, allowing students to gradually progress toward grasping the topic. According to Andrayani's research, students in science learning are more involved since the teacher serves as a facilitator using the CLIS paradigm (Andrayani, 2018). Meanwhile, based on Asrori's research, the CLIS model can significantly improve test results from 70.14 to 82.59 (Wibawa et al., 2020a). Then according to Arisantiani et.al, this method has also been able to increase the average value of learning outcomes by 69.43 to 76.02. The application of this model is able to improve the quality of student understanding and is evidenced by an increase in evaluation (Windarwati, 2017).

Students' awareness of concepts must be stressed, and this must be accomplished in an entertaining manner that does not include any dull parts. According on the findings of Ambarwati et al research, this model is believed to be capable of overcoming the issues listed above. By putting greater emphasis on students, it allows them to express their opinions and ideas more freely, allowing the concepts they have learned to stick in their minds for a longer period of time after they have been learned. The application of the CLIS model in learning to see its effect on grasping the concept is still rarely done. Consequently, researchers use this method to improve the quality of the learning process, which has an impact on students' conceptual understanding, so that case studies on conceptual understanding experienced by students no longer serve as a barrier to students' progress through the physics learning process.

2. RESEARCH METHOD

The research approach is quantitative, the type of research used is true experimental, namely at the time of implementation the researcher is able to monitor all external variables that have an influence on the research experimental stage (Asrori et al., 2020). The research design was the Pre-test and Post-test Control Group Design, in the research design both the control class and the experimental class were applied and only the experimental group received X treatment. The research population was all 9th grade students of SMP N 23 Malang.

The sample collection technique used by the researcher is the Cluster random sampling technique. To begin, a normality test was done before by using Lilliefors and a homogeneity test using the Barlett test to ascertain whether the samples come from similar variants. From the results of the Barlett test, the samples were normally distributed. Then continued by doing a lottery, then IX A class as the experimental class with the application of the CLIS learning model and IX B class as the control class using the conventional model was obtained (Andrayani, 2018).

The analysis technique was carried out using a comparison of the test results of the control class and the experimental class. The data obtained from the experimental class and the control class were processed and analyzed in order to respond to the problem formulation and research hypotheses. However, before analyzing the data, the researcher first needed to test for normality and homogeneity. Then proceed with the submission of hypotheses, namely N-Gain, T-test, and Effect Size.

3. RESULT AND DISCUSSION

3.1. Research Result

The sample in this study was selected using a cluster random sampling technique, this actively demonstrate that the sample was selected using a lottery. Then the class that became the experimental class was obtained, namely IX A class with a total of 30 students, and a class that became the control class, namely IX B class with a total of 27 students. The results of the pretest-posttest control class and experimental class were obtained from giving direct questions about students' understanding of the concept of magnetism discussion material.

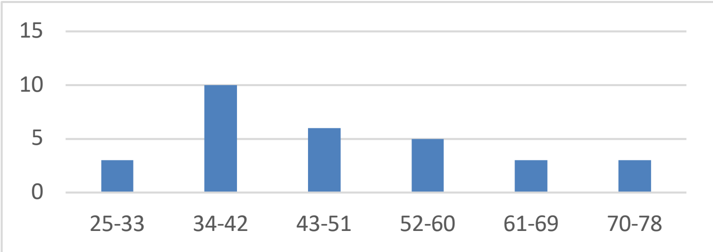

Figure 1 Frequency Distribution of Experimental Class Pretest Results

Based on Figure 1, it can be seen that the pretest scores of students' answers are in the interval between 25-33, 61-69, 70-78 each has 3 student intervals, while an interval of 34-42 as many as 10 students, with an interval of 43-51 as many as 6 students, and an interval of 52-60 as many as 5 students.

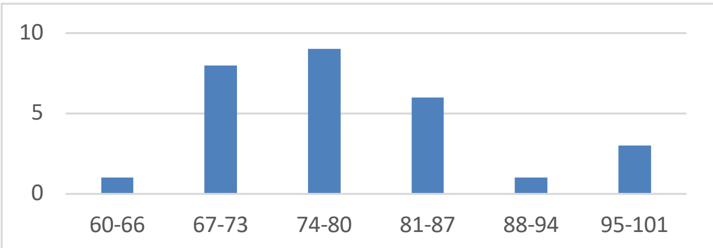

Figure 2 Frequency Distribution of Experimental Class Posttest Results

Based on Figure 2, it can be seen that the posttest scores of students' answers are in the interval between 60-66, 88-94, namely the interval of 1 student respectively, at the interval of 67-73 as many as 8 students, at the interval of 74-80 as many as 9 students, while at the interval of 81-87 as many as 6 students and the interval 95-101 as many as 5 students.

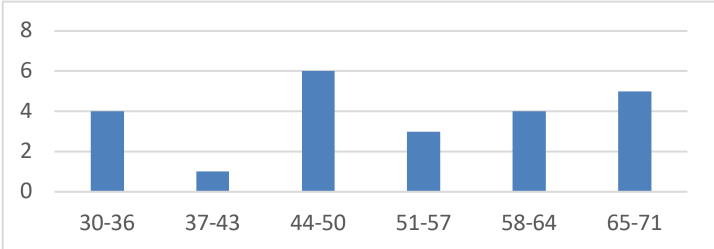

Figure 3 Frequency Distribution of Control Class Pretest Results

Based on Figure 3, it can be seen that the pretest scores of students' answers are at intervals between 30-36, 58-64, namely 4 students respectively, at intervals of 37-43 only 1 student, at intervals of 44-50 as many as 6 students, while at intervals of 51-57 as many as 3 students and the interval 65-71 as many as 9 students.

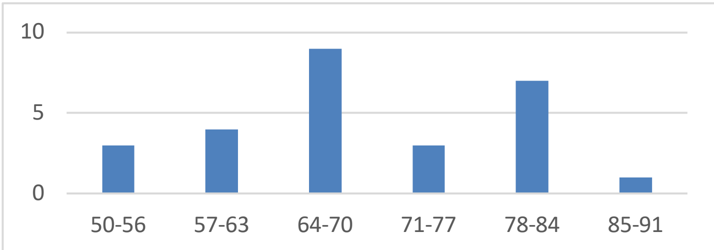

Figure 4 Frequency Distribution of Experimental Class Pretest Results

Based on Figure 4, it can be seen that the posttest scores of students' answers at intervals between 50-56, 71-77, namely 3 students respectively, at intervals of 57-63 as many as 4 students, at intervals of 64-70 as many as 9 students, while at intervals of 78-84 as many as 7 students and the interval of 85-91 only 1 student.

3.1.1. Data analysis

1) Normality test

Table 1 Normality Test Results

Class		N	$Ls_{statistic}$	L_{table}	Interpretation
Experiment Class	Pretest	30	0,156	0,159	Experiment Class
	Posttest	30	0,149	0,159	Experiment Class
Control Class	Pretest	27	0,121	0,166	Control Class
	Posttest	27	0,104	0,166	Control Class

Based on Table 1, it can be seen that the results of the pretest-posttest normality test of the experimental class and the pretest-posttest of the control class resulted in a significant value of Lstatistic and Ltable. Thus, it can be said that the data is normally distributed.

2) Homogeneity Test

Table 2 Pretest Homogeneity Table

Sample	S	s^2	N	Dk= N-1
Experiment Class	13,88	192.65	30	29
Control Class	13,39	179.29	27	26

$$f_{\text{statistic}} = \frac{192{,}65}{179{,}29} = 1{,}07$$

From the test results, it is known that the results of the homogeneity test of the sample using the formula for the different variance test obtain a significant value of 1,07 < 1,91. Therefore, it can be said that the data has a homogeneous variance.

Table 3 Table of Posttest Homogeneity

Sample	S	s^2	N	Dk= N-1
Experiment Class	9.87	97.41	30	29
Control Class	10.41	108.36	27	26

$$f_{\text{statistic}} = \frac{108{,}36}{97{,}41} = 1{,}11$$

From the test results, it is known that, the results of the homogeneity test of the sample using the different variance test formula obtain a significant value of 1,11 < 1,91. Therefore, it can be said that the data has a homogeneous variance.

3) Hypothesis testing

Table 4 T-Test Experiment Class

	Experiment Class	Control Class
	Posttest	*Posttest*
X	80,17	69.44
S	13.88	13.39
s^2	192.65	179.29
N	30	27

$$\text{t statistic} = \frac{X1 - X2}{\sqrt{\frac{(n_1 - 1)s_1^2 + (n2 - 1)s_2^2}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$= \frac{80{,}71 - 69{,}44}{\sqrt{\frac{(30 - 1)(13{,}88)2 + (27 - 1)(13{,}39)2}{30 + 27 - 2}\left(\frac{1}{30} + \frac{1}{27}\right)}}$$

$$= \frac{10,73}{\sqrt{\frac{(29)(192,65) + (26)(179,29)}{55}\left(\frac{1}{30}+\frac{1}{27}\right)}}$$

$$= \frac{10,73}{\sqrt{\frac{5586,85 + 4661,54}{55}(0,06)}}$$

$$= \frac{10,73}{\sqrt{11,18}}$$

$$= \frac{10,73}{3,34} = 3,21$$

Based on the results of the pretest-posttest calculations for the experimental class and the control class, the t-test value was 3,21 with a significance level of 5%, and the effect size test was 1,05. Therefore, the hypothesis : and : the existence of t-statistic > t-table means rejecting and accepting . Thus, it can be concluded that there is a significant influence on the learning process of students' understanding of Physics concepts using the CLIS model.

3.2. Discussion

In this study, there were two groups selected at random, IX A class was selected as the treatment group (X) who received learning using the CLIS model, while IX B class as the control group did not receive treatment. The learning process uses a conventional model. Based on previous researchers, the use of the control class was carried out to compare the learning outcomes obtained by the control class using the conventional model with the experimental class using the CLIS learning model (Mursalin et al., 2016).

The learning process is carried out equally, namely 3 meetings for each class, the class which during the learning process applies the CLIS model, namely the experimental class, and the class which in the learning process applies the conventional model (not using the CLIS model), namely the control class. The instrument for measuring conceptual understanding used in this study was 10 multiple choice questions. Based on the results of descriptive statistical calculations, the average pretest-posttest scores of control class students were 52,03 and 69,44 with standard deviations of 13,39 and 10,40. However, after the experimental class finished learning using the CLIS learning model, it was seen that there was an increase in the average pretest-posttest score of the experimental class which was higher than the control class. It can be seen that the average pretest-posttest scores of the experimental class students were 47,83 and 80,16, with standard deviations of 13,87 and 9,86. This shows that there is a very high influence of the CLIS learning model on students' understanding of physics concepts.

The level of students' understanding of the magnetic material can not only be seen through the scores of the pretest and posttest results, but can also be seen from the achievement of the concept understanding indicators which can be seen in Figure 5. The difference in points of the experimental class and control class students from the three indicators (recognize, differentiate, and analyze). Indicators of understanding the concept of students' ability to recognize indicators (CI) in questions number 1, 4, and 9, students are expected to be able to recognize objects related to magnetism that are known and asked on questions given simultaneously with topics that have been discussed and taught regularly in full and clear. Based on Figure 5, the highest recognition indicator (CI) was obtained in the experimental class with 83.0% criteria, while the lower control class was 71.48%.

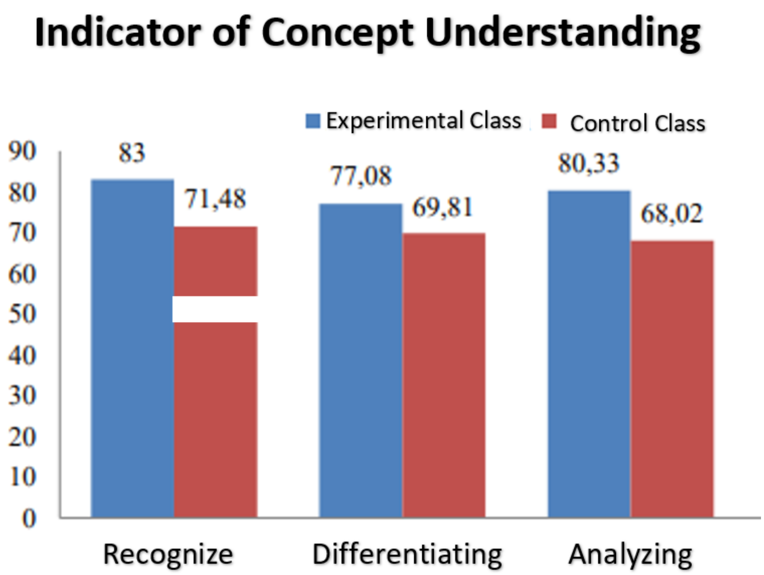

Figure 5 Indicators of Concept Understanding

On indicators of understanding the concept of students' ability to distinguish indicators (C2) in questions number 3, 5, 7 and 8, students are expected to be able to distinguish which materials are included in magnetism, magnetic properties and types of magnetism. Based on figure above, the highest differentiating indicator (C2) was obtained by the experimental class, namely 77.08% while the lowest control class was 69.81%. In the indicator of understanding the concept of students' ability on the indicator of analyzing (C3) on questions number 2, 6, and 10, students are expected to be able to analyze and solve calculation problems using formulas and concepts that have been conveyed by the teacher. Based on Figure above, the highest analytical indicator (C3) is found in the experimental class, which is 80.33%, while the control class is lower at 68.02%. From the results of the analysis, it is known that the understanding of the concepts of 9th grade students is the highest, namely the results of the experimental class on the indicators of recognizing, distinguishing and analyzing. Based on these events, the researchers concluded that the average value of understanding the concepts of the students in the class that received treatment was higher, while the class that did not receive the treatment had a lower value of understanding the concept.

Furthermore, the researchers conducted an analysis to draw conclusions and answer the hypothesis. The analysis used by the researcher is N-Gain, t test, and Effect Size. Before the researcher tested the three variables, the researcher first carried out a hypothesis prerequisite test to see whether the data was homogeneously distributed or not, as well as for the normality of the data. To see if there are differences in students' conceptual mastery of the pretest-posttest scores in the experimental class and pretest-posttest in the control class, the researcher used the N-Gain test, after carrying out the N-Gain test, the difference in the pretest-posttest scores between classes was 0,61 in the medium category. Furthermore, to see the difference in the average of the research sample using the t-test, after testing, the results of the t-test are 3,21 while the t-table is 2,004, to see the magnitude of the effect of a variable, the researcher uses Effect Size testing and based on the test results, a value of 1,05 is obtained which indicates the high category. Based on the results of the analysis, it can be seen that the CLIS learning model has a significant influence on students' understanding of physics concepts.

Based on the calculation of data analysis, it can be concluded that there is a significant effect of applying the CLIS learning model on students' understanding of physics concepts. This conclusion is reinforced by the results of previous relevant studies, namely based on previous research the CLIS model can significantly improve test results from 20,17 to 22,30 (Wibawa et al., 2020b). This model has also been able to increase the average value of learning outcomes from 69,43 to 76,02. The application of this model is able to improve the quality of student understanding and is proven by an increase in evaluation (Laili et al., 2015; Mala et al., 2019; Nurseha & Darsikin, 2015; Windarwati, 2017). The results of previous studies showed that the percentage of students' conceptual understanding increased after students received treatment with the CLIS learning model.

4. CONCLUSION

To sum up everything that has been stated so far, the CLIS learning model has a significant effect on comprehending the concept of Physics in magnetic materials, as evidenced by the Pretest and Posttest results ranging from 47,83 to 80,16 on the Pretest and Posttest. In addition, the results of the Effect Size test, which obtained a result of 1,05, demonstrate the validity of the findings.

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