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The Effect of a Jigsaw Type Cooperative Learning Approach Towards Primary Students' Understanding Concepts of Science Learning in Primary Schools

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Abstract: This research is based on the results of observations and interviews at SD Al-Hikmah Indonesia that the learning carried out is still limited due to time so that only the target of material completion is pursued, while the achievement of learning outcomes and students' understanding of concepts is still lacking. Learning is only student-centered. For this reason, there is a need for appropriate and effective methods in learning. Therefore, researchers tried to use a jigsaw type cooperative learning approach to overcome this problem. This research uses a pretest-posttest control group design, data collection techniques using test and non-test data. Test data was obtained from pre-test and post-test results, while non-test data was obtained from questionnaires. This research took as subjects students of class IV A and students of class IV B. In this research three meetings were held which included pre-test, learning and post-test. After applying this approach, the average gain for the experimental class was 0.49 and the control class was 0.25. The results of the research show that there is an increase in students' post-test results in learning using the jigsaw type cooperative learning approach. So it can be concluded that there is an influence of this approach on science learning on the subject of natural resources. The results of this research are recommended as a reference for further research, especially research that uses a jigsaw type cooperative learning approach in learning natural resources in order to improve students' understanding of concepts better in the future.

Keywords: Jigsaw cooperative learning; Science learning; Understanding concepts

Introduction

Cooperative learning is teaching and learning that emphasizes shared attitudes or behavior in working or helping others in an orderly cooperative structure within a group, consisting of two or more people (Juhri, 2021; Khan et al., 2020; Torabi et al., 2022). In this case, the success of the group and its individual members is greatly influenced by the involvement of each member of the group itself.

The cooperative learning model has the assumption that to achieve maximum results in learning (Hasanah & Himami, 2021), students need to be at least part of a cooperative system in a group. In this way, learning success is not obtained solely from the teacher, but also from other parties involved in learning, especially students. The other parties mentioned above can also have a broader meaning, for example peers, peer groups, etc.

Jigsaw type cooperative learning is learning that consists of a group of experts who must master the material provided by the teacher and then the expert members must take responsibility for it by presenting it to all group members (Billa et al., 2023; Putra, 2021). According to Sidney et al. (2024) the relationship between the home group and the expert group is

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described by Figure 1. The first stage of this learning is that students are grouped into small groups. Jigsaw type cooperative learning, the first stage is that each group member is assigned to study certain material (Abdullah, 2017; Handayani, 2020; Lubis & Harahap, 2016). Next, the teacher provides the theme, text, information or materials to the class and helps students understand why they are studying that theme.

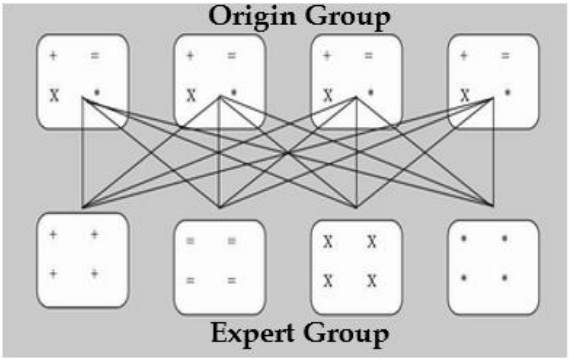

Figure 1. Illustration of jigsaw group

Second stage, students are regrouped to form expert groups (Pohan, 2023). Students or representatives from their respective groups meet with members of other groups who study the same material with the help of learning media and student worksheets provided by the teacher. Next, the material is discussed, studying and understanding each problem encountered so that the representative can understand and master the material.

The third stage, each member of the expert group returns to their original group. Then each group member explains to their group friends so that their group friends can understand the material assigned by the teacher. At this stage students will encounter many problems with varying levels of difficulty. In this activity, the teacher acts as a facilitator who directs and motivates students to learn independently and fosters students' sense of responsibility towards their group.

The fourth stage, students are given a test/quiz, this is done to find out whether students can understand the material. In this way, implementing the jigsaw learning model in the learning process can actively involve students so that students can understand problems and solve them in groups.

The advantages and disadvantages of the Jigsaw type cooperative learning approach according to Sudrajat et al. (2024) are: the advantages of the jigsaw type cooperative learning model; provide greater opportunities for teachers and students to provide and receive the lesson material being delivered. teachers can provide all the creativity of teaching abilities; students can be more communicative in conveying the difficulties they face in studying the material; students can be more motivated to support and show interest in what their teammates are learning.

Disadvantages of jigsaw type cooperative learning: requires longer and more complex preparation, for example the preparation of the original group and expert group whose seats will later change; and requires greater funds to prepare learning devices.

Method

This research uses an experimental approach with a "Control Group Pretest-Posttest Design" design (Garcia, 2021; Halim et al., 2020), namely one group of subjects as the experimental group and the second group as the control group (Shakerian et al., 2020). The experimental group used inquiry learning, while the second group used conventional cooperative learning. This research involves independent (inquiry approach) and dependent variables (understanding of natural science concepts). The place where this research was carried out was at SD Al-Hikmah Indonesia. This school is located in Cikampek District, Karawang Regency. This research activity as a whole was carried out for 5 months, from February 2013 to June 2013. The subject population was all students in the Al-Hikmah Indonesia Elementary School class. As with the design used in this research, 2 class groups were selected from class IV, namely group A and group B. Then the two groups were randomly selected to determine the experimental class and the control class. After random selection, group A was obtained as the experimental class and group B as the control class (Ramadhan & Sulaiman, 2023).

Result and Discussion

Before the approach to be researched was carried out, students in the experimental class and control class were given pre-test questions about understanding concepts, which then used the pre-test results as the researcher's initial data. This is done to determine students' initial understanding of concepts. When carrying out the pretest in accordance with the teacher's directions, the pretest questions are adjusted to the subject matter that will be discussed. After carrying out descriptive calculations of pretest data in both classes, the lowest score, highest score, average score (mean), variance and standard deviation (standard deviation) were carried out in each class (Bahri & Mustajab, 2020; Laia, 2023). The results of descriptive calculations of pretest data for the experimental class and control class as shown in Figure 1.

These results provide an illustration that the average initial concept understanding abilities of students in the experimental class and the control class are different. However, whether the average conceptual

understanding ability of students in the two classes is significantly different or not, testing will be carried out at a significance level of 5% to determine this, inference calculations will be carried out.

The normality test decision making criteria are as follows: if the significance value is smaller than 0.05 then it is rejected; and if the significance value is greater than or equal to 0.05 then it is accepted.

Table 1. Descriptive Statistics of Pretest Data

Class	N	Min	Max	Sum	Mean	Std. Deviation	Varian
Experiment	21	8	19	15.48	15.29	3.052	9.314
Control	21	5	19	13.16	13.05	4.248	18.048

Table 2. The Output Data from the Shapiro-Wilk Normality Test Analysis

Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	Df	Sig.
Experiment	0.189	21	0.048	0.911	21	0.058
Control	0.160	21	0.169	0.941	21	0.224

a. Lilliefors Significance Correction

Based on Table 2, the significance values obtained for the experimental class and control class are 0.58 and 0.224 respectively. The significant value is more than 0.05, so it is based on the decision that it is accepted. So it can be concluded that the two samples are from a normally distributed population. Because both samples had a normal distribution, a homogeneity test was carried out.

The hypothesis in this research is as follows: H_0 = Sample data has a homogeneous population variance; H_1 = Sample data has a population variance that is not homogeneous

The decision making criteria for the homogeneity test are as follows: if the significance value is smaller than 0.05 then it is rejected; and if the significance value is greater than or equal to 0.05 then it is accepted.

Because the sig of 0.075 is greater than 0.05, the variance of the two classes is homogeneous. Therefore, the analysis was continued with the t test to determine the similarity of the pretest averages for the experimental class and the control class.

Table 3. The Results of the Homogeneity Variance Test

Levene Statistic	df1	df2	Sig.
3.333	1	40	0.075

The hypothesis to be tested is: H_0= There is no difference in the average initial ability to understand the concepts of experimental class and control class students; and H_1= There is a difference in the average initial ability to understand the concepts of students in the experimental class and the control class.

The decision making criteria are as follows: if the significance value is smaller = 0.025 then it is rejected; if the significance value is greater than or equal to = 0.025 then it is accepted.

Table 4. The Results of the Similarity Test of the Two Pretest

		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Pretes value	Equal variances assumed	1.961	40	0.057	2.238	1.141	-0.069	4.545

With a=0.05 then = 0.025. Because the variants are the same, sig is used. (2-tailed) for equal variance assumed. From the table it can be seen that sig. (2-tailed)= 0.057 > so that both classes have the same initial conditions for students' understanding abilities. Next, post-test data can be carried out.

Based on the analysis of post-test data, it was concluded that the initial understanding of experimental class and control class students had relatively the same results. So to find out whether there is an effect of using the jigsaw type cooperative learning approach on students' conceptual understanding, post-test data was used. Post-test data was obtained from the results of students' final tests after receiving treatment, namely tests of students' conceptual understanding in both the experimental class and the control class.

Table 5. The Descriptive Data Analysis of the Posttest Results for the Experimental and Control Class

Class	N	Min	Max	Sum	Mean	Std. Deviation	Variance
Experiment	21	12	38	27.06	26.86	7.761	60.229
Control	21	7	35	19.25	19.43	7.600	57.757

The Table 5 shows that the average post-test score for the experimental class was 26.86 and for the control class was 19.43. Meanwhile, the variance in the experimental class was 60.229 with a standard deviation of 7.761, while in the control class it was 57.757 with a standard deviation of 7.600. This shows that the average posttest score for the experimental class is higher than the control class. Mathematical testing can be done using: post-test data normality test; post-test data homogeneity test; and equality of two post-test averages.

Table 6. The Results of the Normality Post Test

Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Experiment	0.132	21	0.200*	0.949	21	0.325
Control	0.129	21	0.200*	0.966	21	0.653

*. This is a lower bound of the true significance
a. Lilliefors Significance Correction

The decision making criteria of the normality trial are as follows: if the significance value of the Shapiro-Wilk test is less than 0.05 then it is rejected; and if the significance value of the Shapiro-Wilk test is equal to or smaller than 0.05 then it is accepted.

From the normality results table above, with the Shapiro-Wilk test and a 95% confidence level, namely a = 0.05, the experimental sig = 0.325 and control sig = 0.653 so that the two classes are normally distributed. After the normality test was carried out, the post-test data was continued with the homogeneity of variance test.

Table 7. The Results of the Homogeneity Test

Levene Statistic	df1	df2	Sig.
0.296	1	40	0.589

Because Sig = 0.589 > then the variance of the two classes is homogeneous. Therefore, data analysis can be continued by testing the similarity of the two posttest averages for both classes.

Table 8. The Results of the Similarity Test of the Two Post-Test

						t-test for Equality of Means	
	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Equal variances assumed	3.134	40	0.003	7.429	2.370	2.638	12.219

With a=0.05 then = 0.025. Because the variants are the same, Sig is used. (2-tailed) for equal variances assumed. From the table of results of the similarity test of two averages, it is found that Sig. (2-tailed) = 0.003 < means rejected so that the two classes have different post-test averages.

Apart from the pretest and posttest results, quantitative data can also be obtained from the gain of each class. The gain in question is the normalized gain. In finding the gain for the two classes, researchers used manual calculations. The conclusions from the gain calculation are as follows:

Table 9. Normalized Gain Data Statistics

Class	Mean	N	Criteria
Experiment	0.49	21	Medium
Control	0.25	21	Low

Based on Table 9, the results show that the Normalized Gain or normalized gain is different between the experimental class and the control class. The mean of the experimental class was 0.49 while the control class was 0.25. So it can be concluded that there is an influence of the Jigsaw type of Cooperative Learning approach on students' understanding of concepts.

Overall, learning using the jigsaw type cooperative learning approach went smoothly and smoothly (Paliling et al., 2024; Purwanty et al., 2020; Rahmawati et al., 2022). In non-test data analysis, it is in the form of observations. The observation results concluded that overall students were active in participating in learning (Gandasari et al., 2020; Widianingsih, 2020). Students are motivated to answer the problems given by the teacher. Students also actively discuss with their groups. But in terms of opinions, students are very poor because they listen more to the teacher and discuss with their group. Students also still have difficulty participating in learning with jigsaw type cooperative learning (Kurniawan et al., 2024; Maison et al., 2021). However, if it is concluded that overall from pre-test to post-test there is development as expected from each student in

participating in learning. Learning from start to finish can be concluded that learning is smooth and conducive (Degeng et al., 2022; Walmiati, 2021).

Conclusion

Students' responses to learning using the cooperative learning approach are very positive. This can be seen from the questionnaire given to students. It can be seen that students are happy with learning in groups because it is easier to overcome existing problems. Students also do not feel bored with group learning , they are more motivated to take part in learning. Students respond that this learning is interesting and not boring, students look enthusiastic in carrying out this learning even though they have only just used the jigsaw method. Students' initial ability to understand concepts at the start of learning between the experimental class and the control class can be seen from the average pretest results, namely the pretest average for the experimental class is 15.28 and the control class is 13.04. The learning results after using the jigsaw type cooperative learning approach can be seen from the average post-test results between the experimental class and the control class, namely the average post-test for the experimental class was 26.85 and the control class was 19.42. From these results it can be seen that there is an improvement after learning. Meanwhile, from the measurement results of the gain or normalized gain analysis to see the differences in the jigsaw type cooperative learning approach, namely the experimental class obtained an average value of 0.49 and was included in the medium category, while the control class obtained an average value of 0.25 and included in the low category. From this category, it can be concluded that the use of the jigsaw type cooperative learning approach is different from the conventional approach in understanding elementary school students' concepts in natural resource science learning. The jigsaw type cooperative learning approach has an influence on elementary school students' understanding of concepts in initial science learning, although it is not significant.

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The authors declare no conflict of interest.

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