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The Effectiveness of the Guided Inquiry Learning Model and Jigsaw Towards Students' Natural Science Outcomes in Grade 4 Elementary School Gugus Pangeran Diponegoro, Demak District

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Abstract

The results of this study are: 1) the guided inquiry learning model is more effective than the conventional model on the science learning outcomes of grade IV students on the material properties of light in the Prince Diponegoro Cluster, Demak District, as evidenced by the t-test, namely the t-hit value of 4.722. Because the value of $t\text{-}_{hit} > t\text{-}_{tab}$ (4.722 >2.005) means that H_o is rejected and H_a is accepted, so hypothesis 1 is accepted, 2) the jigsaw learning model is more effective than the conventional model on the science learning outcomes of fourth grade students on the material properties of light in the Prince Diponegoro Group, Demak District, as evidenced by the t test, namely the t-hit value of 5.572. Because the value of $t\text{-}_{hit} > t\text{-}_{tab}$ ((5.572 >2.018) means H_o is rejected and H_a is accepted, hypothesis 2 is accepted, 3) the jigsaw learning model is more effective than guided inquiry on the science learning outcomes of fourth graders on the material properties of light in the Prince Diponegoro Group, Demak District, as evidenced by the t-test, namely the t-hit value of 2.571. Because the value of $t\text{-}_{hit} > t\text{-}_{tab}$ (2.571 >2.003) means that H_o is rejected and H_a is accepted, so hypothesis 3 is accepted.

Keywords: Guided inquiry, jigsaw, learning outcomes

INTRODUCTION

Reforms in the field of education through efforts to improve the quality of education in the hope of increasing human dignity (Aakvik et al., 2010). These reforms can be achieved through the application of innovative and effective learning. As educators, we need to make various reform efforts in order to achieve learning objectives. These various efforts can be in the form of renewal of teaching methods, learning innovations, assessment systems, learning atmosphere, learning models and learning media (Nadarajah & Sivakumaran, 2021). Meaningful learning can be obtained if children learn according to their social environment.

According to the results of interviews and observations with the fourth-grade teacher of Public Elementary School Gugus Pangeran Diponegoro, it turns out that there are still many students who do not understand the material properties of light, resulting in low student learning outcomes. This is because the learning process carried out by teachers currently tends to achieve the target curriculum material, more concerned with memorizing not understanding the material. Delivery of subject matter where students just sit, take notes, and listen to what is being said and there are few opportunities for students to ask questions. So that the learning atmosphere is not conducive and students become passive.

According to research from Juhji (2016) students being passive may occur due to the use of inappropriate learning approaches or learning models applied by teachers in teaching. This is in line with research from Fong et al. (2021) which states there have been considerable efforts to describe, examine, and foster the strategies students use while learning. Defined as thoughts, behaviors, beliefs, or emotions that facilitate knowledge acquisition, learning strategies play an essential role in students' achievement.

The learning process is a complex outcome, students determine whether or not the learning process occurs. The teacher acts as a guide and mentor, while the one who drives the process comes from the students (Zokirovna, 2020). Thus, teachers need to apply a learning model approach that directs students to play an active role, so that they are able to develop science process skills such as observing, classifying, predicting, measuring, concluding, and communicating (Arora & Srinivasan, 2020).

Conceptual framework

The learning method that has been used by teachers so far is a conventional model that tends to be teacher-centered, without involving student activities so that students are not taught a learning model that can understand how to learn, think and motivate themselves (Rabindarang, 2020). Learning with conventional models has certain characteristics, namely not contextual, not challenging, passive, and the learning materials are not discussed between teachers and students. So that it makes students less enthusiastic and less enthusiastic in participating in learning in class, this of course can result in student learning outcomes to be decreased (Triyanti et al., 2021).

Based on the results of interviews from researchers, it is necessary to carry out renewal in learning so that it can create an active, innovative, creative, and fun learning atmosphere for students. By applying the guided inquiry learning model and the jigsaw learning model applied in the learning process in the classroom, it is expected to improve science learning outcomes.

Research objectives

This study aims to: 1) analyze the effectiveness of the use of guided inquiry learning models compared to conventional models on science learning outcomes on the material properties of light for class IV Public Primary School Gugus Pangeran Diponegoro, 2) analyze the effectiveness of using jigsaw learning models compared to conventional models on science learning outcomes on material the properties of light in class IV Public Primary School Gugus Pangeran Diponegoro, 3) analyze the effectiveness of the guided inquiry learning model and the jigsaw learning model on the science learning outcomes of fourth grade students on the material properties of light in the Prince Diponegoro cluster, Demak District, Demak Regency.

METHODOLOGY

Research design

This research method uses a quantitative experimental approach. The experimental research method is used if the researcher wants to know the causal effect between the independent and dependent variables (Wiley et al., 2020). The research design used was a one-group pre0test and post-test design or one-group pretest-posttest design. This design involves one group being treated (treatment) and then the results are observed. The treatment as the independent variable and the result as the dependent variable (Alam, 2019). The characteristic in this design is that there is a pretest before being given treatment and a post-test after being given treatment. Thus, the results of the treatment can be known to be more accurate, because it can compare with the situation before being treated and after being given treatment (Tobi & Kampen, 2018). This study examines the effectiveness of the guided inquiry and jigsaw learning model on the science learning outcomes of grade 4 students.

Respondents of the study

The population in this study were all fourth-grade students in the Prince Diponegoro Cluster of Bidkikbud Korwil, Demak District, Demak Regency for the 2021/2022 academic year. The sampling

technique used in this research is purposive sampling (assessment sample). The sample of this study consisted of 3 classes in State Elementary Schools in the Prince Diponegoro Cluster Korwil Biddikbud, Demak District, Demak Regency, namely Public Elementary School No. 1 Kadilangu which is experimental class 1 with guided inquiry learning model, Public Elementary School No. 10 Bintoro which is experimental class 2 with jigsaw learning model, and Public Elementary School No. 2 Kadilangu which is control class with conventional model. The objects studied are the fourth-grade students of Public Elementary School No. 1 Kadilangu totaling 35 students, Public Elementary School No. 10 Bintoro totaling 23 students, and Public Elementary School No. 2 Kadilangu totaling 21 students.

Research data collection techniques through tests. The test instrument used by the researcher is a multiple choice test question with 4 answer choices. This test is used to determine the extent of student learning outcomes with the application of guided inquiry and jigsaw learning models. Pre-test questions are given to measure initial ability before applying the guided inquiry and jigsaw learning model. Furthermore, post-test questions were given to measure student learning outcomes after applying the guided inquiry and jigsaw learning model in learning (Sulfemi & Kamalia, 2020).

This study uses two variables, namely the independent variable (dependent) and the dependent variable (independent). The independent variable (dependent) in this study is the guided inquiry learning model and the jigsaw and the dependent variable (independent) in this study is the result of learning science (Mishra & Min, 2010). The statistical test analysis used was the normality test (Shapiro-Wilk), homogeneity test, and to test the hypothesis, the independent sample t-test was used with the help of the IBM SPSS 22 for Windows program.

FINDINGS AND DISCUSSION

This research was carried out on fourth grade students in 3 elementary schools in the Diponegoro Prince Cluster, namely at Public Elementary School No. 1 Kadilangu, Public Elementary School No. 10 Bintoro, and Public Elementary School No. 2 Kadilangu which previously carried out instrument trials on fourth grade students at Public Elementary School No. 8 Bintoro and Public Elementary School No. 9 Bintoro. The three elementary schools were divided into experimental class 1 (guided inquiry), experiment 2 (jigsaw), and control class (conventional). The data of this study consisted of data from the pretest and posttest, in the experimental class and the control class.

The pre-test data was obtained from the results of the evaluation carried out before carrying out the learning. Post test data were obtained from the results of the evaluation carried out after carrying out the learning and after being given treatment. The pre-test and post-test data in the control and experimental classes were then analyzed by counting. The results of calculating the pre-test and post-test data are presented in Table 1.

Table 1. Student pre-test and post-test results

Parameter	Class Guided inquiry	Jigsaw Class	Control Class
Total students	35	23	21
Average Pre-Test Score	44.54	47.06	46.80
Average Post Test Score	61.62	72.94	78.52

Based on Table 1, it can be seen that the pre-test value for each class is the control class before being given treatment in the form of learning with the conventional model the average (mean) is 44.54, experimental class 1 average (mean) of 47.06 and experimental class 2 the average (mean) of 46.80. Shows the average value (mean) of the control class, experimental class 1 and experimental class 2 tend to be almost the same with no significant difference. Based on the class used for the research test, it means that students have the same ability before carrying out learning and before being given treatment. It can be seen that the post-test scores for each class, namely the control class, were given treatment in the form of learning with the conventional model, the average (mean) was 61.62, experimental class 1 average (mean) of 72.94 and experimental class 2 the average (mean) of 78.52. Shows the average value (mean) of the control class, experimental class 1 and experimental class 2 are not the same and there is

a significant difference. Based on the class used for the research test, it means that students have different abilities after carrying out learning and after being given treatment.

Data analyst prerequisite test

Normality test

Normality test is used to assess the data variables are normally distributed or not. The normality test in this study uses SPSS with the Saphiro-Wilk test normality test used if the sample size is ≤50.

Pre-test value normality test

The normality test was carried out on the pre-test data for the control class (conventional), the experimental class 1 (guided inquiry), and the experimental class 2 (jigsaw). The results of the normality test of the pre-test values can be shown in Table below.

Table 2. Pre-Test normality test results

Tests of Normality				
	Class	Shapiro-Wilk		
		Statistic	df	Sig
Natural science Pre-test score	Conventional Class	.958	21	.474
	Class Guided inquiry	.940	21	.216
	Jigsaw Class	.936	21	.184

Based on Table 2, the data obtained from the control class sig value with the conventional model is 0.474, experimental class 1 with a guided inquiry model of 0.216, and experimental class 2 with a jigsaw model of 0.184. In the results of the calculation with the normality test on the science pre-test value data, it can be concluded that the control class with the conventional model, the experimental class 1 with the guided inquiry model, and the experimental class 2 with the jigsaw model are normally distributed because the sig values for all classes >0.05.

Normality test of post-test values

The normality test was carried out on post-test data for the control class (conventional), experimental class 1 (supervised inquiry), and experimental class 2 (jigsaw). The results of the post-test normality test can be shown in Table 3.

Table 3. Post Test normality test results

Tests of Normality				
	Kelas	Shapiro-Wilk		
		Statistic	df	Sig
Natural science post-test score	Conventional Class	.930	21	.139
	Class Guided inquiry	.899	21	.034
	Jigsaw Class	.931	21	.144

Based on the table above, the data obtained from the control class sig value with the conventional model is 0.139; experimental class 1 with a guided inquiry model of 0.34; and experimental class 2 with a jigsaw model of 0.144. In the results of the calculation with the normality test on the science pre-test value data, it can be concluded that the control class with the conventional model, the experimental class 1 with the guided inquiry model, and the experimental class 2 with the jigsaw model are normally distributed because the sig values for all classes >0.05.

Homogeneity test

Homogeneity test is used to determine whether some of the population variants are the same or homogeneous. This test is carried out as a prerequisite in the analysis of the independent sample t test. It can be said to be homogeneous if the significance value is >0.05 then it can be said to be

homogeneous, homogeneous if the significance value is <0.05 then it can be said that it is not homogeneous.

Pre-test value homogeneity test

The normality test was carried out on post-test data for the control class (conventional), experimental class 1 (supervised inquiry), and experimental class 2 which used Jigsaw model.

Table 4. Results of homogeneity of pre-test values

Test of Homogeneity of Variances			
Natural science pre-test score			
Levene Statistic	df1	df2	Sig.
2.439	2	76	.094

Based on Table 4, the data obtained from the sig value in the pre-test value obtained the result of 0.094 while the sig table of 0.05. The sig. table value is 0.05, this means that all the data used in the science pre-test values in the three classes, namely the control class with the conventional model, the experimental class 1 with the guided inquiry model, and the experimental class 2 with the jigsaw model have the same variance or homogeneity. because sig. count > sig. table or 0.094 >0.05.

Homogeneity test of post-test values

Based on Table 5, the data obtained from the sig. value on the post-test value obtained the result of 0.062 while the sig. table of 0.05. The sig. table value is 0.05, this means that all the data used in the science post test scores in the three classes, namely the control class with the conventional model, the experimental class 1 with the guided inquiry model, and the experimental class 2 with the jigsaw model having the same variance or homogeneity, because sig. count > sig. table or 0.062 >0.05.

Table 5. Homogeneity test results of post-test values

Test of Homogeneity of Variances			
Natural science post-test score			
Levene Statistic	df1	df2	Sig.
2.878	2	76	.062

Research hypothesis test

The hypothesis test of this study using the t-test (independent sample t-test) was used to determine the difference in the average of two independent populations/data groups. The independent sample t-test was conducted to determine the difference in effectiveness in science learning outcomes using conventional models, guided inquiry learning models and jigsaw learning models on samples that had been treated. The results of the t-test on each hypothesis are as follows:

T-test of hypothesis 1

Based on Table 6. obtained the value of t_{hit} as big as 4,722. In the table with degrees of freedom of 54 ($df = N - 2 = 56 - 2$) and significance (α) 0.05 earned value t_{tab} as big as 2.005. Because value $t_{hit} > t_{tab}$ (4.722 >2.005) means H_o is rejected and H_a is accepted then hypothesis 1 is accepted. This means that there is a significant difference in effectiveness between the guided inquiry learning model compared to the conventional model on the science learning outcomes of 4th grade students of Elementary School Gugus Pangeran Diponegoro, Demak District, Demak Regency.

Table 6. t-test of hypothesis 1

Independent Samples Test		
Science learning outcomes	Levene's Test for Equality of Variances	t-test for Equality of Means

	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	6.658	.013	-4.722	54	.000	-11.31657	2.39637	-16.12101	-6.51213
Equal variances not assumed			-4.276	30.714	.000	-11.31657	2.64664	-16.71646	-5.91669

T-test of hypothesis 2

Based on Table 7, obtained the value of t_{hit} as big as 5.572. In the table with degrees of freedom of 42 ($df = N - 2 = 44 - 2$) and significance (α) 0.05 earned value t_{tab} as big as 2.018. Because value $t_{hit} > t_{tab}$ (5.572 >2.018) means H_o is rejected and H_a is accepted then hypothesis 2 is accepted. This means that there is a significant difference in effectiveness between the jigsaw learning model compared to the conventional model on the science learning outcomes of 4th grade students of Elementary School Gugus Pangeran Diponegoro, Demak District, Demak Regency.

Table 7. T-test of hypothesis 2

Independent Samples Test									
Science Learning Outcomes	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	1.244	.271	-5.572	42	.000	-16.89168	3.03156	-23.00962	-10.77373
Equal variances not assumed			-5.534	39.762	.000	-16.89168	3.05211	-23.06138	-10.72198

T-test of hypothesis 3

Based on Table 8, obtained the value of t_{hit} as big as 2.571. In the table with degrees of freedom of 56 ($df = N - 2 = 58 - 2$) and significance (α) 0.05 earned value t_{tab} as big as 2,003. Because value $t_{hit} > t_{tab}$ (2.571 >2.003) means H_o is rejected and H_a is accepted then hypothesis 3 is accepted. This means that there is a significant difference in effectiveness between the jigsaw learning model and the guided inquiry model on the science learning outcomes of 4th grade students of Elementary School Gugus Pangeran Diponegoro, Demak District, Demak Regency.

Table 8. T-test of hypothesis 3

Independent Samples Test		
Science learning outcomes	Levene's Test for Equality of Variances	t-test for Equality of Means

	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	1.181	.282	-2.571	56	.013	-5.57511	2.16823	-9.91860	-1.23161
Equal variances not assumed			-2.435	38.623	.020	-5.57511	2.28929	-10.20709	-.94312

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of research and discussions that have been carried out, it can be concluded that the guided inquiry learning model is more effective than the conventional model on science learning outcomes as evidenced by the value of $t\text{-}_{hit} > t\text{-}_{tab}$ (4.722 >2.005) and the difference in the average value of pre-test and post-test there is an increase of 17.08 in the conventional class and 25.88 in the guided inquiry class showed that the learning outcomes using the guided inquiry model were better than the conventional model. Because the guided inquiry learning model can train students' activeness, they can construct their own knowledge, and in learning students still get guidance from the teacher.

The jigsaw learning model is more effective than the conventional model on science learning outcomes as evidenced by the value of $t\text{-}_{hit} > t\text{-}_{tab}$ ((5.572 >2.018) and the difference in the average pre-test and post-test scores in the jigsaw class and the conventional class, there is an increase of 17.08 in the control class and 31.72 in the jigsaw class. From these results, it can be seen that the ability of learning outcomes using the jigsaw model is better than the conventional model (Karacop & Doymus, 2013). Because the jigsaw type cooperative learning model is designed so that students are more active in their opinions because students are given the opportunity to discuss and explain the material to each other, -each group, students understand the material better because it is studied more deeply and simply with group members, and students master the material better because they are able to teach the material to their study group friends (Berger & Hänze, 2015). With the application of the jigsaw learning model students understand and master the subject matter more.

The jigsaw learning model is more effective than guided inquiry on science learning outcomes as evidenced by the $t\text{-}_{hit}$ value of 2.571. Because the value of $t\text{-}_{hit} > t\text{-}_{tab}$ (2.571 >2.003) and an increase in the average value of pre-test and post-test on the guided inquiry learning model of 25.88 jigsaw of 31.72, it can be concluded that the effectiveness of the jigsaw learning model is better than the inquiry learning model guided. Because the application of the jigsaw learning model in the learning process does not have to be centered from the teacher to students, but students can teach each other to each other. Because peer learning is more effective than teacher learning, this can foster student activity. Therefore, students can conduct discussions with a full sense of independence, responsibility, and confidence.

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