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Analysis of the Effect of Jigsaw Cooperative Learning Model on Critical Thinking and Problem-Solving Skills

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ABSTRACT

Critical thinking and problem-solving skills in students can be influenced by teacher creativity in choosing learning models and creating an interesting learning atmosphere. However, in fact the level of critical thinking and problem-solving skills in students is still relatively low. Therefore, a learning model is needed that can help improve critical thinking and problem-solving skills in students, one of which is the jigsaw-type cooperative learning model. This study aims to test whether or not there is an effect of the jigsaw type cooperative learning model on critical thinking skills and problem solving in class IV students at MIN 3 Tulungagung which is limited to IPAS subjects. This research uses a quantitative approach with the type of research Quasi Experiment Design. The population in this study were all fourth-grade students at MIN 3 Tulungagung, totaling 81 students. Sampling was done by purposive sampling technique. The samples selected as research subjects were students of class IV-B as a control class totaling 27 people and class IV-C as an experimental class totaling 27 people. Data collection techniques were used using tests and observations. Data analysis techniques used are 1) prerequisite tests (normality and homogeneity tests) and 2) hypothesis tests (t-test and MANOVA test). The results of this study indicate that 1) there is an effect of the application of the jigsaw-type cooperative learning model on critical thinking skills as evidenced by the results of the t-test of critical thinking skills obtained a sig. (2-tailed) value of 0.001 <0.05, then H01 is rejected and Ha1 is accepted; 2) there is an effect of the application of the jigsaw-type cooperative learning model on problem-solving skills as evidenced by the results of the t-test of problem-solving skills obtained a sig value. (2-tailed) of (<0.001) <0.05, then H02 is rejected and Ha2 is accepted; and 3) there is an effect of the application of the jigsaw-type cooperative learning model on critical thinking and problem-solving skills as evidenced by the results of the MANOVA test of critical thinking and problem-solving skills obtained a significance value of (<0.001) <0.05, then H03 is rejected and Ha3 is accepted.

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1. INTRODUCTION

In the 21st-century, the quality of learning must be improved in order to produce meaningful learning. In 21st-century learning, learners are required to master various skills commonly called 4C, namely critical thinking and problem-solving skills; communication; collaboration; and creativity and innovation [1]. With these skills, learners are expected to be able to communicate well in various differences that exist, be able to argue and solve the problems they face, create new things, and be able to analyze the opportunities and challenges that exist.

Among the four skills, critical thinking and problem-solving skills are very important and must be able to be mastered by every learner, especially at the Elementary School or Madrasah Ibtidaiyah level to face education in the 21st-century. Critical thinking and problem-solving skills are very important for every learner to have, because these skills can improve and develop a better understanding of the material, solve problems in an effective way, and can help students make the right decision or solution [2]. According to Enis in Widodo, critical thinking is the ability to think logically and reasonably focused when making decisions on the problems faced by referring to several dimensions in critical thinking, namely (1) formulating problems; (2) providing arguments / ideas; (3) doing deduction; (4) doing induction; (5) doing evaluation; and (6) making decisions [3]. Critical thinking skills can train learners to think logically, train concentration, and focus on the problems at hand and think analytically [4]. So, by having critical thinking skills, learners will be trained to think about things more deeply, ask questions for themselves, and find relevant information that can be used as a solution.

Problem-solving skills are abilities that students must have to understand problems, finding solutions, and predicting results that also involve decision-making skills [5]. According to Butterworth and Thwaites in Widodo, there are several stages in problem-solving, including (1) defining the problem; (2) looking for alternative solutions; (3) determining and selecting the most appropriate solution options among alternative solutions; (4) applying the selected solution to the problem; and (5) predicting the results of problem-solving [3]. So, with this problem-solving skill, students will be able to find their own solutions and solutions to the problems they face.

Students' critical thinking and problem-solving skills can be created through learning that is packaged as interesting as possible. In this case, educators must have the right strategy in choosing and using learning models. A learning model can be interpreted as a conceptual framework that describes learning procedures systematically in organizing learning experiences in order to achieve certain learning objectives [6]. The learning model refers to the learning approach that will be used, learning objectives, stages in learning activities, learning environment, and classroom management and organization [7]. Learning models are very important in learning so that learning activities can be tailored to the characteristics and abilities of students.

When viewed from the learning approach, to improve critical thinking and problem-solving skills students must use a learner-centered learning approach [8]. The learning model that can be used is the cooperative learning model. A cooperative learning model can be defined as a learning model that fully involves students to be able to collaborate and work in groups to achieve common goals [9]. The cooperative learning model itself has many types or variations of models, one of which is the jigsaw-type cooperative learning model.

According to Almukarram quoting from Trianto explained that the use of the jigsaw-type cooperative learning model can provide conditions for improving critical and analytical thinking skills, as well as solving complex problems so that it will create a culture of thinking in students [10]. The jigsaw-type cooperative learning model is a learning model that trains students to be responsible for their respective tasks in a group and teach what they have learned to other group members [11]. This can help learners to understand each other. The jigsaw-type cooperative learning model conditions students to learn cooperatively and collaborate in two groups, namely the origin group and the expert group [12]. With this, all learning activities can involve students actively and fully so that the learning process is considered more meaningful. This can help students understand subjects that have very dense material, such as in Natural and Social Sciences (IPAS) subjects.

Based on interviews that researchers conducted with one of the fourth-grade teachers at MIN 3 Tulungagung, researchers asked how the learning process occurred in the classroom and what learning models were used by the teacher. From the interview, the results showed that in the learning process, the teacher had implemented study groups. However, these learning groups are only traditional discussions and group work, namely by discussing the material that has been determined together. This kind of learning model will only be mastered by students who stand out and are good at speaking, otherwise students who are less active and do not stand out will feel burdened so they will not be able to develop their abilities.

The previous research that is relevant to this study is research conducted by I. B. P. Angga Putra, N. M. Pujani, and P. Prima Juniartina entitled “The Effect of the Jigsaw-type Cooperative Learning Model on Students' Understanding of Science Concepts” which found that there were differences in understanding of science concepts between students who studied with the jigsaw-type cooperative learning model and the direct learning model. Students who learn with the jigsaw-type cooperative learning model significantly have a higher understanding of science concepts compared to the direct learning model. [13] Other relevant research is research conducted by Lidia Herawati and Irwandi entitled “The Effect of Jigsaw-type Cooperative Learning Model on Learning Outcomes and Critical Thinking of Students in Science Subjects at SMP Negeri 09 Lebong” which found that there was a significant effect of using the jigsaw-type cooperative learning model on cognitive learning outcomes and critical thinking of students. [14].

This research has several differences that distinguish it from previous studies. Most of the previous studies only proved the effect of the jigsaw-type cooperative learning model on critical thinking skills and

student learning outcomes. Therefore, in this study, researchers wanted to prove the effect of the jigsaw-type cooperative learning model on critical thinking skills and problem-solving in students simultaneously as well. In addition, in previous studies, no one has explained the effect of the application of the jigsaw-type cooperative learning model on IPAS (Natural and Social Sciences) class IV MI / SD.

Based on some of the descriptions above, the researchers are interested in conducting research with the title "Analysis of the Effect of Jigsaw-type Cooperative Learning Model on Critical Thinking and Problem-solving Skills". This research was conducted on fourth grade students at MIN 3 Tulungagung which was limited to the IPAS subject, namely "Substance Forms and Changes".

2. METHOD

This research was conducted at MIN 3 Tulungagung which is located in Jati Hamlet, Pandansari Village, Ngunut District, Tulungagung Regency, East Java. The approach used in this research is a quantitative approach with the type of research Quasi Experiment Design. This study uses Quasi Experiment Design because in this study there are external variables that cannot be controlled by researchers, such as learning media, learning resources, teaching materials, and other variables that can affect critical thinking skills and problem-solving in students. This study only focuses on examining the effect of the jigsaw-type cooperative learning model on critical thinking and problem-solving skills in fourth-grade students at MIN 3 Tulungagung which is limited to IPAS subjects. In this study, there are two variables, namely the independent variable (X) and the dependent variable (Y). The independent variable in this study is the jigsaw-type cooperative learning model (X). The dependent variables in the study are critical thinking skills (Y1) and problem-solving skills (Y2).

The population in this study were fourth-grade students at MIN 3 Tulungagung in the 2024/2025 academic year as many as 3 classes, namely classes IV-A, IV-B, and IV-C with a total of 81 students. As for this study, researchers used sampling techniques with a non-probability sampling approach, namely purposive sampling. This technique was used in the study because the sample criteria in this study were classes that had reached the same material in IPAS subjects with homogeneous abilities. The samples taken in this study were class IV-B and class IV-C with a total of 59 students divided into control and experimental classes. The number of students consists of 27 students in class IV-B as the control class and 27 students in class IV-C as the experimental class.

The data collection techniques used in this study were tests and observations. In this study, there were 2 types of tests carried out to the control class and the experimental class, namely the test before being given treatment (pretest) and the test after being given treatment (posttest). A pretest was conducted at the beginning before treatment was given. The test was given to both classes, namely the experimental class and the control class with the aim of knowing the level of understanding of students in learning IPAS material on the form of substances and their changes. While the posttest is a test given after the treatment has been applied. The purpose of this test is to find out if there is a significant difference between the control class and the experimental class. Observation or observation was carried out in this study to obtain information related to the condition of the control class and the experimental class, namely class IV-C at MIN 3 Tulungagung during the treatment.

Before conducting research, researchers conducted a test instrument test for class IV-A consisting of 27 students. The test contains 10 items consisting of 5 description questions to measure critical thinking skills and 5 description questions to measure problem-solving skills that have been tested and then tested for validity and reliability. The validity test in this study used two stages, namely through expert testing and empirical testing using the help of the SPSS 29.0 for Windows 10 program. The hypothesis prerequisite test used in this study is the normality test and homogeneity test. While the hypothesis tests used are the t-test and MANOVA tests. The t-test test is used to answer the first and second hypotheses, namely (1) Ha1: there is an effect of the application of the jigsaw-type cooperative learning model on critical thinking skills in class IV students at MIN 3 Tulungagung, H01: there is no effect of the application of the jigsaw-type cooperative learning model on critical thinking skills in class IV students at MIN 3 Tulungagung; and (2) Ha2: there is an effect of the application of the jigsaw-type cooperative learning model on problem-solving skills in class IV students at MIN 3 Tulungagung, H02: there is no effect of the application of the jigsaw-type cooperative learning model on problem-solving skills in class IV students at MIN 3 Tulungagung. The MANOVA test is used to test the third hypothesis, namely Ha3: there is an effect of the application of the Jigsaw-type Cooperative Learning Model on critical thinking and problem-solving skills in class IV students at MIN 3 Tulungagung, H03: there is no effect of the application of the Jigsaw-type Cooperative Learning Model on critical thinking and problem-solving skills in class IV students at MIN 3 Tulungagung.

3. RESULTS AND DISCUSSION

The data in this study were obtained through tests to determine the effect of the jigsaw-type cooperative learning model on critical thinking and problem-solving skills in class IV students at MIN 3 Tulungagung. The test instrument data is in the form of pretest and posttest description questions with a total of 10 questions each. Each test contains 5 description questions to measure critical thinking skills and 5 other description questions to measure problem-solving skills. The questions that have been validated by experts are then tested on class IV-A and the results are tested for validity and reliability using SPSS 29.0 for Windows 10. This research instrument test includes validity and reliability tests using the help of the SPSS 29.0 for Windows 10 program. The results of the instrument validity test showed that the question instrument is valid if the data has a value of $r_{count} > r_{table}$ with a significance level of 0.05 (5%). The r_{table} value with a significance level of 0.05 (5%) is 0.396. The validity test results can be described in the following table.

Table 1 Critical Thinking and Problem-solving Skills Test Validity Test Results

No. Question	Pearson Correlation	Sig.	Information
1	0.553	0.05	Valid
2	0.706	0.05	Valid
3	0.612	0.05	Valid
4	0.433	0.05	Valid
5	0.518	0.05	Valid
6	0.634	0.05	Valid
7	0.684	0.05	Valid
8	0.631	0.05	Valid
9	0.484	0.05	Valid
10	0.461	0.05	Valid

Critical Thinking and Problem-solving Skills Test Validity Test Results The results of the validity test in the table above show that the person correlation value on 10 description questions is 0.553; 0.706; 0.612; 0.433; 0.518; 0.634; 0.684; 0.631; 0.484; and 0.461, respectively. In the table above, it is found that the value of $r_{count} > r_{table}$ with a significance of 0.05 (5%), which is 0.396. So it can be concluded that all questions are declared valid.

The question instrument that has passed the validity test and is declared valid will then be tested for reliability to determine the level of question reliability. The reliability value criteria can be determined based on the Cronbach's Alpha value, namely as follows.

Table 2 Reliability Value Criteria

No.	Coefficient Interval	Reliability Level
1.	0.000 – 0.200	Very low
2.	0.200 – 0.400	Low
3.	0.400 – 0.600	Currently
4.	0.600 – 0.800	High
5.	0.800 – 1.000	Very high

The results of the reliability test in this study are described in the following table.

Table 3 Results of the Reliability Test of Critical Thinking and Problem-solving Skills Test

Reliability Statistics	
Cronbach's Alpha	N of Items
.740	10

The results of the reliability test in the table above show that the Cronbach's Alpha value is 0.740. Based on these results, it can be concluded that the questions on the critical thinking and problem-solving skills test are said to be reliable and are classified as high.

After the questions were declared valid, the researcher conducted research in the control class by giving a pretest, posttest, and implementation of learning using a conventional learning model. The researcher also conducted research in the experimental class by giving a pretest, posttest, and implementation of learning using a jigsaw cooperative learning model. After the researcher obtained the data or results of the test instruments that had been given to students in the control class and the experimental class, the researcher conducted a prerequisite test before conducting a hypothesis test. The prerequisite tests used were the normality test and the homogeneity test. Normality test is a test used to determine whether the population of data being analyzed is normally distributed or not normally distributed [15]. In this study, the researcher used the calculation of data normality with the Kolmogorov-Smirnov approach with the help of the SPSS 29.0 for

Windows 10 program, assuming that if the Sig value (2-tailed)> 0.05 then the data is normally distributed. In this normality test, the following results were obtained.

Table 4 Normality Test Results of Critical Thinking Skills Test

Tests of Normality				
	Kelas	Kolmogorov-Smirnov[a]		
		Statistic	df	Sig.
Hasil Tes Keterampilan Berpikir Kritis	Pretest Eksperimen (Model Jigsaw)	.102	27	.200*
	Posttest Eksperimen (Model Jigsaw)	.152	27	.112
	Pretest Kontrol (Konvensional)	.146	27	.147
	Posttest Kontrol (Konvensional)	.160	27	.076
*. This is a lower bound of the true significance.				
a. Lilliefors Significance Correction				

The results of the normality test in the table above show that the significance value of the results of the critical thinking skills test in the pretest of the experimental class is 0.200 > 0.05; posttest of the experimental class is 0.122 > 0.05; pretest of the control class is 0.147 > 0.05; and posttest of the control class is 0.076 > 0.05. Based on these results, it can be concluded that the data is normally distributed.

Table 5 Results of the Normality Test of the Problem-solving Skills Test

Tests of Normality				
	Kelas	Kolmogorov-Smirnov[a]		
		Statistic	df	Sig.
Hasil Tes Keterampilan Memecahkan Masalah	Pretest Eksperimen (Model Jigsaw)	.158	27	.080
	Posttest Eksperimen (Model Jigsaw)	.152	27	.114
	Pretest Kontrol (Konvensional)	.157	27	.085
	Posttest Kontrol (Konvensional)	.116	27	.200*
*. This is a lower bound of the true significance.				
a. Lilliefors Significance Correction				

The results of the normality test in the table above show that the significance value of the problem-solving skills test results in the experimental class pretest is 0.080 > 0.05; experimental class posttest 0.114 > 0.05; control class pretest 0.085 > 0.05; and control class posttest 0.200 > 0.05. Based on these results, it can be concluded that the data is normally distributed.

A homogeneity test is a test used to determine whether research data has the same variation or not [16]. Data can be said to be homogeneous if the significance value is > 0.05. In this study, the homogeneity test uses the posttest value in the experimental class and the control class. This homogeneity test also uses the help of the SPSS 29.0 for Windows 10 program. The results of the homogeneity test can be described in the following table.

Table 6 Results of the Posttest Homogeneity Test of Critical Thinking Skills

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Hasil Tes Keterampilan Berpikir Kritis	Based on Mean	1.021	1	52	.317
	Based on Median	.785	1	52	.380
	Based on Median and with adjusted df	.785	1	49.354	.380
	Based on trimmed mean	.899	1	52	.347

The results of the homogeneity test in the table above show that the significance value of the results of the critical thinking skills test on the posttest in the experimental class and the control class is 0.317 > 0.05. Based on these results, it can be concluded that the data is homogeneous.

Table 7 Results of Homogeneity Test of Posttest Problem-solving Skills

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Hasil Tes Keterampilan Memecahkan Masalah	Based on Mean	.205	1	52	.652
	Based on Median	.198	1	52	.658
	Based on Median and with adjusted df	.198	1	50.624	.658
	Based on trimmed mean	.235	1	52	.630

The results of the homogeneity test in the table above show that the significance value of the problem-solving skills test results on the posttest in the experimental class and the control class is 0.652 > 0.05. Based on these results, it can be concluded that the data is homogeneous.

After conducting the prerequisite test, the researcher conducted a hypothesis test. The hypothesis test used was the t-test and MANOVA test with the help of the SPSS 29.0 for Windows 10 program. The results of the t-test in this study are as follows.

Table 8 Results of the t-test of Critical Thinking Skills

Independent Samples Test											
		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						One-Sided p	Two-Sided p			Lower	Upper
Hasil Tes Keterampilan Berpikir Kritis	Equal variances assumed	1.021	.317	3.408	52	<.001	.001	5.481	1.608	2.254	8.709
	Equal variances not assumed			3.408	50.153	<.001	.001	5.481	1.608	2.251	8.712

The results of the t-test in the table above show that the significance value (2-tailed) is 0.001 <0.05, so H01 is rejected and Ha1 is accepted. Based on these results, it can be concluded that there is an effect of implementing the jigsaw cooperative learning model on critical thinking skills in grade IV students at MIN 3 Tulungagung.

In addition, the results of the N-Gain Score test calculation for the critical thinking skills test showed that the average N-Gain Score for the experimental class (jigsaw model) was 63.5047 or 63.5% included in the fairly effective category. While the average N-Gain Score for the control class (conventional) was 45.1044 or 45.1% included in the less effective category. Based on these results, it can also be concluded that the use of cooperative learning models is more effective than conventional learning.

The results of the hypothesis testing analysis in this study are also supported by the results of observations (observations) which obtained the results that all indicators of critical thinking skills in the experimental class were visible and the level of critical thinking skills that were initially still relatively low became high when the jigsaw-type cooperative learning model was applied during the learning process. While

in the control class with a conventional learning model, the level of critical thinking skills of students was not visible and was still relatively low.

In addition to looking at the average score of students' critical thinking skills as a whole from both classes, students' critical thinking skills are also seen based on students' ability to answer each question that has been adjusted to the critical thinking indicators of the Science learning material "State of Matter and Its Changes". Based on students' ability to answer each question, it can be seen that the results of the pretest and posttest scores for each question number in the experimental class increased after the implementation of learning with the jigsaw cooperative model. This is evidenced by question number 1 with the indicator of critical thinking skills, namely interpretation (understanding the intent and identifying problems in a situation regarding changes in the state of matter), the average pretest score is 1 with the criteria for answering incorrectly. While the average posttest score is 5 with the criteria for answering completely and correctly. Based on this, it can be concluded that the score of students' critical thinking skills increased after the implementation of the jigsaw cooperative learning model.

The results of this study are also in line with Alfiyah's theory that the application of the jigsaw-type cooperative learning model has the potential to improve students' critical thinking skills, because they feel they have responsibility for their group. [17]. The implementation of the jigsaw cooperative learning model can make students have a high curiosity to explore information in more depth. So, the jigsaw cooperative learning model can affect the level of critical thinking skills in students, from initially lower-order thinking to higher-order thinking. Critical thinking skills have six indicators based on Fascione's theory, including interpretation, analysis, evaluation, inference, explanation, and self-regulation. [18]. Indicators of critical thinking skills are seen in students when the jigsaw model is applied.

Table 9 Problem-solving Skills t-test Results

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p			Lower	Upper
Hasil Tes Keterampilan Memecahkan Masalah	Equal variances assumed	.205	.652	4.885	52	<.001	<.001	9.407	1.926	5.543	13.271
	Equal variances not assumed			4.885	51.582	<.001	<.001	9.407	1.926	5.543	13.272

The results of the t-test in the table above show that the significance value (2-tailed) is (<0.001) and <0.05, so H02 is rejected and Ha2 is accepted. Based on these results, it can be concluded that there is an effect of implementing the jigsaw cooperative learning model on problem-solving skills in grade IV students at MIN 3 Tulungagung.

The results of the N-Gain Score test calculation for the problem-solving skills test showed that the average N-Gain Score for the experimental class (jigsaw model) was 66.9794 or 67% included in the fairly effective category. While the average N-Gain Score for the control class (conventional) was 22.1593 or 22.1% included in the ineffective category. This shows that the use of the jigsaw-type cooperative learning model is more effective in improving problem-solving skills in students compared to conventional learning.

Based on Surya's theory, problem-solving skills have five indicators, including (1) stating the sequence of problem-solving steps; (2) finding possibilities that can arise in problem-solving strategies; (3) evaluating the possibilities that arise and linking them to existing criteria; (4) choosing the right solution; and (5) developing plans and implementing problem-solving strategies. [19]. All indicators of problem-solving skills in the experimental class were seen in students when the jigsaw cooperative learning model was applied during the learning process. Initial observations made by the researcher showed that the level of problem-solving skills in students in both the control and experimental classes was relatively low. However, when the researcher made observations during the learning process, students in the control and experimental classes had

very significant differences. The level of problem-solving skills in students in the experimental class changed to high when the jigsaw cooperative learning model was applied.

During and after the implementation of the jigsaw cooperative learning model in the experimental class, students were able to state the sequence of problem-solving steps well regarding the material of the form of matter and its changes. Students have a systematic and structured attitude, namely by arranging problem-solving steps logically, starting from identifying problems, analyzing information, designing solutions, implementing solutions, to obtaining problem-solving results. In addition, when discussing with group members, students are also able to explain the reasons behind the solutions they provide by connecting existing data or information, and designing problem-solving strategies.

In this study, the MANOVA test was used to answer the third hypothesis. Before conducting the MANOVA test, a homogeneity test of variance and a homogeneity test of the variance matrix must be carried out. Data can be said to be homogeneous if the significance value is > 0.05. In this study, the homogeneity test of variance used the posttest value of critical thinking and problem-solving skills in the experimental class and the control class. The results of the homogeneity test of variance obtained the following results.

Table 10 Results of Homogeneity of Variance Test

Levene's Test of Equality of Error Variances[a]					
		Levene Statistic	df1	df2	Sig.
Keterampilan Berpikir Kritis	Based on Mean	1.021	1	52	.317
	Based on Median	.785	1	52	.380
	Based on Median and with adjusted df	.785	1	49.354	.380
	Based on trimmed mean	.899	1	52	.347
Keterampilan Memecahkan Masalah	Based on Mean	.205	1	52	.652
	Based on Median	.198	1	52	.658
	Based on Median and with adjusted df	.198	1	50.624	.658
	Based on trimmed mean	.235	1	52	.630

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Kelas

The results of the homogeneity test of variance in the table above show that the significance value of the results of the critical thinking skills test is 0.317 > 0.05 and the significance value of the results of the problem-solving skills test is 0.652 > 0.05. Both variables have a significance value > 0.05. Based on these results, it can be concluded that the data is homogeneous.

The homogeneity test of the variance matrix is a test used to test data that has a homogeneous variance matrix or not [20] Data can be said to be homogeneous if the significance value is > 0.001. In this study, the homogeneity test of the variance matrix used the posttest values of critical thinking and problem-solving skills in the experimental class and the control class. The results of the homogeneity test of the variance matrix obtained the following results.

Table 11 Results of the Variance Matrix Homogeneity Test

Box's Test of Equality of Covariance Matrices[a]	
Box's M	11.672
F	3.728
df1	3
df2	486720.000
Sig.	.011

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + Kelas

The results of the homogeneity test of the variance matrix in the table above show that the significance value of the results of the critical thinking and problem-solving skills test is 0.011 > 0.001. Based on these results, it can be concluded that the data is homogeneous.

After the data is declared homogeneous, the next step is to conduct a MANOVA test to test the effect of the jigsaw cooperative learning model on critical thinking and problem-solving skills in grade IV students at MIN 3 Tulungagung. The results of the MANOVA test are as follows.

Table 12 MANOVA Test Results

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Intercept	Pillai's Trace	.986	1762.461[b]	2.000	51.000	<.001	.986
	Wilks' Lambda	.014	1762.461[b]	2.000	51.000	<.001	.986
	Hotelling's Trace	69.116	1762.461[b]	2.000	51.000	<.001	.986
	Roy's Largest Root	69.116	1762.461[b]	2.000	51.000	<.001	.986
Kelas	Pillai's Trace	.387	16.121[b]	2.000	51.000	<.001	.387
	Wilks' Lambda	.613	16.121[b]	2.000	51.000	<.001	.387
	Hotelling's Trace	.632	16.121[b]	2.000	51.000	<.001	.387
	Roy's Largest Root	.632	16.121[b]	2.000	51.000	<.001	.387

a. Design: Intercept + Kelas

b. Exact statistic

The results of the MANOVA test in the table above show that the significance value is (<0.001) and <0.05, so H03 is rejected and Ha3 is accepted. Based on these results, it can be concluded that there is an effect of implementing the jigsaw cooperative learning model on critical thinking and problem-solving skills in grade IV students at MIN 3 Tulungagung.

The results of this hypothesis testing are also supported by the results of observations (observations) that researchers conducted in the control and experimental classes. Researchers found that the increase in critical thinking and problem-solving skills in students in the experimental class with the jigsaw model was higher than in the control class with conventional learning. The jigsaw-type cooperative learning model can encourage each student to become an "expert" in one part of the material who then teaches what has been learned to the members of their group. This process will be very useful in improving critical thinking and problem-solving skills in students.

The cooperative learning model creates a dynamic learning environment where critical thinking and problem-solving processes in students occur naturally through various situations, such as interaction, discussion, and collaboration between students [21]. When each student is responsible for understanding the material in-depth and teaching it to their group members, they must analyze, strategize, and convey knowledge in a logical way. This ultimately stimulates critical thinking and problem-solving skills in students.

Previously, it should be noted that in previous studies, there has been no research on the effect of the jigsaw cooperative learning model on critical thinking and problem-solving skills in students simultaneously, especially in the fourth grade science subjects. So in this study, the researcher proves the effect of implementing the jigsaw cooperative learning model on critical thinking and problem-solving skills in students simultaneously or simultaneously through the MANOVA test. This study also provides support for the findings of previous studies that show similar results and strengthens the conclusion that the cooperative learning model can be an effective alternative in improving critical thinking and problem-solving skills in students at the elementary school level.

4. CONCLUSION

Based on the results of the research and discussion on "Analysis of the Influence of the Jigsaw-type Cooperative Learning Model on Critical Thinking and Problem-solving Skills" conducted on grade IV students at MIN 3 Tulungagung which is limited to the subject of Science, the researcher concludes that (1) The findings in this study are supported by previous theories that there is an influence of the application of the jigsaw-type cooperative learning model on critical thinking skills in grade IV students at MIN 3 Tulungagung which is proven by the results of the t-test of critical thinking skills which obtained a sig. (2-tailed) value of 0.001 < 0.05; (2) The findings in this study are supported by previous theories that there is an influence of the application of the jigsaw-type cooperative learning model on problem-solving skills in grade IV students at MIN 3 Tulungagung which is proven by the results of the t-test of problem-solving skills which obtained a sig. (2-tailed) value of (<0.001) < 0.05; and (3) The findings in this study are supported by previous theories that there is an influence of the application of the jigsaw-type cooperative learning model on critical thinking and problem-solving skills in class IV students at MIN 3 Tulungagung, as proven by the results of the MANOVA test of critical thinking and problem-solving skills simultaneously, which obtained a significance value of (<0.001) <0.05.

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REFERENCES

[1] R. Septikasari dan R. N. Frasandy, "Keterampilan 4c Abad 21 Dalam Pembelajaran Pendidikan Dasar," *Jurnal Tarbiyah Al-Awlad*, vol. 8, no. 2, hlm. 112–122, 2018, doi: https://doi.org/10.15548/alawlad.v8i2.1597.

[2] S. N. Ariadila, Y. F. N. Silalahi, F. H. Fadiyah, U. Jamaludin, dan S. Setiawan, "Analisis Pentingnya Keterampilan Berpikir Kritis Terhadap Pembelajaran Bagi Siswa," *Jurnal Ilmiah Wahana Pendidikan*, vol. 9, no. 20, hlm. 664–669, Okt 2023, doi: https://doi.org/10.5281/zenodo.8436970.

[3] S. Widodo dan R. K. Wardani, "Pembelajaran Untuk Meningkatkan Kompetensi 4C (Communication, Collaboration, Critical Thinking Dancreative Thinking) Untukmenyongsong Era Abad 21," *Modeling: Jurnal Program Sttudi PGMI*, vol. 7, no. 2, Sep 2020, doi: https://doi.org/10.36835/modeling.v7i2.665.

[4] Ş. D. Belet Boyacı dan N. Atalay, "Slowmation Application in Development of Learning and Innovation Skills of Students in Science Course," *iejee*, vol. 11, no. 5, hlm. 507–518, Jun 2019, doi: 10.26822/iejee.2019553347.

[5] M. D. R. Simanjuntak, "Membangun Ketrampilan 4 C Siswa Dalam Menghadapi Revolusi Industri 4.0," *Prosiding Seminar Nasional Fakultas Ilmu Sosial Universitas Negeri Medan*, vol. 3, 2019.

[6] S. A. Oktavia, *Model-Model Pembelajaran*. Yogyakarta: Deepublish, 2020.

[7] J. Mirdad, "Model-Model Pembelajaran (Empat Rumpun Model Pembelajaran)," *Jurnal Sakinah: Journal of Islamic and Social Studies*, vol. 2, no. 1, hlm. 14–33, Apr 2020, doi: https://doi.org/10.2564/js.v2i1.17.

[8] S. S. Burengge, "Penerapan Model Pembelajaran Kooperatif Tipe STAD dengan Pendekatan Kontekstual bagi Siswa SDN 7 Tentena Sulawesi Tengah," *j. paedagog. penelit. pengemb. pendidik.*, vol. 7, no. 4, hlm. 275, Okt 2020, doi: 10.33394/jp.v7i4.2832.

[9] D. B. Ahyar, E. B. Prihastari, Rahmadsyah, dan R. Setyaningsih, *Model-Model Pembelajaran*. Sukoharjo: Pradina Pustaka, 2021.

[10] A. Almukarram, M. A. Sarong, dan E. Apriana, "Penerapan Model Pembelajaran Kooperatif Tipe Jigsaw Terhadap Peningkatan Kemampuan Berpikir Kritis pada Konsep Pencemaran Lingkungan di SMA Negeri 12 Banda Aceh," *Biotik*, vol. 4, no. 1, hlm. 8, Feb 2017, doi: 10.22373/biotik.v4i1.1066.

[11] M. S. Kahar, Z. Anwar, dan D. K. Murpri, "Pengaruh Model Pembelajaran Kooperatif Tipe Jigsaw Terhadap Peningkatan Hasil Belajar," *AJPM*, vol. 9, no. 2, Jun 2020, doi: 10.24127/ajpm.v9i2.2704.

[12] I. B. P. A. Putra, N. M. Pujani, dan P. P. Juniartina, "Pengaruh Model Pembelajaran Kooperatif Tipe Jigsaw Terhadap Pemahaman Konsep IPA Siswa," *JPPSI*, vol. 1, no. 2, hlm. 80, Okt 2018, doi: 10.23887/jppsi.v1i2.17215.

[13] I. B. P. A. Putra, N. M. Pujani, dan P. P. Juniartina, "Pengaruh Model Pembelajaran Kooperatif Tipe Jigsaw Terhadap Pemahaman Konsep IPA Siswa," *JPPSI*, vol. 1, no. 2, hlm. 80, Okt 2018, doi: 10.23887/jppsi.v1i2.17215.

[14] L. Herawati, "Pengaruh Model Pembelajaran Kooperatif Tipe Jigsaw Terhadap Hasil Belajar dan Berpikir Kritis Siswa Pada Mata Pelajaran IPA di SMP Negeri 09 Lebong," *Prosiding Seminar Nasional Sains dan Entrepreneurship VI Tahun 2019*, hlm. 1–9, Agu 2019.

[15] A. Nasrum, *Uji Normalitas Data untuk Penelitian*. Denpasar: Jayapangus Press, 2018.

[16] R. Sianturi, "Uji homogenitas sebagai syarat pengujian analisis," *PSSA*, vol. 8, no. 1, hlm. 386–397, Jul 2022, doi: 10.53565/pssa.v8i1.507.

[17] M. Alfiyah dan A. Widiyono, "Pengaruh Model Pembelajaran Kooperatif Tipe Jigsaw Untuk Meningkatkan Kemampuan Berpikir Kritis," *science*, vol. 4, no. 4, hlm. 511–518, Des 2024, doi: 10.51878/science.v4i4.3571.

[18] R. Abdullah, "Pengaruh Penerapan Model Pembelajaran Kooperatif Tipe Jigsaw Pada Mata Pelajaran Kimia Di Madrasah Aliyah," *Lantanida ournal*, vol. 5, no. 1, hlm. 13–28, 2017, doi: http://dx.doi.org/10.22373/lj.v5i1.2056.

[19] H. Surya, *Cara Belajar Orang Jenius*. Jakarta: PT Elex Media, 2013.

[20] Dewa Ayu Putu Putri Sri Devi, I Wayan Widana, dan I Wayan Sumandya, "Pengaruh Penerapan Ice Breaking Terhadap Minat Dan Hasil Belajar Matematika Siswa Kelas Xi Di Smk Wira Harapan," *Indonesian Journal of Educational Development*, vol. 3, no. 2, hlm. 240–247, Agu 2022, doi: 10.5281/ZENODO.7032283.

[21] T. Fitriani, S. Salman, T. Martini, T. Hidayat, dan H. Firmansyah, "Pengaruh Model Pembelajaran Cooperative dalam Meningkatkan Hasil Belajar Guling Depan dan Guling Belakang," *jpo*, vol. 1, no. 4, hlm. 11, Jun 2024, doi: 10.47134/jpo.v1i4.572.