

Comparison of STAD Cooperative Learning Types and Direct Learning With Approach Problems Posing With Connection Ability Student Mathematics

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ABSTRACT

This study aims to: (1) find out the student's mathematical connection ability who use the direct learning model with the problem-posing approach and the STAD cooperative learning model with the problem-posing approach, (2) find out the difference in students mathematical connection ability who use the STAD cooperative learning model with the problem-posing approach and the direct learning model with the problem-posing approach, (3) knowing which are more effective between students using the STAD cooperative learning model with a problem-posing approach and the direct learning model with the problem-posing approach. This type of research was the Quasi Experiment. The population in this study were all eighth-grade students of MTs Guppi Samata with 42 students. In this study, the sample was a saturated sample in which the entire population was sampled. The data analysis technique used descriptive statistical analysis and inferential statistical analysis. Based on the analysis results obtained that (1) the average value of students' mathematical connection ability using STAD cooperative learning model with the problem-posing approach is 81.43 and the mathematical connection ability students using direct learning model with the problem-posing approach is 72.76, (2) there are differences in the average mathematical connection ability between students taught using the STAD cooperative learning model with the problem-posing approach and students taught using direct learning model with the problem-posing approach, (3) the STAD cooperative learning model with the problem approach Posing is more effective than direct learning model with the problem-posing approach in improving the mathematical connection ability of VIII grade students in MTs Guppi Samata, Gowa Regency.

Keywords: *STAD cooperative learning model, problem-posing, direct learning model*

1. INTRODUCTION

Education is an essential thing in our lives; it means that every human being in Indonesia deserves to have and expected always to develop in it. Education can be found anywhere in the family, school environment, and community. Based on RI Law No. 20 of 2003 concerning the National Education System, an educational program is the effort to create a learning atmosphere that can stimulate students to develop students' potential. The students should build their spiritual strength, self-control, personality, intelligence, noble character, and skills needed by himself, society, nation, and state. At the level of education, there are various kinds of knowledge contained therein, one of which is mathematics.

Mathematics is one of the basic sciences that has an essential role in the mastery of science and technology. Nedaei [1] revealed that the ability of mathematics students related to their competence to link the mathematical concepts and other subject areas, or into everyday life. Improving students' mathematical connection skills required a lesson that provides opportunities for students to construct learning into the real world. The students should try to find relationships or connection concepts and have been mastered that, can connect them to other learning areas.

According to Schroeder [2], mathematical connections are the relationship between mathematical concepts internally and externally. Internally it can be

interpreted as the relationship between concepts in mathematics, while externally the relationship between mathematics and other fields as well as everyday life. According to Eli [3], there are two common types of mathematical connections such as modeling connections and mathematical relationships. Furthermore, modeling connection is the relationship between problem situations that arise in the real-world or other disciplines with mathematical representations, whereas mathematical relationships are the relationship between two equal images and each representation resolution.

From one of the mathematics teachers at MTs Guppi Samata, it found that students only focused on topic or material. They were difficult to connect the math question to the concept. so that when students are faced with problems related to the previous material students experience difficulties and cannot solve the problem. In the interview, it was also found the learning model used by the teacher was direct. The teacher explained the material using the lecture method, gave examples of questions, then students were given practice questions. From the problems obtained by researchers take an outline of the problem to be investigated, namely the lack of students' mathematical connection ability in linking between mathematical concepts and linking mathematics with everyday life and the inaccurate models approaches used. Therefore, appropriate models and approaches are needed and can improve students' mathematical connection skills after learning mathematics. Models and approaches that are considered to be able to provide changes in developing the ability are STAD type cooperative learning models with the problem-posing approach.

According to Long [4], the learning model is a design that can be used to plan long-term learning, design learning materials, and guide learning in the classroom or others. According to Lie [5], cooperative learning is active learning that emphasizes student activities together in groups. Students in groups develop their life abilities, such as finding and solving problems, making decisions, thinking logically, communicating effectively, and collaborating. According to Tiantong [6], the STAD cooperative learning model is cooperative learning, which is suitable for use by teachers who are just starting to use cooperative learning. With STAD cooperative learning, students will conduct social interactions both between students and teachers and between students making it easier to understand the material.

According to Ding [7], the approach to learning mathematics is the way taken by teachers in implementing learning, so the concepts presented can be adapted by the students. It is also suggested by Brown [8] that problem posing is a learning approach to improve the student's ability. The students are required to ask questions and solve them following the situation or problem. The teacher prepared learning material with

using pictures, stories, or other information related to the subject matter. According to Kojima [9] in problem-posing students must generate new ideas because generally, new problems cannot be composed of only information obtained from assignments.

The teacher introduces the STAD cooperative learning model with the problem-posing approach. It enables the students to find a new understanding of useful ideas in the problem. The class is divided into several groups consisting of five students in each group. This group enables them to discuss the problem intensively. According to English [10], direct instruction or direct teaching is based on behavioristic learning theory that focuses on concepts mastery and behavioral changes as a result of observable learning. The learning model used a teacher-centered approach. The teacher presents material or transfers information directly and structured using lecture, expository, question, and answer, demonstration presentations conducted by the teacher. The direct learning model with the problem-posing approach encourages the students to think directly and solve the problem without focusing on mathematic concept. Therefore, in this study, the researcher wanted to compare the STAD cooperative learning model with the problem-posing approach and the direct learning model with a problem-posing approach to students' mathematical connection abilities. The template provides most of the formatting specifications needed to prepare an electronic version of the paper. All components of standard paper have been determined for three reasons: (1) ease of use in formatting individual papers, (2) automatic selection of electronic requirements that facilitate the production of electronic products, and (3) paper format suitability, including margins, column widths, and line spacing. Some components, such as multi-level equations, graphics, and tables, are not specified. However, the various table text styles are provided. The format is required to follow the applicable criteria.

2. METHODOLOGY

This research used a quantitative approach to the Quasi Experiment type research. The research design was Nonequivalent Control Group Design, wherein this study the STAD cooperative learning model with the problem-posing approach as X1 variable, direct learning model with the problem-posing approach as X2 variable and connection ability mathematically as Y variable.

Table 1. Nonequivalent Control Group Design

Group	Pretest	Treatment	Post-test
Experiment 1 (STAD cooperative learning model with a problem-posing approach)	O1	X1	O2

Group	Pretest	Treatment	Post-test
Experiment 2 (direct learning model with a problem-posing approach)	O3	X2	O4

Information:

- X = Treatment
- O1 = Pretest value of experimental group I
- O2 = Posttest value of experimental group I
- O3 = Pretest value of experimental group II
- O4 = Posttest value of experimental group II

In this study, the instrument used was a mathematical connection ability test, where the test was an essay test each of 5 items. In determining the items, the validity level is to use the product-moment Pearson. Based on SPSS 22, the validity results are as follows:

Table 2. Validity Test Results

Item	Pretest		
	Correlation value	r _{label} Value	Information
1	0.497	0.404	Valid
2	0.759	0.404	Valid
3	0.638	0.404	Valid
4	0.864	0.404	Valid
5	0.455	0.404	Valid

Table 3. Validity Test Results

Item	Posttest		
	Correlation value	r _{label} Value	Information
1	0.608	0.413	Valid
2	0.631	0.413	Valid
3	0.491	0.413	Valid
4	0.658	0.413	Valid
5	0.750	0.413	Valid

Based on table 3, it can be concluded that the Pretest and Posttest were five valid items. Reliability is the measurement result that can be trusted. Instrument reliability in this study used the Alpha formula. Based on SPSS 22, the following results are obtained:

Table 4. Reliability Test Results

Instrumen Test	Cronbach's Alpha	Item
Pretest	0.648	5
Posttest	0.556	5

Based on table 4, it can be synthesized that the pretest and posttest instruments have a good reliability index. Data analysis techniques used in this study were using descriptive statistical analysis and inferential statistics. Descriptive analysis techniques include frequency distribution table, minimum, maximum, mean, standard deviation, and variance. In contrast, inferential analysis

uses a t-test, with the first data normality test and variant homogeneity test all using SPSS 22 program assistance. Then a two-party hypothesis test was conducted to find out the provisional allegations which the researchers formulated. Furthermore, the effectiveness test to find out the model is better used to improve students' mathematical connection abilities.

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. The descriptive mathematical connection ability of VIII grade students in MTs Guppi Samata by using the STAD Cooperative Learning Model with Problem Posing approach

Based on the pretest and Posttest result in experimental class1 by using the STAD cooperative learning, the description on SPSS are as follows:

Table 5. Description of Pretest and Posttest Results in Experiment Class 1

Descriptive Statistics					
	N	Min.	Max	Mean	Std. Deviation
Pretest1	1	12	48	26.90	9.273
Posttest1	1	66	95	81.43	7.173
Valid N (listwise)	21				

Based on table 5, it can be seen that the maximum score of experimental class 1 obtained at the Pretest is 48, and the minimum score is 12, so the average obtained is 26.90, with a standard deviation of 9.277. While the maximum score obtained by students at the Posttest is 95 and the minimum score is 66, so the average obtained is 81.43.

3.1.2. Descriptive mathematical connection ability of VIII grade students in MTs Guppi Samata by using the Direct Learning Model with Problem Posing approach

Based on the Pretest and Posttest given to students in experimental class 2 using the direct learning model with the problem-posing approach in class VIII B Mathematics Subjects.

Table 6. Description of Pretest and Posttest Results in Experiment Class 2

Descriptive Statistics					
	N	Min.	Max	Mean	Std. Deviation
Pretest2	21	8	36	23.24	9.990
Posttest2	21	46	90	72.76	13.438
Valid N (listwise)	21				

Based on table 6, it can be seen the maximum score of experimental class 2 obtained at Pretest is 46, and the minimum score is 8. The average obtained is 23.24 with a standard deviation of 9.990. While the maximum score obtained by students at the Posttest is 90 and the minimum score is 46, so the average obtained is 72.76.

3.1.3. Comparison of the average mathematical connection ability of the eighth-grade students in MTs Guppi Samata with the problem-posing approach and direct learning model

3.1.3.1 Normality test

Data Normality testing was performed on pretest and posttest results of experimental class 1 and experimental class 2 using the SPSS 22 application, to obtain the following data.

Table 7. Test the Normality of Students' Mathematical Connection Abilities

One-Sample Kolmogorov-Smirnov Test				
	Pre1	Post1	Pre2	Post2
N	21	21	21	21
Test Statistic	.179	.183	.179	.175
Asymp. Sig. (2-tailed)	.078c	.065c	.076c	.091c

Based on table 7, in the Experiment 1 class, Pretest obtained a significant value of $0.078 > 0.05$, then the normal distribution, while the Posttest Experiment 1 class obtained a significant value of $0.065 > 0.05$, then the normal distribution.

As for the Pretest 2 Experiment class obtained significant values for Kolmogorov-Smirnov $0.76 > 0.05$, then normal distribution, while the Posttest Experiment 2 class obtained significant values of $0.091 > 0.05$, then normal distribution.

3.1.3.2. Homogeneity Test

Homogeneity testing of variants was performed on the mathematical concept connection ability data of Experiment 1 and Experiment 2.

From the analysis result in the Test of Homogeneity of Variances table, it is obtained a significant value at the Pretest that is $0.169 > 0.05$. It can be said to be homogeneous pretest data. While the significant value at the Posttest is $0.258 > 0.05$, it can be said to be homogeneous.

Table 8. Homogeneity Pretest and Posttest Connection Ability

Test of Homogeneity of Variances				
Test	Levene Statistic	df1	df2	Sig.
Pretest	1.961	1	40	.169
Posttest	1.319	1	40	.258

3.1.3.3. Hypothesis testing

Hypothesis testing is used to determine the provisional estimates formulated in the research hypothesis by using a two-part test with a significant level of $\alpha = 0.05$. In this test, the Independent Sample t-test is used.

Statistic hypothesis:

$H_0 : \mu_1 = \mu_2$

$H_1 : \mu_1 \neq \mu_2$

H_0 : There is no difference in the average mathematical connection ability between students taught using the STAD cooperative learning model with the problem-posing approach and students taught using the direct learning model with the problem-posing approach in class VIII students in MTs Guppi Samata.

H_1 : There is an average difference in the ability of the mathematical connection between students taught using the STAD cooperative learning model with the problem-posing approach and students taught using the direct learning model with the problem-posing approach in grade VIII students in MTs Guppi Samata.

Testing Criteria

If $\text{Sig} < \alpha$, then H_0 rejected and H_1 accepted

If $\text{Sig} > \alpha$, then H_0 accepted and H_1 rejected

Based on table 9, it is known the Sig value Levene's Test for Equality of Variance is $0.258 > 0.05$. It can be interpreted that the data variance of experimental groups one and experiment 2 are homogeneous. So the interpretation of the Independent Samples Test output table is guided by values contained in Equal variances assumed table. Based on the Independent Samples Test output table in the Equal variances assumed section, the Sig. (2-tailed) of 0.013. It is significant or $0.013 < 0.05$. It concluded that H_0 is rejected or there are differences in the average mathematical connection ability between two learning model

Table 9. Hypothesis Test of Students' Mathematical Connection Ability

Independent Samples Test						
		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	Df	Sig. (2-tailed)
Learning outcomes	Equal variances assumed	8.225	.0258	2.607	40	.013
	Equal variances not assumed			2.607	30.54	.014

3.1.3.4. Effectiveness Test

To test the effectiveness of a learning model, we can use the relative efficiency formula. This test is used to find out more effective learning models between STAD cooperative learning models with the problem-posing approach and the direct learning model with the problem-posing approach. If $R > 1$, relatively θ_2 is more efficient than θ_1 , conversely if $R < 1$, θ_1 is relatively more efficient than θ_2

It is known from the descriptive analysis calculation that the variance of the STAD cooperative learning model with the problem-posing approach (S_1^2) = 51.46 and the direct learning model (S_2^2) = 180.6. So d value of

$$R(\theta_2, \theta_1) = \frac{Var \theta_1}{Var \theta_2} = \frac{51.46}{180.6} = 0.28$$

Based on the data processing above, it can be seen that the value of $R < 1$ ($0.28 < 1$) is relatively θ_1 more efficient than θ_2 . The STAD cooperative learning model with the problem-posing approach is more effective than a direct learning model with the problem-posing approach to the mathematical connection ability of Grade VIII students of MTs Guppi Samata, Gowa Regency.

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3.2. Discussion

3.2.1. Description of the mathematical connection skills of Grade VIII students in MTs Guppi Samata who use the STAD cooperative learning model with the problem-posing approach

Based on data analysis before applying the STAD cooperative model with the problem-posing approach, the category of students' mathematical connection ability is in a low category. Some students still experience difficulties in connecting mathematical concepts and associating with everyday life. Some students, when given a question, count the numbers without knowing the meaning of the question. Meanwhile, after applying the STAD cooperative model with the problem-posing approach, it can be said that the category of students' ability to connect is already in the high category. Because by studying groups, students can work together or discuss with classmates.

Based on the description of the mathematical connection ability in experimental class 1 using the STAD cooperative learning model, the average value of Pretest was 26.90 and Posttest was 81.43. Therefore, it can be concluded the STAD cooperative learning model with the problem-posing approach can improve students' mathematical connection abilities. In line with the research conducted by Rosyada et al. [11] who stated that the STAD learning model with the problem-posing approach influenced student achievement. The learning model with the problem-posing approach was better when compared to student achievement using the learning model live. The theory, according to NCTM which states that small groups in cooperative learning can be used effectively to help develop mathematical communication skills. It is also related to their problem-solving ability by make mathematical connections, all

key elements of Curriculum and Evaluation Standards for Secondary Schools of NCTM.

3.2.2. Description of the mathematical connection ability of VIII grade students in MTs Guppi Samata who uses a direct learning model with a problem-posing approach

Based on data analysis before applying the direct learning model with the problem-posing approach, the category of students' mathematical connection ability is in a low category. Some students still experience difficulties in connecting between mathematical concepts, and associating with everyday life. Some students, when given a question, just count the numbers without knowing the meaning of questions. Meanwhile, after applying the direct learning model with the problem-posing approach, it can be said that the category of students' connection ability is a high category. Based on the description of students' mathematical connection abilities in the experimental class 2 using a direct learning model with the problem-posing approach, the average score of the Pretest is 23.24 and 72.76. Therefore, it can be concluded that the direct learning model with a problem-posing approach can improve students' mathematical connection abilities. According to Brown [8], the theory says that the submission of a problem (problem-posing) is said to be the most important core in mathematics discipline and in the nature of mathematical reasoning thinking. Another opinion put forward by English [10] about the problem-posing approach can help students develop beliefs and preferences for mathematics. The mathematical ideas are understood of students and they can improve their performance in problem-solving.

3.2.3. Comparison of average mathematical connection ability of VIII grade students in MTs Guppi Samata who uses STAD cooperative learning models with the problem-posing approach and direct learning models

Based on observations and analysis results with SPSS 20, the value of Sig. (2-tailed) of 0.013. It is significant $0.013 < 0.05$, so it can be concluded that H_0 is rejected indicating that there are differences in the average mathematical connection ability between students taught by using the STAD cooperative learning model with the problem-posing approach and students taught using the direct learning model with the problem-posing approach in eighth grade students in MTs Guppi Samata, this might be due to the strengths and weaknesses of each learning model, another student who is taught using the STAD cooperative learning model with the problem-posing approach can work together with their group friends while those taught using a direct learning model cannot work together in other words working individually, in

line with research conducted by Gupta [12] stated that there were significant differences in the ability of the mathematical connections between students who were taught using the STAD cooperative model and students who were taught using conventional models, the theory says that STAD cooperative learning model with the problem-posing approach is a learning model not only focuses on student activities in working together in groups but also triggers students to optimize their understanding abilities in understanding the concepts of the material being taught by formulating their own problems there and look for alternative answers.

3.2.4. Comparison of the effectiveness STAD cooperative learning model with the problem-posing approach to mathematical connection ability of the VIII grade students in MTs Guppi Samata

Based on the relative efficiency test, the value of $R < 1$ ($0.28 < 1$) is obtained, so θ_1 is relatively more efficient than θ_2 . It can be concluded that the STAD cooperative learning model with the problem-posing approach is more effective than in improving students' mathematical connection abilities. The implementation of the STAD cooperative learning model enable students to work together and help each other. They can improve their understanding of the material. In contrast, the direct learning model did not divide students into groups. It requires students to understand the material by directly asking the teacher if there is material that is not understood. This is reinforced by Hiebert and Carpenter [13], who suggest that in-class learning, mathematical connections should be discussed by students. The connection between mathematical ideas explicitly taught by the teacher does not make students understand them.

4. CONCLUSION

Based on the previous results, the following conclusions are obtained. The mathematical connection ability of students who were taught by using the STAD cooperative learning model has increased. It seen from the average pretest score of 26.90 and the average posttest score of 81.43. While the mathematical connection ability of the students who were taught by using the direct learning model with the problem-posing approach also increased. It seen from the average pretest score of 23.24 and the posttest average value of 72.76. Based on the analysis results, there are differences in average mathematical connection ability between students taught using the STAD cooperative learning model and students who are taught using the direct learning model. The STAD of cooperative learning model with the problem-posing approach is more effective than the direct learning model with the problem-posing approach in improving the mathematical

connection ability of Grade VIII students in MTs Guppi Samata, Gowa Regency.

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