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Effectiveness of Learning with Scientific Approach in Cooperative Model of STAD-based Type Lesson Study

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A B S T R A C T

This study aims to determine the effectiveness of learning with a scientific approach in the STAD-based cooperative model lesson study of learning outcomes in mathematics. This research is a quasi-experimental study. The study population was junior high school students in Rokan Hilir Regency which were divided into three school levels; upper level, medium level and lower level. The research sample was taken randomly (clustering random sampling). Each sample contained an experimental class and a control class. The research instruments were learning devices and instruments for collecting data. The design of hypothesis testing of student learning outcomes in the form of pretest and posttest data analysis through statistical tests. The data was analyzed using integrated statistical tests. The results showe that student learning outcomes in the experimental class were better than the control class for each level. There are differences in student learning outcomes in the experimental class viewed from the school level, and learning with a scientific approach in cooperative type STAD-based lesson study is effective in terms of student learning outcomes. The conclusion is that the learning with the scientific approach in the STAD-based cooperative model is effective.

1. Introduction

Mathematics has a role in developing the potential of students and the development of science-technology. The role of mathematics can be realized through the mathematics learning process carried out in schools and must be a

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concern for the teacher. Teachers as the spearhead of education who are directly at the forefront of dealing with students are required to have adequate competence. This shows that teachers must have the ability to innovate learning learning that can motivate students to learn more actively, creatively and systematically in solving problems. Through these learning innovations, students are expected to be able to solve mathematical problems independently so that learning objectives are achieved.

The mathematics learning objectives in accordance with the 2013 curriculum are included in Minister of Education and Culture number 58 of 2014. The objectives of mathematics learning generally outline students must have the competence to understand concepts, use patterns to solve problems, use reasoning, communicate ideas, have an attitude of appreciating mathematics, carry out motor activities and use simple tools and technology to carry out mathematical activities. This capability requires critical, systematic, logical, creative thinking and effective collaboration. Therefore, a teacher must follow the development of mathematics and always try to be creative in the learning process. Teachers who are creative in learning can realize innovative learning. Innovative learning can improve student learning activities so that optimal learning outcomes are obtained. The optimal learning outcomes obtained by students show that students are able to solve problems. The ability to solve problems requires several principles in learning in accordance with the 2013 curriculum, namely learning with a scientific approach (Dian, 2016).

Permatasari (2014) conducted a research in the Batang Regency School, shows that students after following learning have not seen the character to have appreciative traits, activities, high learning achievement and even tend to be mediocre. Then with the application of learning with a scientific approach, it shows positive student behavior such as high learning motivation, high learning activities, mutual respect, and work together.

Regarding learning through the scientific approach mentioned earlier, in the current era of globalization, it is still not enough. The teacher's effort to teach students is a very important part in achieving the planned learning goals. Therefore, even though learning has used a scientific approach, it requires the right learning model. One of them is the cooperative learning model of Student Teams Achievement Division (STAD) type. According to Slavin (in Rusman, 2014), STAD is a variation of cooperative learning that spurs students to encourage and help each other to master the skills taught by the teacher (Suparmi, 2012; Handayani. 2014; Sapitri et al., 2015). Rahayu (2017) stated that STAD type cooperative learning can create an atmosphere of life learning and student motivation.

According to Novianti (2012) the STAD type cooperative learning has high learning motivation which is the right learning strategy. This strategy can make students more active in the learning process. When teachers apply STAD type cooperative learning, there are unconsciousness or weaknesses. Therefore, an effort is needed to overcome the shortcomings or weaknesses made by the

teacher. The intended effort is to conduct a study of learning and require some colleagues to work together, share and provide solutions in solving problems in learning. These efforts are lesson study learning.

Herman (2012) revealed that lesson study activities implemented in several Lembang district schools have shown success, including having good pedagogical and professional competencies, such as teachers being able to develop learning tools independently, conducting learning innovations and being creative in preparing strategies learning. Whereas, according to Putri et al. (2013) lesson study learning is important to improve the practice of classroom learning, improve creativity and student motivation and improve student learning outcomes.

According to Aini et al. (2018), the lesson study approach is the most appropriate approach to address this problem. The lesson study approach is an approach that is very suitable in overcoming various problems. According to Lewis (2004), Lesson Study is a learning assessment activity carried out by a group of teachers to determine the effectiveness of a continuous learning to improve the quality of learning. Furthermore, Ciaptaningsari et al. (2016) stated that lesson study has effectiveness in improving teacher competency.

According to Rini et al. (2015), the effectiveness of learning is the level of achievement of predetermined teaching goals. Meanwhile, Adhetia (2016) stated that the effectiveness of learning because learning is carried out through a model shows the achievement and confidence for students (Deka et al., 2016).

This study aims to determine the effectiveness of scientific learning in the cooperative study model type STAD based lesson. The results of the study indicate the effectiveness of learning with the scientific approach in the STAD type cooperative model based on Lesson Study on student learning outcomes.

2. Methodology

This type of research was quasi-experimental research. The design used was nonequivalent group pretest-posttest design. This research was conducted in Rokan Hilir Regency. The population was junior high school students in Rokan Hilir Regency grouped into three levels; upper level schools, medium level schools and lower level schools. Samples were taken randomly (clustering random sampling). The sample taken was the research sample. Each sample was chosen by two classes by purposive sampling. The two classes were selected for the experimental class and the control class.

This study used three variables, including: independent variables, dependent variables and control variables. The independent variable is learning with a scientific approach in the cooperative learning model of STAD type. The dependent variable was student learning outcomes and the control variable was learning with the scientific approach. Differences in learning outcomes at the overall level and each

school level can be known, after students were given the posttest. Posttest was given after students take the lesson.

The data analysis technique in this study was carried out by describing the data obtained. The data description is in the form of average values, maximum values and minimum values, both data before treatment and for data after treatment.

Test analysis was carried out after knowing the assumption test for the overall level and at each school level. Test assumptions in the form of normality data Kolmogov Smirnov data. The hypothesis proposed was: H_0: Data comes from sources that are normally distributed and H_1: Data comes from sources that are not normally distributed. Test criteria: If the value is sig. (2-way)> $\alpha = 0.05$, then H_0 is accepted and if the value is sig. (2-way) <$\alpha = 0.05$, then H_0 is rejected. To determine the homogeneity of variance, a homogeneity test of Lavene was carried out. The hypotheses test given are: H_0: $\sigma_1^2 = \sigma_1^2$ and H_1: $\sigma_1^2 \neq \sigma_1^2$, with σ_1^2 = Group variance or experimental class and σ_1^2 = Group variance or control class. The test criteria are used: if the value is sig. (2-way)> $\alpha = 0.05$, then H_0 is accepted and if the value is sig. (2-way) <$\alpha = 0.05$, then H_0 is rejected.

The normalized distributed data was carried out a different test, namely the Independent T-Test. The hypothesis is: H_0: $\mu_1 = \mu$ and H_0: $\mu_1 > \mu_2$, with, μ_1 = average student or experimental class student learning outcomes and μ_2 = average learning outcomes of group students or control classes. The test criteria are: if the value is sig. (1-way)> $\alpha = 0.05$, then H_0 is accepted and if the value is sig. (1-way) <$\alpha = 0.05$, then H_0 is rejected. If the data source is abnormally distributed, then the different test uses the Mann Whitney U test.

Furthermore, to find out the differences in student learning outcomes, a significance test of the differences in the average student learning outcomes between school levels was carried out with a one-way ANAVA test. The hypotheses are: H_0: $\mu_2 = \mu_2 = \mu_3$ and H_1: at least one of the average is different from the others, with μ_1, μ_2, μ_3, respectively are the average learning outcomes of upper level students, moderate levels and lower level. The test criteria are: if the value is sig. (2-way)> $\alpha = 0.05$, then H_0 is accepted and if the value is sig. (2-way) <$\alpha = 0.05$, then H_0 is rejected. To find out which experimental class is significantly different, followed by the Schefee test. Schefee test was conducted to determine whether there were differences in learning outcomes of students who took part in learning with a scientific approach in the cooperative model of the lesson study type STAD based on the school level. The calculation is done with the help of the Excel for Windows program and the SPSS version 16.0 statistical program package.

3. Results and Discussion

Mathematics learning with the scientific approach in this study was carried out in accordance with the planned learning activities. Even so, in the learning process there were some limitations which could become obstacles in this study.

Description of learning outcomes at each school level and overall levels can be seen in Table 1.

Table 1. Pretest and Posttest of Both Groups

School Level	Stat	Experiment		Control	
		Pretest	***Posttest***	***Pretest***	***Posttest***
Above	N	35	33	35	34
	Rerata	59,57	96,36	59,86	85,44
	Maks	80	100	80	100
	Min	40	85	40	70
Medium	N	26	24	26	24
	Rerata	57,50	91,46	57,31	81,46
	Maks	75	100	75	100
	Min	35	75	40	70
Down	N	30	28	30	29
	Rerata	56,50	88,57	57,67	80,86
	Maks	75	100	75	100
	Min	35	70	35	70
Overall	N	91	85	91	87
	Rerata	57,97	92,41	58,41	82,82
	Maks	80	100	80	100
	Min	35	70	35	70

Table 1 informs that the average pretest results for each school level are not significant while the average learning outcomes (posttest) at each school level are significantly different. Test the normality of learning outcome data (posttest) at the overall level and each level of the two learning groups (experiment and control) respectively as given in Table 2.

Table 2. Normality Test Based on Overall Level of Student Learning Outcomes

Class	Dk	*Sig.*	H_0
Experiment	91	0,000	Rejected
Control	91	0,000	Rejected

Table 2 informs that the two learning groups, obtained a probability value (sig.) Smaller than 0.05, which means H_0 is rejected. That is, the two data groups were not normally distributed.

Table 3. Test of Variance Homogenity for Student Learning Outcomes

Statistic Lavene	dk1	dk2	*Sig.*	H_0
0,298	1	170	0,598	Diterima

Table 3 informs that the value of sig. = 0.598> 0.05 = α which means H_0 is accepted. That is, the data of the two learning groups at all levels have the same or homogeneous variance.

Table 4. Test of Differences for Student Learning Outcomes

Statistics	**Learning outcomes**	**H_0**
Mann-Whitney U	1522,000	
Sig. (2-arah)	0,000	Rejected

Table 4 informs that the Sig. (2-way) = 0,000 smaller than α = 0.05 which means H_0 is rejected. It means there are differences in student learning outcomes between the two learning groups at the overall level. At the overall level, the learning outcomes between students who take part in the study with the scientific approach in cooperative type STAD-based lesson study are better than the learning outcomes of students who take learning with the scientific approach. The normality test of the experimental class student learning outcomes data according to school level, as given in Table 5.

Table 5. Normality test of Data on Learning Outcomes of Experimental Class Students According to School Level

School Level	**Class**	**Dk**	***Sig.***	**H_0**
Above	Experiment	33	0,000	Rejected
Medium	Experiment	24	0,009	Rejected
Down	Experiment	28	0,016	Rejected

Table 5 informs that the value of sig. smaller than 0.05, for each school level. This means that data at all three school levels is abnormal. The results of homogeneity test for the three school levels can be seen in Table 6.

Table 6. Homogeneity test of Learning Outcomes of Students in All Group Levels Experiment

Statistic Levene	dk1	dk2	*Sig.*	H_0
9,408	2	82	0,000	Rejected

Table 6 provides information that the value of sig. = 0,000 smaller than 0.05, meaning H_0 is rejected. This means that the learning outcome data variance after treatment between the three school levels is not homogeneous. According to Mahmudi (in Kartini, 2011), to conduct ANAVA testing, the terms of homogeneity can be ignored.

Table 7. Test the Significance of Differences in Student Learning Outcomes

Source of Learning Outcomes	**Number of squares**	**Df**	**Average Squares**	**F**	**Sig.**
Between groups	950,136	2	475,068	9,787	0,000
In Group	3980,452	82	48,542		
Total	4930,588	84			

Table 7 informs that the value of sig. = 0,000 <0,05 = α which means H_0 is rejected. Meaning: there are differences in student learning outcomes that take part in learning with a scientific approach in the cooperative learning model STAD-based type in schools: upper level, medium level and lower level. Table 8 shows the Scheffe test.

Table 8. Scheffe test

School Level		Average Different	*Sig.*	95% Confidence Interval		H_0
				Lower Bound	Upper Bound	
Above	Medium	4,905*	0,037	0,25	9,57	Rejected
	Down	7.792*	0,000	3,33	12,26	Rejected
Medium	Above	-4,905*	0,037	-9,57	-0,25	Rejected
	Down	2,887	0,335	-1,95	7,72	Accepted

Table 8 informs that the learning outcomes between experimental class students of upper level with moderate and lower levels that is differ significantly. Whereas, there is no difference between moderate levels and lower levels (not significantly different).

Table 9. Normality Data Based on School Level Results

School Level	Class	Dk	*Sig.*	H_0
Above	Experiment	33	0,000	Rejected
	Control	34	0,014	Rejected
Medium	Experiment	24	0,009	Rejected
	Control	24	0,014	Rejected
Down	Experiment	28	0,016	Rejected
	Control	29	0,022	Rejected

Table 9 informs that the two learning group probability values (sig.) are smaller than 0.05, which means H_0 is rejected. That is, the two groups of sample data are abnormally distributed.

Table 10. Homogeneity Test of Secondary Student Learning Data Variance Learning Group for Each School Level

School Level	Statistic Lavene	dk1	dk2	*Sig.*	H_0
Top level	14,421	1	65	0,000	Rejected
Medium level	0,403	1	46	0,529	Accepted
Lower Level	5,453	1	55	0,023	Rejected

Table 10 informs that the upper and lower levels, get the Sig. smaller than 0.05 which means H_0 is rejected. Meaning: upper and lower level data is not homogeneous. While the moderate level gets the Sig. greater than 0.05 which means H_0 is accepted. Meaning: level data is homogeneous.

Table 11. Test of Differences in Student Learning Outcomes for Each School

School Level	Learning outcomes				H_0
	Mann-Whitney U	Wilcoxon	Z	*Sig.* (2-arah)	
Above	190,500	785,500	-4,787	0,000	Rejected
Medium	95,000	395,000	-4,033	0,000	Rejected
Down	217,500	652,500	-3,061	0,002	Rejected

Table 11 informs that each level obtains the Asym value. Sig. (2-tailed) smaller than $\alpha = 0.05$ which means H_0 is rejected. It means there are differences in student learning outcomes between the two learning groups at each level. The learning outcomes of each level between students who take part in learning with the scientific approach in cooperative type STAD-based lesson study are better than the learning outcomes of students who take learning with the scientific approach.

Based on the results of data analysis (Table 4 and Table 11), it can besaid tahat students who received learning with a scientific approach in cooperative type STAD-based lesson study were better than students who received learning with the scientific approach. Researchers assume that the causes of learning in the experimental group are better than the control group because the learning provided is an innovation of scientific learning. Learning innovations that are implemented are collaborations between approaches, learning models and learning assessment processes. In the research that has been carried out this is the application of learning with a scientific approach in the cooperative learning model STAD based on lesson.

The learning outcomes of students who take part in learning with a scientific approach in cooperative type STAD based lesson study are different from the learning outcomes of students who follow learning with a scientific approach. Differences in learning outcomes, obtained at the overall level (see Table 4) and each level (see Table 11). The significance of differences in student learning outcomes in the experimental group viewed from the school level can be seen in Table 7 and Table 8.

Regarding the differences in learning outcomes above, it explains that the learning model has a positive impact on student learning outcomes. The learning model in question is innovation in the learning process. Based on research in the field, the learning model applied at each school level is presented in the same way but the service is different. Differences in learning services at each level because each school level has different characteristics of students. For example: in upper level schools, the learning process runs in an orderly and smooth manner. At this level, students easily adapt through learning with a scientific approach in the cooperative learning model STAD-based type. The adaptation can be seen from the high student motivation, cooperation between members in a solid and active group to ask questions and actively respond to the percentage of work results in other groups.

Based on observations, during the learning process with the scientific approach in cooperative STAD-based type lesson study, high-level schools were more independent and there were fewer teacher assistance than students at medium level schools. This also happens between the middle level school and the lower level. Students' skills in completing the upper level school pretest are higher than those at the middle and lower level schools. The entrance student in the school also is considered as another factors.

The learning process with a scientific approach in cooperative learning with STAD-based type lesson as above, at each level is different. These differences can be seen from student learning motivation, student activities to work together, student adaptation to friends and often whether the teacher gives guidance. Furthermore, student learning outcomes are different in each level (upper, middle and lower).

Description of learning outcomes of students who receive learning with a scientific approach in cooperative learning STAD-based type on high school level, medium level and lower level are increased (Table 4). Learning outcomes between upper-level school students are better than moderate level student learning outcomes and learning outcomes between middle-level school students are better than the learning outcomes of lower-level school students. Differences in learning outcomes are influenced by learning factors as mentioned earlier.

Regarding the analysis of the statistical tests about testing differences in student learning outcomes (see Table 4 and Table 11), table 4 shows that student learning outcomes for the overall level between the two groups (experiment and control) are different. It means that at the overall level, the learning outcomes of students who take part in learning with the scientific approach in the cooperative model STAD-based type lesson study are better than the learning outcomes of students who take the learning with the scientific approach. There is an effectiveness of learning with a scientific approach in the cooperative learning model of the STAD-based lesson study on student learning outcomes in junior high school mathematics subjects in Rokan Hilir Regency.

4. Conclusion

Based on the results of the research and analysis, it can be concluded that learning with the scientific approach in the cooperative model STAD-based type on lesson study is more effective than learning with a scientific approach in terms of student learning outcomes. The results of the study show that there is effectiveness in learning as explained previously, but there are still some limitations that are obstacles in the implementation of this research. One obstacle that became a discovery was the presence of several students who were representatives of schools to attend school activities. This, can interfere with the concentration of students to study so that it affects the learning outcomes.

References

Adhetia, M. (2016). Keefektifan pendekatan problem solving dengan setting STAD dan TAI ditinjau dari prestasi dan self-confidence. *Jurnal Riset Pendidikan Matematika, 3(1)*, 1-15.

Aini, H. A., & Zanaton, H. I. (2018). Lesson study: an approach to increase the competency of out-of-field mathematics teacher in building the students conceptual understanding in learning mathematics. *Journal of Educational Sciences, 2(2)*, 1-13.

Ciptaningsari, A. V., & Tafsilatul, M. A. (2016). Efektifitas lesson study calon guru matematika. *Jurnal Matematika dan Pendidikan Matematika, 1(1)*, 23-33.

Deka, P. S., Nurochman, H., Haryadi, S., & Syaiturjim. (2016). Meningkatkan kemampuan pemahaman matematis melalui pendekatan pembelajaran student teams achievement division (STAD). *Jurnal Riset Pendidikan Matematika*, 3*(1)*, 16-22.

Dian, W. (2016). Pengembangan perangkat pembelajaran statistika dan peluang dengan metode penemuan terbimbing berorientasi kurikulum 2013 untuk siswa kelas X. *Jurnal Riset Pendidikan Matematika*, 3*(1)*, 23-33.

Novianti, I. (2012). Eksperimentasi model pembelajaran kooperatif tipe STAD dan jigsaw pada pokok bahasan sistem persamaan linier dua variabel ditinjau dari motivasi belajar. *Jurnal Pendidikan, 13(1),* 23- 31.

Putri, I., Atmazaki, & Syahrul, R. (2013). Pelaksanaan lesson study dalam pembelajaran bahasa Indonesia kelas VII.5 lubuk Buaya Padang. *Bahasa, Sastra, dan Pembelajaran, 1(1)*, 108-117.

Kartini. (2011). *Peningkatan kemampuan berpikir kritis dan kreatif serta belief matematis siswa sekolah menengah atas melalui pembelajaran inkuiri model alberta. (unpublish).* Bandung: Disertasi Pascasarjana Universitas Pendidikan Indonesia.

Lewis, C. (2004). Does lesson study have a future in the united states?. *Journal of Social Education*: http://www.jsse.org/2004/2004-1/lesson-lewis.htm.

Permatasari, E. A. (2014). Implementasi pendekatan saintifik dalam kurikulum 2013. *Indonesian Journal of History education, 3(1),* 11-16

Rahayu, F., & Ninit, A. (2017). Effect of student teams achievement division and vocabulary mastery to reading comprehension ability, *Journal of Education and Learning, 11(4),* 453-459.

Rini, D. A., & Agus, M. A. (2015). Keefektifan pembelajaran jigsaw dan TAI ditinjau dari kemampuan penalaran dan sikap belajar matematika siswa. *Jurnal Riset Pendidikan Matematika, 2(2),* 235- 250.

Rusman. (2014). *Model-model Pembelajaran. Edisi Kedua*. Jakarta: PT Raja Grafindo Persada.

Sapitri, & Hartono. (2015). Keefektifan cooperative learning STAD dan GI ditinjau dari kemampuan berpikir kritis dan komunikasi matematis. *Jurnal Riset Pendidikan Matematika, 2(2)*, 273-283.

Handayani, S. (2014). Penerapan model pembelajaran kooperatif tipe student teams achievement division (STAD) berbantuan media gambar untuk meningkatkan hasil belajar siswa. *Jurnal pendidilkan, 15(2)*, 125-133.

Suparmi. (2012). Pembelajaran kooperatif dalam pendidikan multicultural. *Jurnal Pembangunan Pendidikan Fondasi dan Aplikasi*, *1(1)*, 108-118.

Herman, T. (2012). Meningkatkan kualitas pembelajaran matematika melalui lesson study. *Jurnal Pendidikan*, *13(1)*, 56-63.

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