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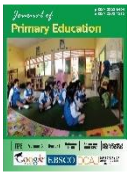

Improving Science Process Skills Through The Socio-Cultural Inquiry Model

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Abstract

This study aims to determine the improvement of science process skills towards grade IV elementary school student science learning using a socio-cultural inquiry model. This research type is Quasy Experimental Design with the form of non-equivalent control group design. The sampling technique used is the type of Cluster Random Sampling. The result of n-gain analysis shows that the Inquiry in the observing, classifying, communicating, and inferring aspect control class gets 0.10; 0.07; 0.09, and -0.08. All aspects of the science process skills are in the low category, while using the socio-cultural Inquiry class observing aspects get 0.61 medium category, classifying get 0.45 as medium category, communicating get 0.26 as low category, and inferring to get 0.30 as low category. The results of the t-test show the difference in the average results of the science process skills on the observing with the result of Sig. (2-tailed) of 0.004 < 0.05 and t_{value} of 2.94 > t_{table} = 2.04. Aspect classifying Sig. (2-tailed) of 0.015 < 0.05 and t_{value} of 2.49 > t_{table} = 2.04. Inferring aspects Sig. (2-tailed) of 0.042 < 0.05 and t_{value} of 2.07 > t_{table} = 2.04. But in the aspect of communicating there is no difference in the average learning outcomes of science process skills between the experimental group and the control group with the results of Sig. (2-tailed) of 0.321 > 0.05 and t_{value} 1.000 < t_{table} = 2.04. The conclusions of this study are the results of the science process skills of the experimental group are higher than the results of the control process of science process skills.

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INTRODUCTION

The achievement of the vision and mission of national education still has many obstacles. The problem of education in Indonesia today is still very complex, such as an ever-changing curriculum, lack of learning facilities, low quality of teaching staff, and lack of internal and external motivation of students as objects of education. According to Slameto (2010), the quality of learning, which ultimately produces learning outcomes, is influenced by various factors, both internal and external factors. Internal factors include physiological and psychological factors, such as intelligence, motivation, achievement, and cognitive abilities. The extern factors include environmental and instrumental factors, such as teachers, curriculum, methods, and learning media. Learning experiences are obtained through a series of activities to explore the environment through active interaction with friends, the environment and other sources (Asriningsih, 2015)

Indonesia's participation in the International Trends study in the International Mathematics and Science Study (TIMSS) and the Program for International Student Assessment (PISA) since 1999 also shows that the achievements of Indonesian children have not been encouraging in several reports issued by TIMSS and PISA. This is due, among other things, to the large number of test materials asked in TIMSS and PISA is not included in the Indonesian curriculum. The PISA test results in 2015 Indonesia occupy a low position, ranking 69 from 76 countries. The quality of education is determined by the results of science learning at each level. However, this cannot yet become a benchmark for learning in Indonesia, if learning is designed according to students character and using a varied model, it is hoped that it can improve the quality of existing education.

Learning by many educators today tends to achieve curriculum targets. Observations and interviews with 18 teachers in the Diponegoro cluster showed more than 80% of the learning carried out using conventional models. Even though the teacher has compiled a good lesson plan (RPP) by listing various learning models that encourage meaningful learning activities, in the implementation of classroom learning activities that are always dominated by teachers. It is more important to memorize concepts not on understanding, students are not trained to find concept of knowledge. As a result, students forget more quickly about the material being taught. This has an impact on students' interest in learning and is not motivated to try to understand what the teacher teaches so that it influences learning outcomes.

Based on the analysis of the problems that have been carried out, it is need to set the right alternative actions to improve students' science learning process skills. Therefore, it is necessary to apply an inquiry model that can increase student interest in science lessons. In delivering science lessons on energy material and its changes, the teacher should associate science learning with energy material and its changes with everyday life so that students learn from simple things in the environment where they live so that students are easy to understand and master the material. One approach to learning is socio-cultural. In socio-cultural learning, the teacher functions as a motivator that provides stimulation so that students are active and have a passion for thinking, facilitators, who help show a way out if students find obstacles in the thinking process, managers who manage learning resources, and as rewarders who reward achieved by students. In essence, it is students who can solve their own problems to build knowledge.

Sharma (2016) explained that socio-cultural not only positioning students because they are actively involved in finding meaning during the learning process, but also suggests that students can be helped by working with others who are more knowledgeable. In addition socio-cultural can be the basis of the development of teaching materials that make elementary school students get to know their own values and culture (Sukitman, 2013).

Learning Science is an effort to hone process skills, conduct scientific work processes (think and do like scientist), contextual, rich in locality, hands-on activity, and minds-on activity.

Zeidan (2015) describes science process skills as procedural, experimental skills and investigates the habit of carrying out scientific work processes of the thinking ability or scientific inquiry. Science process skills are suitable to be taught in the early grades of elementary school to hone basic skills as a prerequisite for learning integrated skills. Subali (2011) explained that science process skills in the science field should be prioritized in learning to develop students' creativity. Students can be given the opportunity to observe, handle various things and explore the environment (Ango, 2002).

Some considerations on the basics described above, the application of a socio-cultural inquiry model can provide opportunities for students to improve science process skills.

METHODS

The population in this study were the IV grade students of Elementary School in Diponegoro cluster, Mejobo District, Kudus Regency. The sampling technique in this study was carried out by cluster random sampling obtained by the 5 Jepang Elementary School students as the control class and 3 Gulang Elementary School as the experimental class. The sample in this study were two classes, one class as an experimental class consisting of 32 students and one class as a control class consisting of 40 students. The independent variables in this study are socio-cultural insightful Inquiry learning methods that can be seen from the learning of students in grade IV in the science subject of energy material and its changes. Inquiry methods in control class and socio-cultural inquiry experiment class. Dependent variables are variables that are influenced or which are due, because of the independent variables (Sugiyono, 2014). The dependent variable in this study is science process skills. Data collection of science process skills using observation sheets.

The analysis test used was instrument analysis and data analysis. Instrument analysis includes validity testing. Data analysis methods consist of initial and final data analysis. Initial data analysis includes normality test and homogeneity test. Final data analysis includes score gains and t-test.

RESULTS AND DISCUSSION

The learning outcomes in this study are the use of inquiry models with socio-cultural insight in the experimental class and the use of inquiry models in the control class to determine the improvement of science process skills of fourth grade elementary school students. Learning activities are carried out for three meetings in each class to be measured and analyzed in hypothesis testing.

The results showed that the socio-cultural inquiry model to improve students' science process skills was fulfilled. The results of the science process skills in observing aspects in the first learning get 5.78 points with a percentage of 72% with good categories. In the second learning, it gained 6.28 points with a percentage of 79% in the good category. The aspect of classifying in the first learning gets 4.72 points with a percentage of 59% with enough categories. In the second learning, it gained 5.38 points with a percentage of 67% with good categories. Aspect of communicating in the first learning gets 6.53 points with a percentage of 54% with enough categories. In the second learning, it got 7.72 points with a percentage of 64% with good categories. The aspects of inferring in the first learning get 2.34 points with a percentage of 59% with enough categories. In the second learning, it gained 2.38 points with a percentage of 59% with enough categories.

Continued on observations of science process skills observing aspects in the third learning get 7.16 points with a percentage of 89% in the very good category, increasing from the second learning that gets 6.28 points with a percentage of 79% in the good category. The aspect of classifying in the third learning gained 6.22 points with a percentage of 78% in the good category, increasing from the second learning which received 5.38 points with a percentage of 67% with good categories. Aspect of communicating in the third learning gets 7.72 points with a percentage of 64% in the good category, does not experience an increase from the second learning that gets 7.31 points with a percentage of 61% in the good category. The aspects of inferring in the third learning gained 2.84 points with a percentage of 71% in the good category, increasing from the second learning which received 2.38 points with a percentage of 59% with enough categories. The graph of the increase in learning in the experimental class can be seen in Figure 1 below.

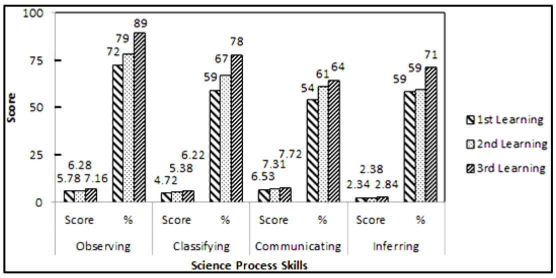

Figure 1. Improved Science Process Skills Experimental Classes

The results obtained from the control group of science process skills observing aspects in the first learning get 6.18 points with a percentage of 77% with good categories. In the second learning, it gained 6.20 points with a percentage of 78% in the good category. The aspect of classifying in the first learning gets 4.98 points with a percentage of 62% with good categories. In the second learning, it gained 5.08 points with a percentage of 63% with good categories. Aspect of communicating in the first learning gets 6.73 points with a percentage of 56% with enough categories. In the second learning, it got 7.13 points with a percentage of 59% with enough categories. The aspects of inferring in the first learning get 2.43 points with a percentage of 61% with good categories. In the second learning, get 2.45 points with 61% percentage with good category. The improvement of students' science process skills in the experimental class can also be seen from the results of student work as shown in Figure 2 below.

Figure 2 above shows an increase in students' abilities, especially in the aspect of instruction. They are easier to make conclusions from their activities. Students in the experimental class that using the sociocultural inquiry model improved scientific process skills.

Continued on the results of learning observations of the three science process skills observing aspects gained 6.18 points with a percentage of 77% with good categories, decreased from the second learning that got 6.20 points with a percentage of 78% with good categories. The aspect of classifying in the third learning gets 5.20 points with a percentage of 65% in the good category, increasing from the second learning that gets 5.08 points with a percentage of 63% in the good category.

Aspect of communicating in the third learning gained 7.23 points with a percentage of 60% with a good category, an increase from the second learning that received 7.13 points with a percentage of 59% with enough categories. The aspects of inferring in the third learning get 2.38 points with a percentage of 59% with enough categories, experiencing a decrease from the second learning that gets 2.45 points with a percentage of 61% with a good category.

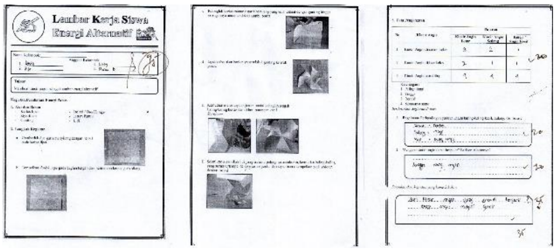

Figure 2a. Example of Student Activity Sheet Learning Experiment Class 1st Learning

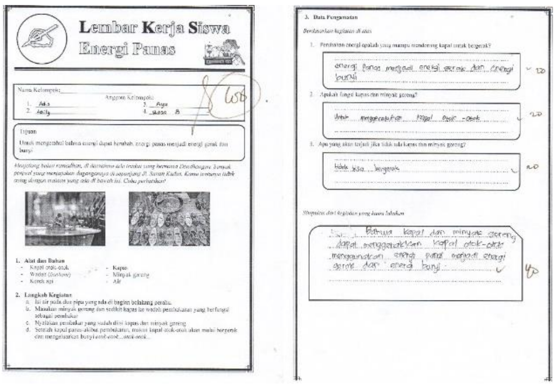

Figure 2b. Example of Student Activity Sheet Learning Experiment Class 3rd Learning

The learning graph in the control class can be seen in Figure 3 below.

The science process skills of students in the control class, especially the aspect of instruction, have decreased from learning 1 to learning 3, this can be seen from the example of the student activity sheet in Figure 4 below.

Improved learning in the experimental class and the control class tested using the score gain was listed in Figure 4 below.

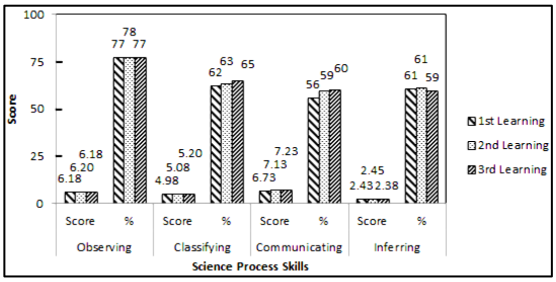

Figure 3. Results of Science Process Skills Control Class

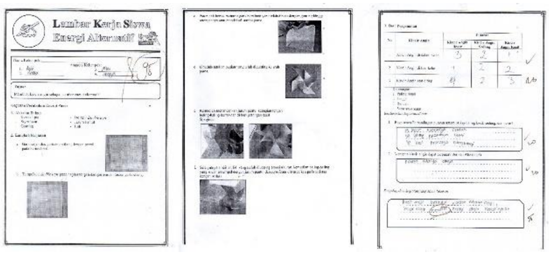

Figure 4a. Example of Student Activity Sheet Learning Control Class 1st Learning

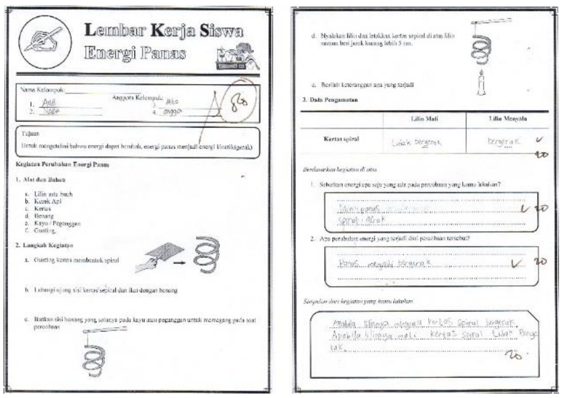

Figure 4b. Example of Student Activity Sheet Learning Control Class 3rd Learning

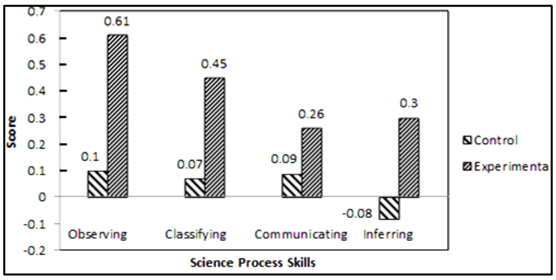

Figure 4. Average Score Gain Result

Figure 4 above can be seen that the results of n-gain experimental class observing aspects get 0.61 included in the medium category, classifying aspects get 0.45 included in the medium category, aspects of communicating get 0.26 included in the low category, and the inferring aspect gets 0.30 is included in the low category. N-gain in the observing aspect control class gets 0.10, the classifying aspect gets 0.07, the communicating aspect gets 0.09, and the inferring aspect gets -0.08. All aspects of science process skills are included in the low category. The results of the gain test can we conclude that the difference in the experimental class is higher than the control class so that the learning in the experimental class is better than the control class.

The results of independent sample t-test of science process skills analyze the four aspects of science process skills, namely aspects of observing, classifying, communicating and informing. Observing aspects can be seen in Table 2.

The results of the independent sample t-test showed that there were differences in the average results of the science process skills on observing aspects that obtained the results of Sig. (2-tailed) < 0.05, which is 0.004 < 0.05 and t_{value} is 2.94 > t_{table} = 2.04, this shows that there is a difference in the average results of learning aspects of science process skills observing between the experimental group and the control group.

Furthermore, the results of independent sample t-test skills in classifying science process aspects can be seen in Table 3.

Table 2. Test Results of Independent Sample t-test Observing Aspects

		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% Confidence interval of the difference	
									Lower	Upper
Pos-tes	Equal variances assumed	2.25	.13	2.94	70	.004	12.26	4.16	3.96	20.56
	Equal variances not assumed			3.01	69.93	.004	12.26	4.07	4.14	20.38

Table 3. Test Results of Independent Sample t-test Classifying Aspects

		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% Confidence interval of the difference	
									Lower	Upper
Pos-tes	Equal variances assumed	1.79	.18	2.49	70	.015	12.73	5.10	2.54	22.92
	Equal variances not assumed			2.43	59.28	.018	12.73	5.22	2.27	23.19

Table 3 above shows that the classification aspects get the results Sig. (2-tailed) < 0.05, which is 0.01 < 0.05 and t_{value} is 2.49 > t_{table} = 2.04, so it is concluded that there is a difference in the average learning outcomes of aspect science process skills classifying between the experimental group and the control group.

The results of independent sample t-test skills in communicating aspects of science processes can be seen in Table 4.

Table 4. Test Results of Independent Sample t-test Aspects of Communicating

		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% Confidence interval of the difference	
									Lower	Upper
Pos-tes	Equal variances assumed	.017	.89	1.00	70	.32	4.11	4.11	-4.09	12.32
	Equal variances not assumed			1.01	69.03	.31	4.11	4.06	-3.99	12.22

Table 4 above shows that the aspects of communicating get results Sig. (2-tailed) < 0.05, which is 0.32 > 0.05 and t_{value} is 1,00 < t_{table} = 2.04, so it is concluded that there is no difference in the average learning outcomes of science process skills between the experimental group and the control group.

The last independent sample t-test is the results of the inferring aspects of the science process skills can be seen in Table 5.

Table 5. Independent Sample t-test Aspect Test Results

		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% Confidence Interval of the Difference	
									Lower	Upper
Pos-tes	Equal variances assumed	17.55	.00	2.07	70	.042	11.71	5.65	.44	22.99
	Equal variances not assumed			1.97	50.05	.054	11.71	5.92	-.19	23.62

Table 5 above shows the inferring aspects to get results Sig. (2-tailed) < 0.05, which is 0.04 < 0.05 and t_{value} is 2.07 > t_{table} = 2.04. So that it was concluded that there were differences in the average learning outcomes of the inferring aspect science process skills between the experimental group and the control group.

The use of the socio-cultural inquiry model in the experimental class showed a difference in science process skills with the use of inquiry models in the control class. The results obtained show significant results in aspects of observing, classifying, and inferring. But in the aspect of communicating shows insignificant results.

Relevant research on the use of socio-cultural learning and inquiry models conducted by Mavuru & Umesh (2017) finds conclusions in his research that the incorporation of socio-cultural backgrounds of students in lessons provides authentic learning situations that promote the development of critical and analytical thinking skills for students. Lee & Luykx (2007) explain that effective teachers must has an understanding the language and culture of students and the ability to articulate their students' experiences. Furman (2008) explains that teacher education must be culturally responsive to the background of students to be taught by the teacher.

The results achieved by Chen & She (2015) which states that the inquiry learning model is effective and efficient to implement science learning. The inquiry model involves the process of exploring nature which leads to the process of asking questions, making discoveries, testing discoveries and solving problems to find new understanding, so as to encourage students' scientific reasoning which is one of the goals of education. According to Yuniastuti (2012) the application of inquiry learning can trigger an increase in student process skills. Because in the learning process to look for problem solving and the accompanying knowledge will produce meaningful understanding. The guided inquiry learning model requires students to actively participate with concepts and principles in order to gain experience and conduct experiments that will direct students to discover the principle itself. Thus, the knowledge gained will last a long time and be easier to remember when compared to the knowledge obtained in other ways. In addition, with the discussion and exchange of opinions between friends in a group that can then be expanded and developed with other groups provide opportunities for students in learning to construct knowledge both existing and newly acquired (Mahmud, 2014).

This research has several main constraints, that in terms of time. Learning time is only 2×35 minutes each meeting has not been able to provide students the freedom to practice. As the result researchers are only able to facilitate learning with very simple practices for understanding concepts. The number of students in the class is also an obstacle in the implementation of inquiry learning, learning will be more optimal if the number of students in one class does not exceed 30 students.

CONCLUSION

Based on the results of the study after being analyzed and discussed according to the relevant theory, it can be concluded that the results of the science process skills of the experimental group students using a socio-cultural insight model inquiry is higher than the results of the control group science process skills.

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