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The Effectivenes of Science Domain-Based Science Learning Integrated with Local Potency

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Abstract. This research aimed to determine the significant effect of science domain-based science learning integrated with local potency toward science process skills. The research method used was a quasi-experimental design with nonequivalent control group design. The population of this research was all students of class VII SMP Negeri 1 Muntilan. The sample of this research was selected through cluster random sampling, namely class VII B as an experiment class (24 students) and class VII C as a control class (24 students). This research used a test instrument that was adapted from Agus Dwianto's research. The aspect of science process skills in this research was observation, classification, interpretation and communication. The analysis of data used the one factor anova at 0,05 significance level and normalized gain score. The significance level result of science process skills with one factor anova is 0,000. It shows that the significance level < alpha (0,05). It means that there was significant effect of science domain-based science learning integrated with local potency toward science learning process skills. The results of analysis show that the normalized gain score are 0,29 (low category) in control class and 0,67 (medium category) in experiment class.

INTRODUCTION

Along with the rapid developing era, human resources must adapt and improve in order to adjust the social needs and demand. Globalization, science and technology development, economy growth, international competition, environmental issue and political changes are the challenges human resources' ability and knowledge must meet to be successful in XXI century[1]. According to McCormack & Yager (1992), there are five domains of competencies must be possessed by the students in order to survive in this kind of challange. These science domains are knowledge, process of science, creativity, attitude, and application and connection).By developing these five domains, the students will be able to receive more meaningful Science learning and expected to improve their learning result. The Science learning result that must be mastered by the students is not only knowledge in form of facts, concepts, principles, but also innovation and development process that are usefull in daily life.

Based on the research conducted by Purwanti Widhy H, Sabar Nurohman, & Widodo Setyo W [2], current Science learning still tends to underline the product achievement which is cognitive field and has not approached aspects of process skills, attitude, and science thinking ability optimally. This is proven with the research result taken by Sukarno that the average of basic process skills ability of the junior high school students in Jambi is still low [3].

The result of Science literacy percentage of the Indonesian students is still far left behind another countries. This finding is based on TIMSS (Trends in International Mathematics and Science Study) achievement in 2015 that shows that the Indonesia was on the 45th place with score 397 from 48 countries [4]. Similar result is also

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shown by PISA (Programme for International Student Asessment) study in 2015, Indonesian students' Science literacy was on the 62nd place from 70 countries with average score of 403 [5].

The low students' science achievement shows that the Science learning process in school has not been optimized to master five Science domains as a whole. The learning process in school still underlines the cognitive result instead of aspects of process skills, attitude, creativity and application optimally. One of the steps that is possible to be implemented in order to improve the process skills is by applying Science domain based learning. Science domain based learning integrates Science domains into the present Science learning. In this kind of learning, the students are actively being involved in the knowledge finding process while the teachers play role as guides and coordinators during the students' learning activities. The students are invited to implement knowledge finding process through Science process activities as applied by the scientists in searching new inovations.

The Science process skills is very important tool to make and process the scientific data in order to develop the scientific research and solve the problem [6]. According to Chabalengula the Science process skills can be classified into two groups namely basic process skills and integrated process skills [7].The basic process skills are the basic foundation to study the integrated process skills. The integrated process skills are more complex skills to solve the problem or to implement Science experiment [8].

Based on the research conducted by Haryono it is concluded that Science skills based learning model is effectivelly proven to improve the mastery of Science concept, Science process, and Science attitude of the students [9]. Furthermore, from the research performed by Dadan Rosana it is concluded that the Science five domains learning model with contextual approach based on the constructivism theory is able to achieve high cognitive score (73,11%), decent attitude score (58%), high process score (63,31%), high applicative score (61,93 %) and unfortunatelly still low creativity score (39,41%) [10].

In Acts No. 20 Year 2003 on National Education System and the Regulation of the Minister of National Education of Republic Indonesia Number 81A year 2013, the Government supports the school to include local potency elements. This is due to Indonesia as Country well known with a lot of local potencies [11] [12]. Each island or region in Indonesia owns various ethnics, races, languages, traditions, cultures representing special characteristic of such region [13].

The integration of local potency into the school learning process is really necessary therefore the students do not forget who they really are and are capable to develop the local potencies around them. One of the efforts to plant the sense of belonging the local potency is through Science learning integrated with local potencies in their surrounding. The acknowledge of local potency can increase the students' respect toward the local potency itself, acknowledge the values of the local wisdom and experience internalized values that are able to guide the students into persons with characters [14].

In addition, by integrating the local potency in learning process the students's ability can also be improved in matter of process skills and scientific method. This is affirmed with the research conducted by Atmojo that the students' Science process skillsare increased and classified into high Science process skills category (80%) when the learning is integrated with local potency which is making *jumputan batik* [13].

Meanwhile, based on the result of the observation and interview with the teachers and the students in SMP Negeri 1 Muntilan,the Science learning integrated with local potency seemed as rarely implemented. The local potency was deemed as the local content field. Therefore, the Science learning seldom integrates local potency. This is due to still few references and researches on the effectivity of local potency integration to improve the students' learning result. In facts, if we see the school's surrounding, there are a lot of available local potencies which can be used to be integrated into Science learning. One of them is the local potency in producing the brown sugar (Javanese brown sugar) that is possible to be integrated into Science learning in the topic of the changes of states of matter around us. Under such consideration, currently the writer wants to describe the significant effect of science domain-based learning integrated with local potency toward science process skills.

METHOD

Type of Research

Type of research applied is quasi experimental research.This research implements two classes namely experimental class and control class. The experimental class applies science domain-based science learning integrated with local potency, while the control class implements the learning according to the school learning that is regularly applied in the research place.

The Place and Time of the Research

The research was implemented in class VII B and VII C in SMP Negeri 1 Muntilan. Class VII B was the class used as control class and class VII C was used as the experimental class. The research was implemented from 19 November 2016 to 26 November 2016.

The Population and Sample of the Research

The population in this research was all students of class VII SMP Negeri 1 Muntilan consisting 7 classeswith total 168 students. The sampling technique in this research was cluster sampling therefore there were total 24 students of class VII B as control class and total 24 students of class VII C as experimental class.

Procedure

The procedures implemented in this research were: (1) giving pretest for both groups, (2) giving treatment of Science domain based learning integrated with local potency in experimental class and treatment of regular learning in the control class, (3) giving posttest for both groups.

The designs of this research was nonequivalent control group design. Where the format of this research can be seen in Table 1 [15] :

TABLE 1. Research Design of Nonequivalent Control Group Design

Group	Pretest	Treatment	Posttest
KE	O_1	X	O_2
K K	O_3	-	O_4

Note:

KE	:	Kelompok Eksperimen/ Experimental Class
KK	:	Kelompok Kontrol/ Control Class
O_1	:	Early Ability of Experimental Class
O_2	:	Later Ability of Experimental Class
O_3	:	Early Ability of Control Class
O_4	:	Later Ability of Control Class

Learning process by using science domain-based science learning integrated with local potency was implemented in 3 meetings for 7 school hours. The first meeting of 2 school hours was about the changes of states of matter. This activity used some materials one of them was the brown sugar therefore the students could analyze the changes of states of matter occurred to the brown sugar according to the activities presented in Student Worksheet 1 and Student Worksheet 2 already prepared by the researcher. Later, the second meeting for 3 school hours was about mixture separation. The mixture separation implemented by the students was filtration, chromatography and sublimation according to the Student Worksheet 3 already prepared by the researcher. On the filtration process, the students were invited to implement mixture separation of brown sugar solution by filtration. Later, on the third meeting for 2 school hours, the students were invited to visit brown sugar production industry site. In this activity, the students were invited to implement analysis on the relevancebetween the industry of brown sugar production and the topic of the around us and to write down the observation result in Student Worksheet 4 already prepared by the researcher.

Data, Instrument, and Data Collecting Technique

The data in this research was the result of the students' Science process skills. The instrument used in this research was 20 multiple choices questions to measure the students' Science process skills on the topic of the changes of states of matter around us. The instrument used was adapted from Agus Dwianto who was the first researcher [16]. The data collecting technique was by taking the students' pretest score on the Science process skills before the treatment and taking the students' posttest score on the Science process skills after the treatment. The questions given for the pretest and the posttest were same but the questions numbers for the posttest were random.

The aspects measured using multiple choices consisted of 4 aspects derived in 9 indicators displayed in table 2 on the hints of the Science process skills.

TABLE 2. Hints of Science Process Skills

No	Process Skills	Indicator
1	Observation	a. Using senses in collecting information b. Collecting relevant facts
2	Classification	a. Seeking the differences and similarities of the object being observed. b. Comparing the object being observed. c. Classifying the object being observed.
3	Interpretation	a. Relating the result of the experiment/ observation b. Summarizing the result of the experiment/ observation
5	Communication	a. Reading the table of the experiment/ observation b. Explaining the result of the experiment/ observation

Data Analysis Technique

Analysis Requirement Test

a. Normality Test
Normality test was applied to test the data distribution of the students' process skills before normal distribution treatment. The normality test was applied upon pretest data of process skills. The test of population data normality with "Kolmogorov-Smirnov" statistics used SPSS'21. The criteria applied was that if the score ofAsymp.sig.(2-tailed)was bigger than degree of determined alpha (5%) the data could be stated as normal distribution.

b. Homogeneity Test
Homogenity test was applied to know the similarities on the experimental class and control class using pretest score of the Science process skills. The homogeneity test on this research with Lavene test used SPSS'21. The criteria applied was that the score of sig>0,05, the data could be assumed as homogeneous and on the other hand if the score of sig<0,05, the data could be assumed as not homogeneous.

Hypothesis Test

The hypothesis test was applied using anova onefactor. Anova one factor was used to analyze data consisting one free variable and one bound variable. Anova one factor was necessary to find significant effect using Science domain based learning tool that was integrated to local potency toward the students' Science process skills either in the experimental class and the control class.

Hypothesis

Ho : There was no significant effect by using science domain-based science learning integrated with local potency toward science process skills in SMP Negeri 1 Muntilan.

Ha : There was significant effect by using Science science domain-based science learning integrated with local potency toward science process skills in SMP Negeri 1 Muntilan.

Decision criteria on this test was that Ho was refused if the score of significance < alpha (0,05)

Improvement Analysis

The students' Science process skill improvement can be known through the calculation of normalized gain score [17]. The formula to calculate the improvement of Science process skills is

$$g = \frac{posttest\ score - pretest\ score}{maximum\ score - pretest\ score}$$

According to Hake the normalized gain score can be explained in Table 3 [17].

TABLE 3. Category of normalized gain score

No.	Normalized gain score	Category
1.	$g > 0.7$	High
2.	$0.7 > g > 0.3$	Middle
3.	$g < 0.3$	Low

RESULTS AND DISCUSSION

In the recent years, science is a body of knowledge, a methods to exploring nature, and a tool for solving problems [18]. The most powerful knowledge to comprehend how our world works and how we interact with our physical surroundings is given by science [19]. The aim of science is to enhance the concept about nature of science. The procedure to collect scientific data and the phases of scientific method are process skills [20]. The science process skills are useful to make students aware in participating science laboratory inquiry. The practice of science process skill can not be separated with the conceptual understanding of science. It is involved in learning and applying science [21]. Playing a key role which is formal and informal learning of science content and practical science can not be separated in science process skills [22]. Science process skills approach emphasizes on constructing knowledge, representing ideas, and communicating information [23].

Science process are the ways of thinking, measuring, solving problems, and using thoughts. Science process skills can be divides into two types, there are basic science process skills and integrated science process skills [24]. Basic science process skills is to form the backbone of the more advanced problem-solving skills and capacities [25]. Integrated science process skills are more characterized and associated with experimentation [26].

The research was implemented in two classes namely class VII B as control class and class VII C as experimental class. The research in the experimental class used science domain-based science learning integrated with local potency. The local potency was the industry of brown sugar production in region of Polengan, Srumbung. The material used for the research was the changes of states of matter around us. While in the control class, the learning was on the regular basis applied in SMP Negeri 1 Muntilan.

The research was conducted in three meetings on each class. The research was implemented in control class on November 21st, 2016 that was pretest activity for one school hour by finishing the pretest of process skills. Later the learning for the research implementation was on November 23rd, 2016 for two school hours for topic of the changes of states of matter and on November 26th, 2016 for two school hours for topic of mixture separation. After the learning was over, later on November 26th, 2016 for one school hour, the posttest for the students' Science process skills was performed.

The pretest activity on the experimental class was conducted on November 19th, 2016. The pretest activity was applied to finish the pretest of the Science process skills. Later, the learning activity was implemented on November 23rd, 2016 for two school hours on the changes of states of matter, and on November 25th, 2016 after the school hours, the students were invited to visit local potency site, in industry of brown sugar production. The Posttest activity itself was implemented on November 26, 2016 for one school hour to finish the posttest of process skills.

Analysis requirement test consisted of normality test and homogeneous test. The first test was normality. The normality test was implemented using Normality Test Kolmogorov-Smirnov with SPSS 21. The normality test was implemented on pretest result data of skill process in class VII B as the control class and class VII C as experimental class.

Based on the result of the normality test, the significant score in the control class was 0,243 and the significant value in was 0,133. The result of normality test in the control test and experimental test described that the pretest data of process skills in both classes was normal distribution. This was due to both classes had significant score that was bigger than alpha score (0,05).

Based on the result of homogeneity test, the score of process skills pretestresult in the control class and the experimental class reached significant value of 0,190. This significant score based on the test result was bigger than the alpha score used (0,05) therefore it can be said that both classes had homogeneous population variant score.

The average score from Science process skill pretest in SMP Negeri 1 Muntilan can be seen in Table 4.

TABLE 4. The Result of Science Process Skills Pretest in SMP Negeri 1 Muntilan

No.	Component	Control Class	Experimental Class
1	Total Students	24	24
2	Average of KPS Score	63,33	61,25
3	The Highest Score	85,00	70,00
4	The Lowest Score	45,00	50,00
5	Variant	64,49	26,63
6	Deviation Standard	8,03	5,16

Based on Table 4 it is informed that the score of Science process skill in control class was 63,33 and in experimental class was 61,25. Later, the score range in control class is from 45,00 to 85,00. While the score range in experimental class was from 50,00 to 70,00. Later, the explaination of process skill value of each indicator can be seen in Table 5:

TABLE 5. Result from Each Indicator of Science Process Skills Pretest in SMP Negeri 1 Muntilan

Indicator	Pretest Score of Process Skills	
	Control Class	Experimental Class
Observation	63,54	61,46
Classification	64,58	60,42
Interpretation	59,38	59,38
Communication	64,58	64,38
Average	63,33	61,25

Based on the Table 5 it is informed that in the control class the students got the highest score under indicator of classification and communication with average score of 64,58 and the students got the lowest score under indicator of interpretation with average score of 59,38. While in the experimental class, the students could gain the highest average scores under indicator communication with average score of 64, 38 and the lowest average score under indicator interpretation with average score of 59,38. The result of Science Process Skills posttest in SMP Negeri 1 Muntilan can be seen in Table 6 :

TABLE 6. The Result of Science Process Skills Posttest in SMP Negeri 1 Muntilan

No	Component	Control Class	Experimental Class
1	Total Students	24	24
2	Average of KPS Score	73,96	87,29
3	The Highest Score	85,00	100,00
4	The Lowest Score	65,00	65,00
5	Variant	26,04	58,65
6	Deviation Standard	5,10	7,66

Based on Table 6 it is informed that the average score of process skills in control class was 73,96 and average score of Science process skills in experimental class was 87,29. Later the score range in the control class was from 65,00 to 85,00 and the score range in the experimental class was from 65,00 to 100,00. It is obvious that the average of Science process skills in the experimental class was bigger than the score average of process skills in the control class. Later for the score of Science process skills from Each Indicator can be seein in Table 7.

TABLE 7. Result from Each Indicator of Science Process Skills Posttest in SMP Negeri 1 Muntilan

Indicator	Posttest Score of Process Skills	
	Control Class	Experimental Class
Observation	77,08	91,67
Classification	75,52	89,58
Interpretation	69,79	73,96
Communication	71,88	91,67
Average	73,96	87,29

Based on Table 7 it is informed that the students in the control class got the highest score under the indicator observation with average score of 77,08 and the lowest score under the indicator interpretation with average score of 69,79. While in the experimental class, the students got the highest score under the indicators observation and

communication with average score of 91,67 and the lowest score under the indicator interpretation with average score of 73,96.

The difference between the average score of pretest of Science process skills and the average score of posttest of Science process skills dan be seen in Table 8.

TABLE 8. Normalized Gain Score from Each Indicator of Science Process Skills in SMP Negeri 1 Muntilan

Indicator	Normalized gain score	
	Control Class	Experimental Class
Observation	0,37	0,78
Classification	0,31	0,74
Interpretation	0,26	0,36
Communication	0,21	0,77
Average	0,29	0,67

Based on Table 8 it is informed that the gain score in the control class was 0,29 therefore it can be concluded that the gain score of the Science process skills in the control class was classified in low category. While the gain score in the experimental class was 0,67 therefore it can be concluded that the gain score of the Science process skills in the experimental class is classified in middle category.

The following test was hypothesis test for research result data. The Hypothesis test used for this research was anova one factor. Analysis of anova one factor was used to know the effect of learning approach toward the students' Science process skill. The result of the anova one factor is presented in the following Table 10.

TABLE 9. Result of Anova One Factor Test

Science process skills after the treatment	F	sig
	50,379	0,000

Based on Table 9 it is informed that the value of F was 50,379 and its significant value was 0,000. The significant value < 0,05 therefore Ho was refused and Ha was accepted. The conclusion is that there was significant effect by using science domain-based science learning integrated with local potency toward the Science process skills in SMP Negeri 1 Muntilan.

The Science domain based learning underlines the students' creativity in distributing new ideas necessary for the students' selves development. This learning prioritizes the students' activeness and involvement in the learning activity [27]. According to the research conducted by Jumadi it is mentioned that the integrated Science learning tool Susan Loucks-Horsley model is effective to improve the students' scientific attitude toward Science, Science process skills, and Science mastery [28].This research result is also relevant with the research result implemented by Suhadi's research that the Science learning using Science domain based LKPD is effective to increase the students' Science process skills and concept understanding [29].

The Science learning that is integrated with the local potency in the surrounding can train the students in order to observe and implement research activity independently. In addition, the students can understand the potency in their area better, therefore the students are getting used to find their own information and use such information to solve the problem around their environment. The Science domain based learning that is integrated with the local potency can increase the Science process skills. This is relevant to the research result under the research implemented by Atmojo that the students' Science process skills was getting better and in the category high process skills (80%) when their learning was integrated with jumputan local potency [13].

CONCLUSIONS

Based on the study, it can be concluded that there is significant effect of using science domain-based science learning integrated with local potency toward the Science process skills. As suggestion, the teacher should conduct the learning that not only emphasizes cognitive aspect but also must consider psychomotor aspect even affective aspect of the students. In addition, the teacher can apply science domain-based science learning integrated with local potency on other topics therefore he can improve the students' ability especially in the Science process skills.

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