

# Integrating Local Wisdom in Natural Science Learning

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**Abstract**—This research aims to determine the significant effect of the use of local wisdom integrated to science domain-based learning media towards the science process skills and the learners' scientific attitude. The research method used is quasi experiment with non-equivalent control group design. The population of this research is the entire seventh grade students at SMP Negeri 1 Muntilan and SMP Muhammadiyah Tanjung. Samples of the research in SMP Negeri 1 Muntilan are class VII B as the control class and class VII C as the experimental class. While the research samples in SMP Muhammadiyah Tanjung are class VII B as the control class and class VII A as the experimental class. The instrument used for measuring the science process was written test. The instrument used to measure the learners' scientific attitude were a questionnaire and an observation sheet. Data analysis employed one factor Manova and Anova with a 0.05 level of significance. The research results show that there is a significant effect of the use of local wisdom integrated to science domain-based learning media towards the science process skills and the learners' scientific attitude simultaneously.

**Keywords**—*local wisdom, Natural Sciences process, scientific attitude*

## I. INTRODUCTION

Along with the development of times, human resources must be able to change and develop in order to adapt to the needs and demands of the society. One of the ways to create high quality, intelligent, open, competitive human resources and to improve the welfare of the people of Indonesia is through education [1]. To improve the quality of education is by implementing effective learning process so that the learning outcomes can be achieved optimally [2]. According to McCormack, the competence that has to be mastered by learners in order to face the development of times is depicted into five domains. The five domains of science are knowledge, process of science, creativity, attitude, as well as application and connection [3]. The learning model which is appropriate to the science domain is the Susan Louck Horsley's model (SLH) [4]. The SLH model has four stages of learning which are invite, explore, discover, create; propose explanation and solutions as well as taking action [4].

One of the stages in the SLH model directs the learners to be able to make a discovery. The learners can create the discovery process if the learners are equipped with a good scientific attitude. A person who has a scientific attitude is not necessarily a scientist but he will think, act and show the common traits of a scientist [5]. According to [6] scientific

attitude is the opinion or circumstances associated with psychological objects in the field of science or related to the psychological process [6]. Scientific attitude is a logical way of thinking without prejudice. A person who has a scientific attitude will not accept a theory without having clear evidence [7]. A person who has a scientific attitude can understand a truth, accept facts and reject prejudice without evidence. Learners who have scientific attitude will be able to solve problems, assess ideas and make the right decisions [8]. Scientific attitude will help to overcome problems objectively and think logically. Scientific attitude is the "scientific spirit" or "scientism" that can create rational prospects [9].

Someone who has a scientific attitude such as curiosity will try to ask and read in order to find information [10]. Science is closely related to the ways of finding out something. Researchers who want to conduct an experiment should possess skills such as the science process skills [11]. The science process skills cannot be separated in practice from the conceptual understanding involved in learning and applying the knowledge [12]. The science process skills are inseparable from science practice and play an important role in studying the science content formally and informally [13]. According to [14] research results, there is a positive correlation between the learners' science process skills and positive attitude towards science [14]. Science process skills are activities undertaken by scientists as they study and investigate problems, issues and questions. These skills are used to discover concepts and form concepts [15]. Emphasis on the science process skills can help learners gain meaningful information in forming an understanding on science [16]. According to [17] the science process skills can be classified into basic process skills and integrated process skills [17]. Basic process skills are the basic foundation to learn integrated process skills. Integrated process skills are more complex skills to solve problems or to conduct scientific experiments [18].

Based on the research conducted by [19], the current tendency of science learning still emphasizes on product achievement in the form of cognitive and has not yet touched the aspects of process skills, attitude, and the ability to think scientifically optimally [19]. This is proven by the results of research conducted by Sukarno which obtained the results that the average ability of the basic process skills of junior high school students in Jambi is still low [20]. In addition, the results of the TIMSS achievement study in 2015 showed that Indonesia's achievement is ranked 45 out of 48

participating countries [21]. Similar results are also shown based on the PISA study in 2015 which found that the level of science literacy of Indonesian learners is ranked 62 out of 70 participating countries [22].

The learners' low scientific achievement indicates that the science learning process at schools is not maximum in terms of training the mastery of the five domains of science as a whole. Learning at schools still emphasizes on the achievement of cognitive results and has not touched the aspects of process skills, attitude, creativity and application optimally. One of the things that can be used to improve the scientific attitude and the science process skills can be done through science-based learning. Learners are invited to do the process of seeking knowledge through the science process activities and attitude like what is done by scientists in searching new discoveries. Based on the research conducted by [23], it was found that the learning model of five domains of science with contextual approach based on constructivism theory can achieve high cognitive value (73.11%), quite high attitude value (58%), high process value (63.31%), high applicative value (61.93%) and low creativity score (39.41%) [23].

According to Law no. 20 of 2003 on the National Education System and the Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 81A of 2013, the Government requires that learning at schools incorporates the elements of local potency [24] [25]. This is because every island or region in Indonesia has ethnic, racial, language, tradition and cultural diversity that symbolize the characteristics of that particular region. [26] Introducing local wisdom can increase the learners' respect for local wisdom, make them recognize the values of local wisdom and experience value internalization that can lead learners to be individuals with characters [27]. If science is associated with the daily life environment, it will be favored by the learners and thus providing a meaningful learning experience to the learners [28]. Based on the results of research conducted by [29], it was found that the utilization of local potency is still minimum; only about 38.23% of teachers have addressed the issues in the Lesson Plans (RPP) or Students' Worksheets (LKS) by exploiting the objects at school [29].

In fact, there are a lot of local potential around schools that can be used to be integrated into science learning. One of them is the making of Javanese sugar that can be integrated into science learning on the topic of objects' changes. Therefore, the researchers conducted a research related to the effectiveness of science domain-based learning media integrating the local potential to improve the learners' scientific attitude.

## II. METHOD

The type of research employed is quasi experimental research. The research was conducted at SMP Negeri 1 Muntilan in November 2016, and also at SMP Muhammadiyah Tanjung in January 2017. The population of this research is all the seventh graders at SMP Negeri 1 Muntilan and SMP Muhammadiyah Tanjung. The sampling

technique in this research is cluster sampling. Therefore, the research at SMP Negeri 1 Muntilan used class VII B as the control class and class VII C as the experimental class. While the research at SMP Muhammadiyah Tanjung used class VII B as the control class and class VII A as the experimental class.

The research steps undertaken in this research are: (1) conducting pre-test in the form of initial questionnaire of scientific attitude and pre-test of initial process skills using written test in both classes, (2) giving treatment by applying local wisdom integrated science domain-based learning in the experimental class and the regular learning in the control class (3) conducting observations during the research on things related to the learners' scientific attitude during the learning activities using observation sheet of scientific attitude, (4) providing post-test in the form of a questionnaire of scientific attitude and process skills test.

The research design in this research is the non-equivalent control group design. The format of the research can be seen in Table 1.

TABLE 1. NON-EQUIVALENT CONTROL GROUP RESEARCH DESIGN

Group	Pre-Test	Treatment	Post-Test
KE	O <sub>1</sub>	X	O <sub>2</sub>
KK	O <sub>3</sub>	-	O <sub>4</sub>

Notes: [30]

- KE : Experimental Group
- KK : Control Group
- O<sub>1</sub> : Initial Ability of the Experimental Group
- O<sub>2</sub> : Final Ability of the Experimental Group
- O<sub>3</sub> : Initial Ability of the Control Group
- O<sub>4</sub> : Final Ability of the Control Group

The learning process by using the local wisdom integrated science domain-based learning media was conducted 3 times. At the first meeting, the two-hour lesson was about the nature of objects and changes in the objects. In this activity, one of the materials was the Javanese sugar so that the learners can analyze the nature and changes that occur in the Javanese sugar in accordance with the activities in student's worksheet-1 and student's worksheet-2 that have been provided by the researchers. After that, at the second meeting, the three-hour lesson was about the separation of the mixture. The separation of mixtures conducted by the learners were filtration, chromatography and sublimation in accordance with student's worksheet-3 that was already provided by the researchers. In the filtration process, the learners were invited to conduct the separation of mixture of Javanese sugar solution by filtration. Finally, at the third meeting, the two-hour lesson invited the learners to the manufacture of Javanese sugar industry. In this activity, the learners were invited to analyze the relationship of Javanese sugar-making industry to the materials of objects' changes and to write down the observation result in student's worksheet-4 which has been provided by the researchers.

### a) Data, Instrument and Data Collection Technique

#### 1). Analysis Requirement Test

The data in this research are in the form of the process

skills test results, questionnaire of the learners' scientific attitude and an observation sheet of scientific attitude. The instruments used in this research are 20 multiple choice questions for measuring the process skills and 13 statements to measure the learners' scientific attitude toward the materials of objects' changes. The instruments of process skills test and scientific attitude questionnaire used were adapted from [31]. Data collection technique was conducted by taking the pre-test scores using the process skills test and the questionnaire of learners' scientific attitude to identify the learners' scientific attitude before the treatment, observing the learners' scientific attitude during the treatment using an observation sheet, and taking the post-test scores using the process skills test and the questionnaire of learners' scientific attitude after the treatment. The aspects of process skills measured consists of 5 aspects which are elaborated into 9 indicators presented in table 2.

**TABLE 2. SCIENCE PROCESS SKILL INDICATORS**

No	Process Skills	Indicators
1	Observing/ observation	a. Using senses in collecting information b. Collecting relevant facts
2	Classifying/classification	a. Identifying the differences and similarities of the objects being observed. b. Comparing the objects being observed. c. Classifying the objects being observed.
3	Interpreting /interpretation	a. Connecting the experiments/observation results b. Concluding the experiments/observation results
4	Communicating	a. Reading the table of experiments/observation results b. Explaining the experiments/observation results

The learners' scientific attitude indicators in this research can be seen in Table 3.

**TABLE 3. LEARNERS' SCIENTIFIC ATTITUDE INDICATORS**

NO	Scientific Attitude	Indicators
1	Curiosity	a. Enthusiastic in finding answers. b. Attention to the object being observed. c. Enthusiastic to the science process. d. Asking questions about the object and the steps of the activity. e. Showing interest to the experiment results
2	Inventive attitude and creativity	a. Using facts for the basis of conclusions. b. Showing a report which is different from other classmates. c. Using unusual tools. d. Suggesting new experiments. e. Elaborating new conclusions based on the observation.
3	Sensitivity to the surrounding environment	a. Attention to the surrounding events. b. Participation in social activities. c. Maintaining the cleanliness of the school's environment.

*b) Data Analysis Technique*

**a. Normality Test**

The data normality test of the population was conducted using the statistical distance of Mahalanobis by using SPSS'21. The criterion used is if the value of  $d_j^2 \chi^2_{(2,0,5)}$  is about 50% of the observation data taken, then the obtained population data were normally distributed or if the sig value is smaller than the specified alpha level (5%), then it can be

concluded that the data are normally distributed.

**b. Homogeneity Test**

The homogeneity test in this research was using the box's M test with the help of SPSS 21 software for windows. The test criterion was if the sig value is  $> 0.05$ , then the data are assumed as homogeneous. On the other hand, if the sig value is  $< 0.05$ , then the data are assumed as not homogeneous.

**2) Hypothesis Test**

Hypothesis test was conducted by using Manova. The Manova hypothesis in this research is:

Ho: There is no significant effect of the use of the local wisdom integrated science domain-based learning media on the science process skills and the learners' scientific attitude simultaneously.

Ha: There is a significant effect of the use of the local wisdom integrated science domain-based learning media on the science process skills and the learners' scientific attitude simultaneously.

The decision criterion in this test is "Ho is rejected if the significance value is  $<$  real level (0.05)."

**III. RESULT AND DISCUSSION**

This research aims to determine the effectiveness of the local wisdom integrated to science domain-based learning media to improve the science process skills and the learners' scientific attitude. The materials used for this research are about the objects changes around the learners. Local wisdom that is integrated in this research is about the Javanese sugar-making industry in the area of Polengan, Srumbung, Magelang.

Normality test was conducted on the initial data of the process skills and scientific attitude. The significance value in the control and experimental classes both at SMP Negeri 1 Muntilan and SMP Muhammadiyah Tanjung is 0.000. Therefore, it can be concluded that the data of process skills and the learners' scientific attitude before the treatment were normally distributed. On the homogeneity test, it was found that the significance value at SMP Negeri 1 Muntilan was 0.115 and the significance value at SMP Muhammadiyah Tanjung was 0.412. The significance value is bigger than the alpha value used (0.05). Therefore, it can be concluded that both classes have a homogeneous population variance value.

The Manova test is used to see whether the local wisdom integrated to science domain-based learning media can improve the science process skills and the learners' scientific attitude simultaneously. The data used for the Manova test were the scores of the scientific attitude questionnaire after the treatment and the post-test scores of the science process skills. The Manova test results at SMP Negeri 1 Muntilan and SMP Muhammadiyah Tanjung can be seen in table 4.

**TABLE 4. MANOVA TEST RESULTS**

School	Sig
SMP Negeri 1 Muntilan	0.000
SMP MuhammadiyahTanjung	0.000

The Manova test results obtained the significance value at both SMP Negeri 1 Muntilan and SMP Muhammadiyah

Tanjung which is smaller than 0.05. Therefore, it can be concluded that there is a significant effect of the use of the local wisdom integrated to science domain-based learning media on the science process skills and the learners' scientific attitude simultaneously. This is because the science domain-based learning can make the learners experience a more meaningful science learning and can improve the learners' learning outcomes [3]. The science-based learning uses the Susan SLH model because this model is a learning model that emphasizes on the creativity of the learners in channeling new ideas that are necessary for the learners' self-development. Learning by using the Susan Louck-Horsley's model emphasizes on the learner's activeness and the learning emphasizes more on the learners' involvement in the learning activities [3]. According to the research results by [32] the SLH model of integrated science learning media is effective to improve the learners' scientific attitude towards science, the science process skills, and the learners' mastery of science materials.

Science learning which is integrated with the surrounding local potency can train the learners to be able to observe and conduct experiments independently. In addition, the learners will be able to understand the potency in their area even more, so that learners are accustomed to searching, processing, and finding information on their own as well as using the information to solve existing problems in their environment. Learning which is based on science and integrating the local wisdom can improve the science process skills and the learners' scientific attitude.

The research results are related to the research results by Agus Dwianto which found that the developed local potential integrated to science-based learning was effective to improve the science process skills and the learners' scientific attitude [31]. In addition, the results of this research are also in accordance with the research conducted by Dadan Rosana which obtained that the learning model of five domains of science with contextual approach based on constructivism theory can achieve high cognitive value (73.11%), quite high attitude value (58%), high process value (63.31%), high applicative value (61.93%) and low creativity score (39.41%) [23]. The results of this research are also in accordance with the results of the research conducted by Haryono that science-based learning model can improve concept mastery, science process mastery and scientific attitude of the learners. The level of achievement after the treatment on the concept mastery is 66.35%, then 62.27% on the science process mastery and 69.92% on the scientific attitude of the learners [33].

Anova test is used to determine the significant effect of the use of the local wisdom integrated to science domain-based learning media on the science process skills. The data used for the Anova test were the post-test scores of the science process skills. The Anova test results at SMP Negeri 1 Muntilan and SMP Muhammadiyah Tanjung can be seen in table 5.

TABLE 5. ANOVA TEST RESULTS ON THE SCIENCE PROCESS SKILLS

School	Sig
SMP Negeri 1 Muntilan	0.000
SMP MuhammadiyahTanjung	0.000

The Anova test results on the science process skills show that the significance value is less than 0.05. Therefore, it can be concluded that there is a significant effect of the use of the local wisdom integrated science domain-based learning media on the science process skills.

The results of this research are also related to the results of the research conducted by [34] which found that science learning by using science-based students' worksheer is effective to improve the science process skills and the learners' concept understanding. Next, this research result has similarity with the research conducted by [26] which found that the learners' science process skills have increased and are in the category of high process skills (80%) when the learning is integrated with local wisdom.

The next test is the Anova test to find out the significant effect of the use of local wisdom integrated to science domain-based learning media on the learners' scientific attitude. The data used for the Anova test were the scores from the questionnaire of learners' scientific attitude after the treatment. The Anova test results on the learners' Scientific Attitude at SMP Negeri 1 Muntilan and SMP Muhammadiyah Tanjung can be seen in table 6.

TABLE 6. ANOVA TEST RESULTS ON THE LEARNERS' SCIENTIFIC ATTITUDE

School	Sig
SMP Negeri 1 Muntilan	0.001
SMP MuhammadiyahTanjung	0.000

The Anova test results on the learners' scientific attitude obtained the significance value which is less than 0.05. Therefore, it can be concluded that there is a significant effect of the use of the local wisdom integrated to science domain-based learning media on the learners' scientific attitude. This is in accordance with the research results from [35] that process skill-based LKPD can raise scientific attitude with the acquisition of a normalized gain score of 0.57 (medium category).

#### IV. CONCLUSIONS AND SUGGESTIONS

There is a significant effect of the integration of local wisdom into science domain-based learning media on the science process skills and the learners' scientific attitude simultaneously. Teachers should implement learning that does not only emphasize on the cognitive aspect but also the psychomotor aspect or even the affective aspect of the learners. In addition, teachers can integrate local wisdom into science domain-based learning on other materials so as to improve the learners' ability, especially their scientific attitude.

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