Dadiah local potential-based biology learning resources to improve students’ science process skills

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Abstract. Dadiah is a local potential of West Sumatra province. The teacher has not utilized Dadiah as a biology learning resource in school. The aim of this study is to apply biology learning resources based on the local potential to improve student’s science process skills. The design of the research was a weak experiment method. The data were collected through biology learning resources that has been developed were lesson plans, worksheets, material supplement and science process skills test. The research subjects were 30 students in one at senior high school at Sijunjung Regency, West Sumatera. The improvement of the students’ science process skills was seen based on the pre- and post-test results. The research result showed that the students’ science process skills increased as of medium category with N-gain of 0.61. Based on the result of this research, the learning resource that was based on Dadiah local potential can be used in the learning process. Learning resources can be an alternative learning with practical activities by applying scientific method to improve science process skills.

1. Introduction

Biology is the natural sciences about animal, plant and other organism. The students should have thinking ability, experience, and implementation of the knowledge they have through a scientific approach. The ability will be achieved if the students have science process skills. Science process skills is a higher-order skill [1]. It can help the students to think critically and scientifically [2]. Process skills become the basis for developing student competencies.

The students ability will increase if the biology learning activities and learning resources used can train Science Process Skills. The teacher's must appropriate design learning resources with attention to the student environment. The application of science process skills is still low, but science process skills are a skill that should be possessed by a scientist, the students, including the pre-service teachers, [3]. Therefore; learning with appropriate learning resources is needed to improve students' science process skills on biology learning.

Learning resources would be better designed with appropriate activities, utilizes the potential which around where students live, so that the learning becomes meaningful. The learning which uses local potential can be used to develop students’ skills, they can compete globally in education, culture, technology and communication and others. The local potential that is optimized positively affects for
student's ability [4]. Indonesia is a country that has a various cultures and local potential, such as West Sumatra Province.

West Sumatra province has one of the potentials known as Dadiah. Dadiah is a local potential which is one of the livelihoods of the people of West Sumatra. Dadiah at first time was made because in west Sumatra there are many buffaloes that produce a lot of milk. The milk is processed into a regional specialty food, so that now it has local potential as a source of income. Dadiah is a result of the fermentation of buffalo milk in a bamboo tube for two days. Dadiah produced by buffalo cattleman as typical probiotics drink Minangkabau people for a long time. Dadiah contains essential amino acids and non-essential amino acids, so it is a nutritious drink easily absorbed by the body.

Dadiah comes from Sijunjung Regency, West Sumatra, is the most effective drink in inhibiting pathogenic bacteria because the fermentation which optimum time to produce Dadiah, while Dadiah from other region is fermented in inappropriate optimum time standard (a day or three days) [5]. This is the same as the result of the interview with one of the buffalo cattleman. He is also the producer of Dadiah with fermented the buffalo milk for two days. Two days is considered to be an appropriate time to produce high-quality Dadiah.

Dadiah can be learned in biotechnology material. The ability that must possess in the material is to be able to experiment with implementing the principles of conventional biotechnology based on the scientific method. This method can be done well if the students have good science process skills. It shows that the appropriate learning resources are needed to achieve learning goals.

The result of interview with biology teacher and observation on the students of XII grade at one of the high schools at Sijunjung Regency, the learning resources used by the teacher have not utilized the local potential. Biotechnology material that students learned are still used a general example like yogurt, cheese, and other examples. Meanwhile, Dadiah, as the Minangkabau local potential, which has biotechnology principles in its processing, has not been utilized as the object of biotechnology learning. Dadiah local potential can be a learning resource for biotechnology material.

There are many local potential internalized in biology learning and to be able to develop biological material. The Ministry of National Education in 2008 stated that the purpose of making learning instruments and teaching materials must be adjusted to the demands of the curriculum by considering the students’ needs, meaning that learning resources are in accordance with the characteristics and settings or social environment of the students. Development of Dadiah local potential-based learning resources is important to improve high school students’ science process skills, the researcher develop a local potential-based learning resources for high school students in West Sumatra. The aim of this research was to look at the improvement of students’ science process skills after the implementation of Dadiah local potential-based learning resources.

2. Experimental Methods
The method used was weak experiment with one-group pretest-posttest design. This research began with the arrangement of Dadiah local potential-based learning resources which can train the students’ science process skills. The learning resources consisted of lesson plan, students’ worksheet, supplementary material, and science process skills test. The research instrument used science process skills test. The instrument of students’ science process skills in this research was refers to the types of skills proposed by Rustaman [6], including observation, interpretation, prediction, asking question, formulating hypothesis, planning an experiment, using tools and materials, as well as communication.

The learning resources are applied to determine the effect of the learning resources on the students’ science process skills. The participants are 30 students of XII grade in one of the high schools in Sijunjung Regency. Pre-test is given before learning. After that, the learning process by using the learning resources was implemented for three meeting and the students were given a post-test to measure the improvement of their science process skills.

Data analysis uses SPSS to see the N-gain of students’ science process skills improvement. The result of N-gain was categorized [7] in Table 1.
### Table 1. Interpretation of N-gain values

| N-Gain Value | Explanation |
|--------------|-------------|
| $N\text{-}gain > 0.7$ | High |
| $0.3 \leq N\text{-}gain \leq 0.7$ | Medium |
| $N\text{-}gain < 0.3$ | Low |

#### 3. Result and Discussion

Learning using *Dadiah* local potential-based learning resources was conducted in three meetings. The learning resources developed to improve students' science process skills can be seen on Table 2.

### Table 2. *Dadiah* local potential-based learning resources

| No | Learning Resources | Explanation |
|----|--------------------|-------------|
| 1  | Lesson plan        | 1) The fist meeting; discussion of biotecnology material   |
|    |                    | 2) The second meeting; making dadiah using worksheet 1 |
|    |                    | 3) The third meeting; bacterial observation using worksheet 2 |
| 2  | Worksheet          | Worksheet 1 |
|    |                    | Worksheet 2 |
| 3  | Supplement material| Summary of teaching materials (information about dadiah) |
| 4  | Science process skills test | 32 of multiple choice questions, 2 of essay question |

The increase in SPS, which was attempted to use this learning resource, was measured using science process skills test. Before the questions were used on high school students, the test questions were first conducted on 24 university students. The trial results showed that 32 multiple choice questions were valid with a reliability of 0.62, which means that it belonged to the high category and two valid essay questions with a reliability of 0.58, which were included in the medium category.

The improved students science process skill was seen after learning resources are implemented. Based on the data analysis, the increase in SPS N-gain on 30 students was in the medium category, with an average N-gain of 0.61%. The percentage increase for high, medium, and low categories can be seen in Table 3.

### Table 3. N-gain students science process skills

| Range of scores | Category | Students | Percentage |
|-----------------|----------|----------|------------|
| $N\text{-}gain > 0.7$ | High     | 5        | 17%        |
| $0.3 \leq N\text{-}gain \leq 0.7$ | Medium  | 25       | 83%        |
| $N\text{-}gain < 0.3$ | Low      | 0        | 0%         |

There were five students in the high category with a percentage of 17%, 25 students in the medium category with a percentage of 83%, and no students in the low category. The data shows that *Dadiah* local potential-based learning resources that have been developed can improved students' science process skills. The percentage increase in science process skills in more detail each indicator of science process skills can be seen in Figure 1.
Figure 1. Percentage diagram for improving student's science process skills

Explanation:

K 1 : Classification skills
K 2 : Data interpretation skills
K 3 : Prediction skills
K 4 : Asking question skills
K 5 : Formulating hypothesis skills
K 6 : Communication skills
K 7 : Planning an experiment skills

The percentage increase student’s science process skills are: (1) classification skills by 32%; (2) data interpretation skills by 15%; (3) prediction skills by 21.7%; (4) asking questions skills by 53%; (5) hypothesis skills by 41%; (6) communicating skills by 34%; (7) experimental design skills by 39.3%. The students’ improved skills because learning activities guided with the student’s worksheet.

The lowest percentage increase was in data interpretation skills compared to other skills, but the data interpretation skills had the highest pretest and posttest scores. This means students already had good basic skills in interpreting data before learning was applied using learning resources. This improvement was supported by students who practiced during practical activities and did worksheets. The skills that needed to be improved were "designing experiments" because it required understanding, critical thinking skills, and other skills students had to determine or design an activity appropriately. Science process skills helped students to think critically and the ability to think scientifically [2]. Science process skills are thinking skills to build knowledge through solving a problem and formulating the results [8].

The improvement of students' skills should be made by habituating students to learn more and practice independently by doing various activities that can improve SPS. Science process skills require more complex experiences such as observing skills, collecting data, hypothesis, and interpretation skills [9]. The teachers must guide students during learning activities in asking questions, hypothesis skills, questions, and experimental design skills. Science process skills are skills used scientists to be able to solve a problem of science, starting form understanding problems, formulating hypothesis, collecting data and formulating conclusions [10].

Basically, these process skills were already possessed by students. Learning resource becomes an effort used to improve students' science process skills by utilizing local potential into learning in the classroom. Implementing education by utilizing local potential was important for students' knowledge, skills, and attitudes [11]. The development of the student skills of globally competitive such as science process skills could be done through local potential-based education. Local wisdom-based learning
tools enhanced students’ science process skills, environmental awareness, and concept understanding [12].

Observation and using tools & materials skills are observed directly during the learning process because cannot be assessed through a science process skills test. In activity 1, the tools and materials used were still simple, so students in making observations such as observing the condition of milk & bamboo were already excellent, and using tools and materials in making Dadiah were also very good.

Observation and using tools & materials skills in activity 2 were already good. Students needed more guidance on taking the bacterial cultures on Dadiah, and taking methylene blue to see bacteria clearly. Therefore, in activity 2 there were 36% of students who were less skilled in using tools & materials.

Students' observation and using tools & materials skills continued to be trained throughout the learning process until they were accustomed to using materials for bacterial staining. Students were also trained to use the microscope properly while observing the bacterial contained in Dadiah. Training and seeing students’ accuracy in making observations and using tools & materials were more assessed directly by the teacher using the appropriate assessment rubric. This assessment also provided an opportunity for teachers to be able to provide direct feedback to all students.

Learning resources based local potential was an alternative in learning biology, especially in biotechnology materials, to improve students’ science process skills. Many local potential could be used as a source of learning biotechnology to increase understanding and awareness of the surrounding environment [13]. Learning resources through local potential were learning tools that helped students relating the material being studied to the real situations and encouraged students to make connections between the knowledge they had and their application in life.

4. Conclusion

Dadiah local potential-based learning resources in the learning process on conventional biotechnology can increase students' Science Process Skills. The increase in student’s science process skill was in the medium category with an N-gain of 0.61. Dadiah local potential-based learning resources could be alternative learning with applying the scientific method.

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