

An Analysis of Science Process Skills of Pre Service Biology Teachers in Solving Plants Physiology Problems

Jirana¹, Mesra Damayanti²
Universitas Negeri Malang, Indonesia
jiran_taheer@yahoo.co.id

Abstract: The lowest of Science Process Skills is one of problem in education. It was caused by the lack of awareness of lecturers to facilitate students to conducting activities to develop the skills of students at the Sulawesi Barat University. This study aims to proof at the science process skills of students. The methods used qualitative research approach to engineering tests, interviews, and questionnaires. Subject of the study consisted of 47 biology education student, Math and Science Faculty in Sulawesi Barat University. Based on the analysis of data was obtained the test results science process skills in solving problems which refers to indicators of process skills Science, showed that students' ability to answer to the percentage identified with control variables as much as 51%, definition operational as much as 57%, test hypotheses as much as 45%, designing investigations as 60%, and graphs with data interpretation as much as 44%. The results of the analysis in accordance with the results of interviews conducted with students, in which they reveal that recognize science process skills but indicators of Science Process Skills have not understood the term as well as the working process. Based on the analysis, it could be concluded that the science process skills of students it was still had been low.

Keywords: science process skills, plant physiology, student

This 21st century manifests a reformation and globalization era which is marked by the emergence of competition between countries. Indonesia is one of the countries which should be able to take part in the competition. Therefore, this country needs to improve the quality of its citizen either through formal or informal education. The preparation of creating high quality human resources has obviously become an absolute necessity of a country and education serves as weapon to realize this goal (Mulyasa, 2004). However, people have been facing serious problems related to education that is lack of quality of skills; one of which is the science process skills (Nurhadi & Senduk, 2004).

Process skills refer to a learning approach which is directed to the growth and development of certain skills of the pre-service biology teachers. These skills will help them process information to discover facts, concepts as well as behaviors and values. Through these skills, the information obtained is more meaningful as they develop their thinking skills. One way to improve process skills is the practicum method through which psychometric, cognitive, and affective skills are simultaneously upgraded.

Facts show that in studying science, students tend to memorize concepts, theories, and principles without deeper understanding the acquisition process (Depdiknas, 2003). This is one of the factors of the students' lack of skills, especially science process skills. Science itself is perceived from two dimensions, product and process. This rationale shows how important the skills for the future, assuring that our nation can become one of developed countries in the world (Holil, 2008). Learning models used in most of educational institutions are still teacher-centered. Therefore, students are not actively engaged in the process. The students are less motivated since they have barely a chance to develop their skills.

The students need the process skills both when doing scientific investigations and during their learning process (Harlen, 2000; Taconis, Ferguson-Hessler & Broek kamp, 2000). Science process skills is also believed to be able to ensure that students have the meaningful learning experience because they help students to develop higher order thinking (Germann & Aram, 1996; Lee et al., 2002). process skills would aid the understanding of the theoretical scientific knowledge if practical learning opportunities were put in place. The prospects of involving students in science practical activities may improve the mastery of science process skills and enhance the ability to understand the scientific concepts (Hodson, 1990). Rubin (1992) says that "... that people who are proficient in science process skills Scientists are not only better citizens but better...". Keil dan Jodi Haney (2009), "... Science process skills are not only important for those pursuing careers in science , but also most jobs in this new millennium using involve; these skills....".

These skills are divided into two groups: basic science process skills which include: observing, asking questions, classifying, measuring, and predicting. The second group was integrated science process skills which include; namely identifying and defining variables, collect and transform data, create data tables and graphs, describing the relationship between variables, interpret the data, manipulating materials, recording the data, formulating hypotheses, designing investigations, make inferences and generalization (Karamustafaoglu, 2011). Science process skills belong to a scientific method in which students are introduced to steps in discovering something through an experiment. These skills play an important role in assissting students in finding concepts of learning. Each of science process skills and its characteristics are related to each other, but there must be an emphasis in every distinctive skill such as in doing an experiment, performing scientific methods, and inquiring. The science process skills are essential in learning science (Sartika, 2015). Indicators of the skills that can be measured cover identifying and controlling variables, defining operational terms, testing hypotheses, designing an investigation, and interpreting data.

Plants physiology is one of the courses in college which is strongly related to natural science. This course contains analyses on the phenomenon of organisms. To observe the phenomenon, students are required to have skills which help them to acquire knowledge. The success of mastering a certain concept can be evaluated by a test. Therefore, this study aimed to evaluate students' science process skills through a plant physiology test. This study was expected to describe the ability of the students or the pre-service biology teachers in solving problems found in the test.

METHOD

This study was a survey approached qualitatively. The subjects of this research were the fifth semester students registered in academic year 2015/2014 who were being enrolled in plant physiology course. Data was collected through a test which consisted of 15 multiple choice items. The test lasted 30 minutes. In addition, interviews and questionnaires were also used in this study. Finally, data was analyzed using Miles and Huberman model.

Findings

The results of the test are depicted in table 1. Based on the results which refer to indicators of science process skills, it was found that the percentage of students' ability in identifying and controlling variables was 51%, defining operational terms was 57%, testing hypotheses was 45%, designing an investigation was 60%, and interpreting data was 44%.

Table 1. Result of Test

No.	Indicator	Persentase (%)
1	Identifying and controlling variables	51
2	defining operational terms	57
3	testing hypotheses	45
4	designing an investigation	60
5	interpreting data	44

Table 2 presents data from questionnaires about science process skills. Based on the results, it was found that 48% of the students were able to identify and control variables, 45% of them could define operational terms, 32% could test hypotheses, 43% could design an investigation, 45% could interpret data.

Table 2. Result of Quistionnaire

No.	Indicator	Persentase (%)
1	Identifying and controlling variables	48
2	defining operational terms	45
3	testing hypotheses	32
4	designing an investigation	43
5	interpreting data	45

The results of the interviews with the students about science process skills are depicted by table 3. Based on the results, it was found that 48% of the students were able to identify and control variables, 53% of them could define operational terms, 47% could test hypotheses, 52% could design an investigation, 50% could interpret data.

Table 3. Result of Interview

No.	Indicator	Persentase (%)
1	Identifying and controlling variables	48
2	defining operational terms	53
3	testing hypotheses	47
4	designing an investigation	52
5	interpreting data	50

DISCUSSION

According to the test of concepts mastering and science process skills, methods used in data collection have showed significant differences. The results of these three different methods of collecting data (test, interviews, and questionnaires) have showed the students' lack of knowledge. Each method showed different result on different indicator of science process skills. The highest percentage of the test was designing investigation that is 60% and the lowest percentage was interpreting data that is 44%. The students' knowledge based on science skill was categorized low. This was proven by the results of interviews and questionnaires which indicated that only a few respondents (students) recognized the description of science process skills. It indicates that the lecturer who taught the course rarely apply science process skills in learning.

Student's responses towards learning methods were positive. Every statement revealed through the interviews demonstrated the benefits of science process skills to make students

more active in learning, help them develop their creativity and improve their thinking skills. This learning method is considered effective in evaluating learning thoroughly from the cognitive, affective and psychometric domain. but this learning method would be more attractive if combined with some models of learning oriented constructivist theories. According to research relevant (Sartika, 2015) that the methods / learning model suggested to increase the Skills Process Science include: Problem Based Learning, Guided Inquiry, Learning-based Practicum, Methods Experiment, Project Based Learning (PjBL), and Collaborative Team Work Learning. Some of the learning model affect the acquisition of science process skills score.

CONCLUSION

Science Process Skills students of Biology, State University of West Sulawesi is still low, especially in the interpretation of data.

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