

The profile of science process skills of junior high school students in Lembata

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Abstract. This preliminary study aims to obtain data on the extent to which the science process skills (SPS) has been developed in the process of science learning in one of the private junior high school in Lembata, which later taken as a consideration for promoting a SPS-oriented learning. Data were collected through questionnaires filled out by students and interviews with science teachers. Based on the results of the analysis, it is known that science learning in schools has not been fully able to bring up the skills expected; for the average score of aspects of observing, designing and making, predicting, measuring and calculating, hypothesizing and communicating, only reached less than 65%. This low achievement is due to the applied methods, models and learning strategies, which tend to lead students having conceptual understanding, while the procedural, factual and other basic understanding of science are poorly trained. Based on this case, it is necessary to do further research in the form of application of a method and learning strategy that is able to enhance student's SPS.

1. Introduction

Science learning is seen as an attempt to build knowledge related to natural phenomena based on human curiosity. This inquisitive nature leads to a scientific inquiry to examine the phenomena of nature deeply. Referring to the 2013 curriculum science syllabus, the competence or skill expected at each level of education, leads to scientific methods. Science includes three scopes, knowledge, skills and scientific attitudes. It is important for a learner to master these skills, so that later they can apply science according to its essence. One of the skills is scientific process skills (SPS). SPS described as a set of skills both of mental and physical skills required in acquiring a knowledge through a scientific process or method [1]. The approach of SPS facilitates students in growing a certain number of skills in terms of information processing to gain facts, concepts, conceptual development and value. In the process of obtaining facts and concepts, students perform mental operations in the form of measurement, observation, conclusion and grouping. Conducting science learning with SPS approach means giving students the opportunity to work and involve in science, not just to hear the story of science. Students are no longer passive because they are involved actively to find the concepts themselves. In addition, applying process skills, facilitates students to learn the processes and products of science as well [2].

There are several components of SPS along with indicators such as observation skills, classifying, interpreting, asking questions, communicating, predicting, using materials, planning experiments, making hypotheses and experimenting [3]. These skills must be practiced on the students continuously in their learning activities. Teaching and learning in science will be more meaningful when students are able to discover the concept themselves by doing processes or scientific methods such as observing facts, making hypotheses and the other mentioned above. This study aimed to capture how teaching and learning process in schools, especially in Lembata regency able to facilitate students having a good SPS. The results of this study will be used as a reference to determine the steps and strategies of further research.

2. Method

Methods applied in this study was a qualitative descriptive [4]. Data were obtained from questionnaires filled out by students and interviews with science teachers. The research was conducted in one of the private junior high school in Lembata regency. A total of 34 9th grade students were involved in this study and two science teachers. The questionnaire instrument for capturing data of student SPS contains 10 statements reflecting six aspects of SPS: observing, classifying, measuring, summarizing and communicating. Interviews with science teachers were conducted semi-structured to get an overview of science-learning process in schools. Data obtained from questionnaire were analyzed using simple statistical measurement to obtain a general overview of students' SPS. The results of this data analysis then compared with the data of interviews to find the correlation between those two variables and further can be used as the discussion in developing learning tools based on SPS.

3. Result and Discussion

3.1. Aspects of Science Process Skills

There are six aspects of process skills measured in this study. Each aspect is elaborated clearly through indicators existed in the questionnaire statement. The results of the process skill questionnaire can be seen in table 1.

Table 1. Results of science process skills questionnaire

Aspect of science process skills	(%)
observing	59.8
designing and making	62.5
predicting	61.02
measuring and calculating	61.76
hypothesizing	61.02
communicating	58.5

Table 1 shows that students' SPS for each aspect are poorly trained. It can be seen clearly that in observing aspect, only 59,8% students who agree with the statement that science learning in schools always required them to use as many as senses in the process of observation, to find similarities and differences in characteristics. In the aspect of designing and making, less than 65% students agree that they are capable of designing and executing the experiment correctly. In predicting aspect, 61.02% of students agree that they are able to use patterns or relationships to make a prediction. In the aspect of measuring and calculating, only some students agree that they are capable of measuring with standard measurements and precise measuring instruments and capable of performing good data calculations. In the hypothesizing aspect 61.02% students agree that they realize there are many possible answers to an event. In communicating aspect only 58.5% of students agree that they are able to present

experimental data in the form of tables, graphics, images and other forms precisely and understandably.

3.2. Science learning process in classroom

An overview of science learning in the classroom, can be seen through the result of interviews below.

Question 1: Can you tell us briefly how the science learning process you have been doing in class?

Teacher 1: At the beginning of the new school year, we create shared learning instruments in science team, so we have the same instruments for each grade level. The instruments created refers to the example given by the ministry of education that matches the demands of the 2013 curriculum. Science lessons takes 5x40 minutes per week divided into two meetings. Science topics are taught sequence according to the basic competency requested.

Teacher 2: We use the same learning instruments at each grade level. In facts, this is not run ideally. There are some students having serious difficulties in understanding a particular learning material so that not all learning materials can be taught completely and done properly according to the demands curriculum.

Question 2: What kind of approach do you apply, teacher centred or student centred? How about time provided for student to take part in learning process?

Teacher 1: I combine the two. I teach all the learning materials, but in the learning process I give students the opportunity to be active such as doing question and answer, discussion and working in small groups.

Teacher 2: Generally, I use teacher centred, in the other hands student were involved actively, for example in doing discussion and question and answer.

Question 3: Are you applying various models and teaching methods in science learning process?

Teacher 1: At least one or two models. The methods applied such as lectures, discussions, and question and answer, but for experiments or laboratory activity it's done one or two times in one school year due to the limited time.

Teacher 2: It is quite difficult to apply various learning models, but the methods is quite varied. The problem is about limited time so that activities involving students such as practicum and experimental activities are conducted only 1 to 2 times in one lesson year. In addition, due to the lack of tools and materials for conducting laboratory activities on certain topics.

Question 4: Do you think the instructional design done in classroom is enough to facilitate students learning with such steps on the scientific methods?

Teacher 1: Overall, science lessons conducted in classroom, have not been fully able to facilitate students learning and working in accordance with the scientific method.

Teacher 2: It does not

Question 5: Do you constantly making a reflection about teaching and learning process and make some improvements in learning activities?

Teacher 1: Yes I do, in terms of instructional design as well as in my individual terms regarding to the ability to carry out learning process.

Teacher 2: I do a thorough evaluation of the lessons I have applied. However, I am aware of the lack of teamwork within the science team to conduct a good team evaluation and improvement.

In both data, questionnaires and interviews there is a correlation which indicates that poor skills of students' SPS are effected by the science-learning design implemented in the classroom. Science learning is generally teacher centred and the lack of learning activities as well that are competent to teach students having a scientific methods skills, including SPS. Science learning should be able to provide the widest portion for students to learn and find for themselves the concepts they learn by performing procedures as well as scientists. Students need to be involved in hands-on and minds-on activities in a balanced way. Several studies have shown that the application of science learning with a model or method that requires students to be actively involved in activities or scientific work, capable to grow students' science process skills and to improve learning achievement as well. The study about application of inquiry learning on the topic of reaction rates turn out to enhance learning achievement and science process skills [5]. This result is supported by another research concerned in model-based inquiry which is not only promoted students' science process skill but also in mastering conceptual

knowledge [6]. There is a very positive correlation between the applications of inquiry based learning and the improvement of SPS. This is confirmed by a study that applied guided-inquiry instructions which is able to improve student's learning outcomes, SPS, as well as student attitudes toward science [7]. This result was further reinforced by a study focusing on the development of laboratory activities combining with the 5E model [8]. To be able to teach some complex materials which is hard to conduct through a true experiments then it can be taught virtually through computer simulation, which is capable to improve students' cognitive understanding, SPS and student learning achievement as well [9].

4. Conclusion

Based on the result of data analysis, it is found that the problem about students' science process skills is effected by the instructional design applied in classroom which is focus on the teacher as the main source of information and give less portion for students to explore their ability to learn and find the concept of science studied by involving in hands-on and minds on activities in a balanced way. Therefore, it is necessary to do further research by applying a model of learning that is able to overcome the problem above. The applied model should promote students learning by discovering their own knowledge by implementing the stages of scientific methods such as observing and exploring natural phenomena, checking hypotheses through data collection, reducing hypotheses to getting the best answer in solving problems related to the concept of science being studied.

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