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The Profile of Science Process Skill (SPS) Student at Secondary High School (Case Study in Jambi)

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Abstract: ***Science process skills, a skill set that is very important for every human being, not just in science activities alone but also is related to the problems of human life. The training for the development of science process skills of students at schools is a necessity. In Jambi, training and development of students' science process skills in science teaching and learning activities are still relatively low. This is demonstrated by the results of a survey is conducted ten places in junior secondary schools. The survey shows that the average ability of students' science process skills are still rather low. The data shows that as much as 43.48% scored by the low category, 30.43% and 26.09% medium category of high category. Therefore the government should have more serious attention to this condition, by taking various measures to improve students' science process skills immediately.***

Keywords: Profile, science process skills, junior high school

1. Introduction

Research and technology development began when human started to observe and ask: what, how, why, where, etc. of this nature. Various forms of questions that arise because human nature has a curiosity. Curiosity can be associated with objects or phenomena that occur around or even about themselves.

To satisfy the human curiosity and then it started to explore nature around through an observation by using the five senses. Based on the observations, and then they began to classify of these objects. Grouping objects is based on shape, size, color, nature, usability and so on. These processes ultimately shape the activities they perform various experiments with systematic steps. The experimental activities which subsequently are led to the birth of a variety of technologies.

Skills are to undertake observation, classification and finally perform the experiment known as the science process skills (SPS). Understanding of science process skills usually refer to skills or abilities that must be owned by the scientists on the process of scientific discovery. 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 (Karamustafaoğlu: 2011). Thus the observation, classification and experiments are part of the science process skills. This is similar to what is conveyed by Harlen and Elstgeest, J. (1993) " ... *Thus process skills Consist of following skills; Observing, Question - raising, designing and making, predicting, hypothesizing, effectively communicating, devising and planning investigations measuring and calculating finding patterns and relationships, manipulating materials and equipment effectively ...* ".

Science process skills such as have been described by experts on the environment are very important to develop primary education through science education. This is not only because of the skill that is in accordance with the character of science as "*a systematic and structured knowledge on a regular basis, generally accepted (universal), and a collection of data from observations and experiments*" Ministry of Education (2006), but also science process skills was instrumental in the success of students in the future. Rubin (1992) says that *"... that people who are proficient in science process skills Scientists are not only better citizens but better..."*. The same thing also expressed by Keil, Jodi Haney, 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...."*.

Recognizing the importance of the development of science process skills, lately several studies that are related to the development of science process skills has been done, for example by; Fouls and Rowe (1996), Ango (2002), Shaibu, A and Jonathan S. Mari, (2003), Rambuda and W.J. Fraser, (2004), Haryono, (2006), Dirks Clarissa and Cunningham (2006), Teo Yew Mei (2007), Keil, Jodi and Jennifer, (2009), Aziz and Ahmad, (2010), Wulandari, Prihanita Retna, (2011, Chabalengula, Mumba and Mbewe (2011), and Septian (2012).

In science teaching and learning activities, in addition it is important to develop science process skills to ensure that students master the concepts taught well. According Silaban

(2006) concept mastery is students' understanding of a concept in the form of skill or knowledge, and the student's ability to apply the skill or knowledge. The same opinion was also delivered by Dahar (2006) that the mastery of the concept could be intended as a form of students' ability to understand the meaning of a scientific concept, the concept is good in theory and in their application form.

Based on the opinion of experts, it can be affirmed that the mastery of concepts should be understood as a whole. Mastery of the concept can't be understood only in the form of knowledge that is rote alone, but must be understood in greater depth and breadth to the extent that the ability to apply the concepts that he knew it was in real life. If it is related to science learning, the mastery of science concepts can be interpreted as a form of student's ability to understand science concepts and apply scientific concepts such as science students participate in learning activities.

Referring to the description of the science process skills and mastery of science concepts above, it can be understood that the science process skills and mastery of the concepts of science are two sides of the coin in science learning, so they can't be separated. Both aspects are interrelated and mutually reinforcing. Science process skills that will support the achievement of mastery of the concepts of science and its applications well, as well as mastery of a good concept will also improve science process skills and application. Therefore in science learning activities both aspects must be considered and developed.

The initial step in the optimization of the development of science process skills and science student's mastery of concepts is the analysis of mapping the extent of mastery of science process skills and science concepts students today. Mapping analysis capability is intended that science teachers know precisely and accurately how the skills and mastery of science process skills of science students are so that teachers have appropriate plans to conduct a study to develop both. Therefore it is necessary for a serious study of the profile of science process skills and mastery of the concepts of science students in order to obtain accurate information related to both.

Based on the above, this research focuses on science process skills of students, especially students at the secondary school level. Thus, the purpose of this survey study was to determine the profile of science process skills abilities in students at secondary school level. The question that will be answered in this study is how the profile of science process skills in the junior high school level is?

2. Method

The study was conducted in secondary schools in Jambi city at the beginning of the second semester of academic year 2012/2013 is using the survey method. The survey involved 322 grade 8 students as respondents. It's also taken from 10 different schools. This means is that every school samples was taken only one class, i.e. the grade 8. So not all students in grade 8 at the ten school were tested. Sampling was carried out both schools and students by random sampling.

The data was collected using a research instrument in the form of tests. Therefore students who respondents were given a package of test questions, which test items to measure science process skills which consists of 20 multiple choice questions. About the basic science process skills test that is used is a matter of adaptive test that has been developed by the *International Energy management courses (IEC)* and the University of Queensland at the University Queensland. Test questions include skills; inference, observation, prediction, measurement and classification. The data has been collected, then performed the scoring (each question has a score of one) the package that has been done about the respondents. After scoring is done then the next step is performed categorization, namely grouping scores obtained by students in the category of high, medium and low. This categorization judgment well as an assessment of the science process skills. Guidelines for the categorization of students' science process skills such as in Table 1 below:

Table 1: Category Score Range Science Process Skills

No	*Score Range*	*Category*
1	16-20	high
2	8-15	medium
3	0-7	low

Once the categorization is done on the data, the analysis. The next is to do the percentage of each category, namely the category of high, medium and low category. Percentage of this category is done with the aim to facilitate the dominance of science process skill ability level of the students. The percentage of the process is done by using the following formula:

$$\frac{x}{n} * 100\% \ (1)$$

x: number of students in a category
n: number of total respondents

Data group category and the percentage will be relied upon by the authors to conduct descriptive analysis. Descriptive analysis was conducted is intended to provide an overview and thorough in order to obtain complete information related to profile student's science process skills.

3. Results and Discussion

From the test of ten Junior high school of science process skills, it shows or produces different data apparently. After the categorization (high category, the category of medium and low categories) and the percentage of the obtained data as it is presented in Table 2 below:

Table 2: Data Distribution of Respondents

School Name	Number of respondents per school	Category			percentage (%)			Total
		H	M	L	H	M	L	
1	32	8	6	18	25,0	18,8	56,3	100,0
2	30	6	10	14	20,0	33,3	46,7	100,0
3	30	11	3	16	36,7	10,0	53,3	100,0
4	31	9	11	11	29,0	35,5	35,5	100,0
5	38	8	13	17	21,1	34,2	44,7	100,0
6	32	9	12	11	28,1	37,5	34,4	100,0
7	33	13	6	14	39,4	18,2	42,4	100,0
8	30	7	10	13	23,3	33,3	43,3	100,0
9	36	9	12	15	25,0	33,3	41,7	100,0
10	30	4	15	11	13,3	50,0	36,7	100,0
Total	322	84	98	140	26,09	30,43	43,48	100,00

Specification: H: High, M: Medium, L: Low

Based on Table 2 above, it is indicated that ten secondary schools were surveyed have a number of different students. At school the number one (1), students who received grades with categories of high, medium and low respectively are 8, 6 and 18 premises percent respectively; 25.0%, 18.8% and 56.3%. While in total, of the 322 students respectively acquisition scores of high, medium and low are the following 84 students (26.09%), 98 students (30.43%) and 140 students (43.48%). To obtain a clearer picture and accurate, the following is a presentation of data in a bar chart.

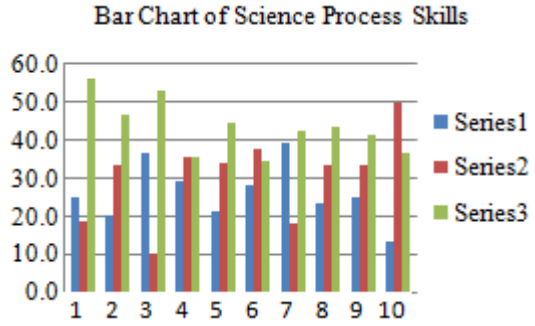

Figure 1: Bar Chart Of Science Process Skills

Description:

Series 1: Students with high scores of SPS
Series 2: Students with medium score of SPS
Series 3: Students with low scores of SPS

Based on the percentage bar chart above science process skills, it appears that there is the highest percentage of students science process low-skilled category (43.48%), followed by medium-skilled science process (30.43%) and high (26.09%). This shows that the basic science process skills which include skills; inference, observation, prediction, measurement and classification of the junior high school students in Jambi city is still relatively low.

In the bar chart also shows that the percentage of students with the acquisition of science process skills score is the highest in school number 7 with the percentage reached 39.4%, followed by school number 3 and number 4 school, each obtained a score of 36.7% and 29.0%. If analyzed more deeply, the highest percentage achieved by the school number 7 is 39.4%, was obtained by 13 students of 33 students with an average score of 16.5. It shows that every student in general did not reach the optimal score in the test process skills.

In other hand, the analysis related to the low test scores and questions test are given, showing that in general students have difficulties in answering questions involving inference, prediction and measurement. Students generally earn low scores on the third science process skills. While the skills of observation and classification, students tend to earn relatively higher scores. This fact proves that the teaching and learning in secondary schools in the city of Jambi yet optimally train students to conduct inference, prediction and measurement.

In-depth analysis is also carried out on relationships with school achievement test scores. Students who acquire science process skills test scores with the highest percentage is 39.4%, (school number 7), 36.7% (school number 3) and 29.0% (school number 4), generally have a conducive school environment to development of science process skills. At these schools, teachers provide ample opportunities in the development of science process skills of students through a variety of laboratory activities. This is in contrast to science learning activities in schools for students who acquire science process skills test scores are low. Students who got science process skills test scores are low, relatively rarely do laboratory-based learning activities. This fact proves that the lab activities can be used as a medium for the development of science process skills

The low students score of science process skills in Jambi city, of course, have an impact on students' lack of ability to perform various experiments based activities, such as inquiry and discovery. Though the experiment is an essence of science itself that science as a process. Science as the process will not run properly without adequate science skills. Therefore, with these conditions, it can be presumed that are lacking or not optimal activity-based learning during the experiment is due to the lack of students' science process skills.

As it has been described above that, science process skills are very useful not only in science learning but also in everyday life (Rubin; 1992). Thus it is almost certain that in general these students have a relatively low ability to observe their environment. This of course will affect their concern about the events or phenomena that exist around them. In other words that the students with low science skills that will have a low level of scientific literacy as well.

The low science process skills in Jambi city junior high school students due to various factors. First, there is still a lack of science teachers to teach students science process skills. This is because the level of science process skills of science teachers at junior high school in Jambi city is also still relatively low at only has score 63.6 with the range score 10-100 (Sukarno; 2013). Second, the lack of materials of science that is more specific to teachers directly and students

to develop and improve the science process skills. Third, there still exists a rule requiring a competency test science process skills, both for science teachers and for students. So the competency test that had been done only focusing on the mastery of scientific concepts alone. Fourth, the lack of clear guidance for teachers how to do the assessment and development of science process skills to the students. Fifth, in general, teaching and learning activities that occur during this still traditional, so less students explore science process skills.

Therefore, to make improvements to science process skills students needs to be done on the training of science teachers science process skills. By the training of science teachers is expected to have a thorough understanding and knowledge related to it. These include understanding and knowledge in terms of types of science process skills, science process skill development methods and science process skills assessment. With the increased understanding and knowledge of science teachers on science process skills, it is expected that science teachers will be able to apply the knowledge and understanding in developing science process skills in students.

In addition to the training of science teachers, science process skills training can also be done with the development of teaching materials. Development of teaching materials that are specifically capable of directing teachers and students to practice science process skills is very important. By having presence of such teaching materials, the teacher and the students will have a great opportunity in the development of science process skills. Teaching materials are capable of directing teachers and students in developing science process skills such as teaching materials based experimentation or exploration activities.

By the training of science teacher about the science prosess skill and development of teaching materials which are related to the development of science process skills is not enough. Thus it still needed a model of learning as a medium for teachers to implement the understanding and knowledge of the science process skills as well as the implementation of instructional materials. Therefore, it also needs the development of learning models that provide opportunities for teachers and students to develop science process skills together, such as lab -based learning model and explore the natural environment around the schools.

4. Conclusions and Recommendations

4.1 Conclusion

Based on the data obtained it can be concluded that the average ability of junior high school students' science process skills in Jambi city is still relatively low. This is the evident from the data of science process skills test that has been done in speaking - also from the high (26.09 %), moderate (30.43 %), and low (43.48 %). The conclusion shows that the teaching of science in secondary schools in Jambi city did not have an opportunity for the development of science process skills students optimally.

4.2 Recommendations

Therefore to increase students' science process skills there are several steps that we need to be done, namely:

1. To conduct the training on the science process skills for science teachers in secondary high school. The training was mainly associated with a model -oriented learning science process skills development and assessment of students' science process skills.
2. To develop the learning models that provide greater opportunities for students to develop science process skills, such as lab-based learning and exploration-based learning of the natural environment around the school.
3. To develop specific teaching materials that is capable of directing teachers and students to practice science process skills. It is intended for teachers and students together and to be consistent in the development of science process skills.

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