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Profile of science process skills of Preservice Biology Teacher in General Biology Course

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Abstract. This study aims to obtain portrayal images of science process skills among preservice biology teacher. This research took place in Sriwijaya University and involved 41 participants. To collect the data, this study used multiple choice test comprising 40 items to measure the mastery of science process skills. The data were then analyzed in descriptive manner. The results showed that communication aspect outperformed the other skills with that 81%; while the lowest one was identifying variables and predicting (59%). In addition, basic science process skills was 72%; whereas for integrated skills was a bit lower, 67%. In general, the capability of doing science process skills varies among preservice biology teachers.

1. Introduction

Natural Science includes biology in terms of finding out about the way living things live and how they deal with the natural challenges. Hence, science is not just the mastery of knowledge content in the form of facts, concepts, or principles alone, but also a process, habits of mind, skills, and practice [1]. Learning science is an active process, students describe objects and events, ask questions, acquire knowledge, construct explanation of nature phenomena, test of them explanation in many different ways, and communicate their idea to others. Active process in learning science implies physical and mental activity. Hands-on activities are not enough, students also must have minds-on experiences [2].

Content consists of subject matter and process consists of essential skills that students need to gain. One of the primary skills that curricula aim for students to attain is science process skills. These skills have to be included not only in science course but also in all science related courses. Science process skills are one of the major goals to be achieved in science education because these skills are utilized not only by scientists but also by everyone, in order to become scientifically literate people [3].

Science process skills are transferable intellectual skills, appropriate to all scientific endeavors. Science process skills are in two categories which are basic and integrated skills. Basic science process skills include observing, communicating, measuring, classifying, inferring and predicting, and integrated process skills include controlling variables, defining operationally, formulating hypotheses, formulating models, interpreting data and experimenting. The basic science process skills form the foundation for later and more thinking skill. Instruction the basic science process skill begins in pre school, is emphasized in elementary grade, and continuous into middle school and



beyond. The integrated science process skill that skills student need to design and conduct scientific investigation [4,5].

Science process skills form an important part of scientific inquiry and consequently promote scientific literacy among students. Therefore, science teachers must be proficient in science process skills on a multitude of levels, and must have the knowledge and understanding to teach the science process skills. Throughout the last two decades science educators have advocated that science process skills be taught in elementary and middle school grades. Science processes skills are intellectual skills used in collecting and analyzing data to solve problems. Students can use process skills to formulate responses to questions, to justify points of view, to explain events or procedures, and to interpret or describe data [6].

Several studies have been done on science process skills. analyzed the mastery of integrated science process skills in high school students in Jamaica. This study was conducted to see the difference between integrated science process skill (recording data, interpreting data, generalizing, identifying variables, formulating hypohese) seen from gender, grade level, location of school, type of school, and socio-economic condition of learners [7].

Stated that high percentage rate of basic science process skills (62.80%) as compared to the integrated science process skills (37.20%). The results also indicated that the number of basic process skills is significantly higher than the integrated process skills in the West African senior secondary school certificate physics practical examinations in Nigeria [8]. The result of The in-service teachers showed greater understanding than the pre-service teachers with an average level of 79.41% for in-service teachers and 75.30% for pre-service teachers. The highest level in the SPS mastery of in-service and pre-service teachers is the aspect of measuring that is 95%, while the lowest aspect is inference with the mastery level is 50% for in-service teachers and 35% for pre-service [9]. State that scientific process skill levels of pre-service biology teachers' need to be developed and that there are no statistically significant difference between pre-service in terms of gender and age [10].

In science teaching and learning process, especially for biology teacher candidates are very important to be trained in science process skills. This is so that they can teach their students to master the subject matter, as well as how to acquire such knowledge. Based on the above background, this paper will present the results of the study of the science skill profile of science process skill of biology teacher

2. Research methods

This research is a descriptive research that reveal proficiency profile of science process skills in prospective biology teacher students. The sample of research involves 41 students of biology education that is student of first semester in academic year 2017/2018. The student is enrolled in General Biology course. Data were collected using science process skill test instruments. The test instrument consists of 40 items in the form of multiple choice. The test measures the skills of the science process in seven aspects. Each test consists of four to eight test items: observing (5 items), communicating (4 items), classifying (8 items), predicting (6 items), identifying variables (5 items), formulating hypotheses (7 items), and interpreting data (5 items). The data were analyzed by calculating the percentage of correct answers on each aspect of science process skills, then averaged. Furthermore, the data obtained are presented in graphical form, described, and interpreted.

3. Result and discussion

The results of the science process skills of biology teacher candidates studied in this study include aspects: observing, communicating, classifying, predicting, identifying variables, formulating hypotheses, and interpreting data. From seven aspects of this science process skill, grouped into 2 types: basic science process skill consisting of observing, communicating, classifying, and predicting, while identifying variable aspect, formulating hypothesis, and interpretation of data including into integrated science process skills. The overall result of the science process skill is presented in Figure 1.

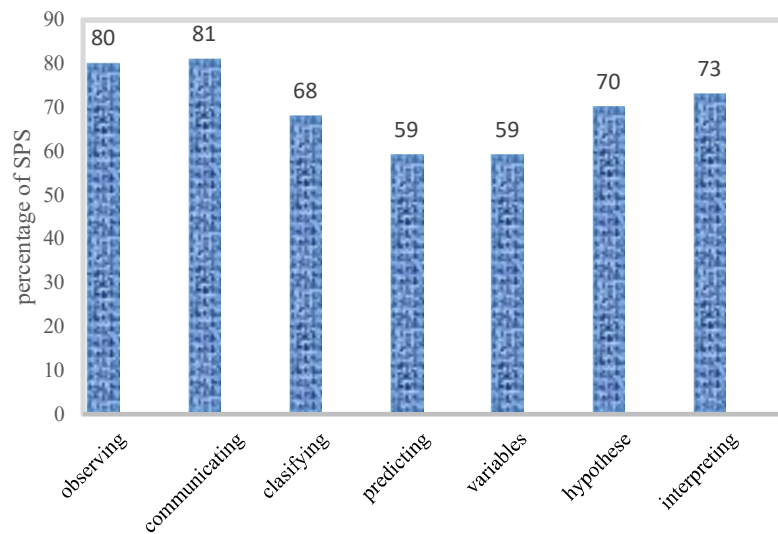


Figure 1. Percentage of Science Process Skill in several aspects.

Based on Figure 1 above can be described that the highest percentage of science process skills by students is the communicating aspect that is with the value of 81. Then followed by the observing aspect. The percentage aspect of predicting and identifying variables same value is 59 and is the lowest value.

The research conducted by in-service and pre-service science teachers shows that aspects of science-process skills are understood at a very good level (> 80) by in-service and pre-service science teachers: classifying, communicating, predicting, identifying variables, and interpreting. Good level of understanding (60-79,9) on science process skills aspect, ie: formulating hypothesis, defining variable, while aspect of observing, in-service has higher level than pre-service science teacher, that is 74 (good) and 59 (satisfactory) [9].

Stated that high percentage rate of basic science process skills (62.80%) as compared to the integrated science process skills (37.20%). The results also indicated that the number of basic process skills is significantly higher than the integrated process skills in the West African senior secondary school certificate physics practical examinations in Nigeria[8].

The percentage of the value of SPS by type (Basic Science Process Skills and Integrated Science Process skills) is presented in Table 1 below

Table 1. Percentage of science process skills on several aspects based on SPS type (Basic and Integrated Science Process Skills).

No	Basic Science Process Skills	value	Integrated Science Process Skill	Value
1	Observing	80	Identifying variables	59
2	Comunicating	81	Formulating Hypothese	70
3	Clasifying	68	Interpreting data	73
4	Predicting	59		
	Average	72		67

Based on the results shown in Table 1 it can be seen that the percentage of basic science process skill is higher than that of the integrated science process skill, which is an average of 72 for basic science process skills, while the average integrated science process skills is 67. The aspect of the basic science process skill is the highest is observing and the lowest one is identifying. In the integrated science process skill, the highest aspect of SPS skill is interpreting data that is equal to

73, while the lowest is the aspect of identifying the variable that is equal to 59. Student still can not identify which independent variable and dependent variable, and control variable in an experiment.

The basic science process skills are the prerequisites to the integrated process skill [7]. The basic (simpler) process skills provide a foundation for learning the integrated (more complex) skills[4]. In other words, to be able to master integrated science process skills involves some basic science process related skills. For example: to be able to Interpreting data (organizing data and drawing conclusions from it). Then needed observation skills, observations and then recorded and entered in the table (communication skills), then formulate conclusions by connecting some data and variables. The role of science process skills in the development of understanding is very important. If these science process skills are not well developed, for example, relevant evidence is not collected, or conclusions are not based on facts or ignoring evidence, it will be difficult to understand the world around. Thus the skills of the science process should be the primary goal in science education [11]. A teacher not only mastered the skill of the science process, but more importantly applied the scientific process skills in science learning. The development of students 'science process skills is very important in education, because it can facilitate students' learning ability and support critical thinking skills. One of the most useful steps to promote science process skills is to train teachers and prospective teachers to develop the skills of the science process [10].

4. Conclusion

Based on the results of research can be concluded that the science process skills measured in this research there are 7 aspects of science process skills. The four aspects of Basic Science Process Skills are: observing, communicating, identifying, and predicting, and 3 aspects of Integrated Science Skills: identifying variables, formulating hypotheses, and interpreting data. The percentage of Basic Science Process Skills of biology teacher candidates is higher than the percentage of Integrated Science Skills. The highest percentage of basic science process skills is observed with a score of 81 and the lowest is a prediction with a value of 59. Integrated science process skill is the lowest interpretation of data with a value of 73, while the lowest is identifying variable is 59.

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