Analysis Science Process Skills of 11th Grade of Senior High School Students

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Abstract. Science Process Skills (SPS) is all scientific skills used to acquire, develop, and apply scientific concepts and theories. The mastery of Science Process Skills is not only useful in science learning but also for the daily life students. The purpose of this is to analyze the science process skills in high school students on the concepts of heat and temperature. This research is a descriptive research with subjects as 11th grade students in Madiun. Data in this study were collected from a two-level multiple choice test, and interviews. Two-tier multiple choice test consists of 14 questions that contain indicators of science process skills. The completion tier is two tier, the first tier is multiple choice questions, the second tier is an explanation of the reasons students answer to the first tier question. Students taken as a sample for this study were not really familiar with the types of questions asked during the science process skills test. Thus, their results are still in the high category. The average science process skills for 11th grade students in Madiun with Two-tier instruments is 47.00 %.

1. Introduction
In the 21st century, it is hoped that studying Physics at school can provide basic lessons and scientific processes. Four important skills that are drilled by teachers for students are 4C (Collaboration, Creativity, and Innovation) [1].

Science process skills are the ability of students to apply scientific methods in understanding, developing and determining science. Science process skills very important for every students a provision to use scientific methods in developing science and expected to acquire new knowledge or develop existing knowledge. Science process skills the thinking skills that scientists use to build knowledge in problem solving [2-4].

Science process skills can be divided into two, basic types and integrated [5]. Basic science process skills consist of basic concepts in science learning that are usually taught to school students [6,7,5] while integrated science process skills generally used to study higher levels of science [8,9]. Both basic and integrated science processes skills can be taught to middle school students [5].

Lack of student process skills must be a major problem that requires attention. Some literature reveals that the science process skills of major students in learning physics has not been well developed [10,11]. In fact, several studies have shown that most secondary schools cannot carry out satisfactory scientific process [12,13].

The concept of physics in secondary schools has various levels of difficulty [14]. One difficult concept in physics is temperature and heat. The abstract concept of temperature and heat causes
teachers not to explain directly the concepts of temperature and heat. Temperature and heat are not visible, but they are everywhere in our lives [15]. One of the experiments to explain the abstract concept of temperature and heat is through laboratory scientific activities. The temperature and heat are abstract and many students are wrong. For this reason, students need learning activities that require students in laboratory activities, so that abstract concepts can be analogous to real concepts. The concept of temperature and heat in elementary and middle schools. At the next level, electricity is bound and becomes an important theme [16].

2. Experimental Method
This research is a descriptive study that aims to determine students’ science process skills. This research was conducted at senior high school in madinu. Respondents in this study were students of 11th grade school who had received 24 students. The data collection technique used in this study was through a multilevel multiple choice instrument consisting of 14 multilevel multiple choice items. From the results of this data analysis, it will be known how the students’ science process skills in the material are temperature and heat. The collected data will be processed using percentage interpretation data processing techniques. The scores obtained are calculated using a formula and converted on a percentage scale (0 % -100 %). The formula used is as follows [17].

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P(\%) = \frac{\sum \text{Score obtained (x)}}{\sum \text{Maximum score (n)}} \times 100\%
\]  

The percentage value obtained will be adjusted to the following table:

| Table 1. Categories of Science Process Skills |
|---------------------------------------------|
| Value (%) | Categories   |
|-----------|--------------|
| 61 < X ≤100 | Very High   |
| 41 < X ≤60  | High         |
| 21 < X ≤40  | Fair         |
| 0 < X ≤20   | Low          |

3. Results and Discussion
This study aims to measure the science process skills of students in senior high schools using a two-tier multiple choice instrument. The two-tier multiple choice instrument consists of 14 question items that have been combined with indicators of science process skills, so in addition to knowing students’ cognitive abilities, this instrument can also provide an overview of the science process skills possessed by students. The results of the analysis of science process skills are presented in Table 2.

| Table 2. Indicator Completeness of students’ science process skills |
|---------------------------------------------------------------|
| Indicators of SPS | SPS completeness (%) |
|-------------------|----------------------|
| Interpret data    | 41.00                |
| Prediction        | 78.00                |
| Asking Question   | 28.47                |
| Formulating hypothesis | 46.53         |
| Plan an experiment | 38.89                |
| Using tools and materials | 42.00         |
| Applying concept  | 42.00                |
| Communicating     | 57.64                |
Table 2. The achievement of the results of the analysis of students' process skills is based on the highest outcome indicator with the percentage of 28.82% Prediction and the lowest is the question asked. This table can occur because students only discuss the basic concepts of temperature and heat, but arranging students is faced with a new age, where students must ask questions and conduct experiments about students who are still experiencing difficulties. The results of this test can also be used to categorize students based on their process skills. In this study, student categorization was divided into 3 students who had high, medium and low SPS. The percentage data of SPS students is presented in Figure 1.

Figure 1. Percentage of Science Process Skills in the aspect of indicators

Figure 1 shows the percentage of science process skills in several aspects. Indicators that indicate a medium category, Asking questions 28.47%. While for the seven other indicators the category is high, Interpret Data 41.00%, Using Tools and Materials 42.00%, Applying Concept 42.00%, Formulating Hypothesis 46.53%, Communicating 57.64% and Prediction 78.00%. Based on data analysis of students' science process skills in the temperature and heat of the material it can be seen that SMAN 4 Madiun is in the high category with an average value of 47.00%.

4. Conclusion
The results of the analysis of science process skills using eight indicators showed positive results with an average of 47.00% in the high category. The indicator with the medium category is the indicator asking questions of 28.47% while the highest indicator is the predicting indicator of 78.00%.

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