Analysis science process skills high school students on electric circuit concepts in Districts Panjalu Ciamis

N A Budiman*, S Sukarmin and A Supriyanto
Program Magister Pendidikan Fisika, Universitas Sebelas Maret, Jl. Ir. Sutami 36A Kentingan, Jebres, Surakarta 57126, Indonesia

*budiman@unmus.ac.id

Abstract. This research aims to analyze the science process skills of high school students on the concept of electrical circuits in Districts Panjalu Ciamis. This research belongs to descriptive research. Research subjects are 100 high school students at five school in District Panjalu academic year 2017/2018. The instrument of the research was multiple choices. Based on the result of answer analysis, students' science process skills on electric circuit concept on each indicator is still low, this is indicated by the average skill level of the electrical circuit concept under 25%. While the highest level of science process skills on predicting indicator with the percentage of 29% and the lowest level of science process skill in the indicators formulate the hypothesis with the percentage of 10%. Due to the students' scientific process in the concept of electrical circuits is still low, it is suggested that teachers can develop science process skills oriented learning on the concept of electrical circuit in schools, so enable the students to be proned to creativity, problem solving, reflective thinking, originality and invention which are vital ingredients for science and technological development.

1. Introduction
In the 21st century, Physics learning in schools is expected teachers can present basic skills and the scientific process. The four important skills trained by the teacher to the students are 4C (Critical thinking and problem-solving, Communication, Collaboration, Creativity and Innovation) [1]. To perform the scientific process, it requires a certain amount of skill in science which was often called science process skills. The first piece of basic science process skills is gathering data about objects and events using all appropriate senses or with instruments extend the senses, such as magnifying glasses, telescopes, microphones, speakers, and medical through words, diagrams, maps, and graphs. The basic science process skills consist of observing (calculating, measuring, classifying, finding relationship of space/time), hypothesizing, planning the experiment, controlling variables, interpreting data, drawing conclusions (inference), predicting, applying, and communicating [2]. The American Association for the Advancement of Science (AAAS) classified the science process skills into fifteen [3]. These are: observing, measuring, classifying, communicating, predicting, inferring, using number, using space/time relationship, questioning, controlling variables, hypothesizing, defining operationally, formulating models, designing experiment and interpreting data [4].

The basic science process skills comprised of observing, measuring, classifying, communicating, inferring, using number, using space/time relationship and questioning while integrated science process skills are controlling and manipulating variable, hypothesizing, defining operationally, formulating...
models, designing experiment and interpreting data. These activities can be conducted in physics labs, learners should be given emphasis in the form of skills training such as observing, classifying, measuring, communicating, interpreting data, and experimenting gradually based on material characteristics [5].

Science process skills are skills that focus on the learning process to develop students' skills in understanding the knowledge or concepts, independently discovering and developing necessary facts, concepts, and values [6, 7]. Science process skills are a learning approach that integrates science process skills into the system of integrated material presentation [8, 9]. The learning approach is not only transferring knowledge, but also emphasizing on the process of scientific inquiry. In this learning approach, the teacher acts as a facilitator who guides and manages students’ learning activities so that students are able to construct necessary facts, concepts, and new values in their lives independently.

The concepts of physics in high school have varying degrees of difficulty [10]. One of the most difficult concepts in physics is the concept of electricity. Abstract electrical concept causes teachers can not explain directly the concept of electricity. Electricity is invisible. However, it is wherever in our life [11]. One attempt to explain the concept of abstract electricity is with the activities of scientific laboratories. Electricity is abstract and many students are wrong in the electric circuit [11]. For that, the need for learning activities that require students in laboratory activities, so that the abstract concept can be analogized into a real concept. The concept of electricity is taught at the primary and secondary levels. At the next level, electricity is taught systematically and becomes a significant theme [12]. Many students find conceptual difficulties in observing, classifying, inferencing, predicting, looking for relationships, communicating, formulating hypotheses, performing experiments, controlling variables, and interpreting simple electrical circuit data.

To find out the problems that occur in the world of education, especially physics in schools, researchers conducted direct observations to 5 schools in the District Panjalu. Based on the observation, students are not skilled in using laboratory tools, students have not been able to formulate problems and formulate hypotheses. The result of the questionnaire of the students needs shows that 75% of students have not yet acquired skills in observing, grouping, interpreting, forecasting, asking questions, planning experiments, using tools and materials, and communicating in teaching activities presented by teachers. This suggests that students' science process skills are not yet optimal.

Based on the above description, the need for a learning that can improve students' science process skills in the District Panjalu Ciamis. it is suggested that teachers can develop science process skills oriented learning on the concept of electrical circuit in schools, so enable the students to be prone to creativity, problem solving, reflective thinking, originality and invention which are vital ingredients for science and technological development.

2. Method
This research belonged to descriptive research. It was aimed to analyse the science process skills of high school students on the concept of electrical circuits in Panjalu Ciamis districts. Research subjects are 100 high school students at five school in Panjalu districts academic year 2017/2018. The instrument of the research was multiple choices. Data of the research was obtained from the test result using multiple choice instruments. It is used to analyze the level of science process skills in each indicator. The instrument consisted of 30 questions from several indicator as figured out at the table 1.

| No  | Indicator       | Number of question |
|-----|-----------------|--------------------|
| 1   | Observing       | 1, 2, 3, 15
| 2   | Hypothesizing   | 8, 9, 14, 16       |
| 3   | Planning the experiment | 4, 5, 11, 12   |
| 4   | Designing experiment | 6, 7, 25, 26   |
| 5   | Inferring       | 10, 17, 29         |
| 6   | Predicting      | 20, 21, 30         |
| 7   | Applying        | 13,22, 23, 24     |
| 8   | Communicating   | 18, 19, 27, 28,   |
In table 1, it can be seen that of the eight science-process skill indicators there are an average of four questions, except inferring and predicting indicators there are three science-process skills. Total test of science process skill in five schools of 30 items. Then from each item got the average score of science process skills on each indicator, and got the average score of science process skill of each indicator in five schools.

3. Result and discussion
The instrument to analyze the science process skills of high school students on the concept of electrical circuits was multiple choices. Validating instruments needed to be done because it aimed to see if the instruments can be used by students or not [13]. Validation also aims to know the shortcomings of the instrument. With valid instruments, teachers can make good and fair judgments. Results of instruments validation indicated that the instruments is valid, reliable, and can be used with revision. A revision related to technical writing, which is to correct some words, Additionally, a validator is encouraged to add another experiment tool.

Based on the results of science process skill test, showing the indicators analyzed that is observing, hypothesizing, planning the experiment, designing experiment, inferring, predicting, applying, and communicating, obtained as table 2.

Table 2. Scores the science process skills each indicator in five schools.

| Name               | Indicator of science process skill |
|--------------------|-----------------------------------|
|                    | OBS  | HYPO | PLAN | DSIGN | INFR | PRED | APP  | COMM |
| MAS Sirnarasa      | 1    | 1    | 1    | 0     | 0    | 0    | 0    | 1    |
| MAS Muslimin       | 1    | 0    | 0    | 1     | 0    | 1    | 0    | 1    |
| MAN 5 Ciamis       | 1    | 1    | 0    | 1     | 1    | 1    | 1    | 1    |
| MAS Agrowisata     | 1    | 0    | 1    | 1     | 1    | 1    | 0    | 1    |
| SMK Panjalu        | 0    | 0    | 1    | 1     | 0    | 1    | 1    | 0    |
| Total              | 4    | 2    | 4    | 4     | 3    | 5    | 3    | 4    |

* Figures in brackets are in percentages. OBS = Observing, HYPO = Hypothesizing, PLAN = Planning, DSIGN = Designing, INFR = Inferring, PRED = Predicting, APP = Applying, COMM = Communicating.

Table 2 shows the results data score science process skills of each indicator, the highest score is in the predicting indicator with total score is 5, and the lowest score on the hypothesis indicator is 2, observing with total score 4, planning, designing and communicating with total score 4, inferring and applying with total score 3. Graph the percentage and the average percentage of science process skills of each indicator shown in figure 1.
Figure 1 shows the indicator science process skills has the lowest percentage of 0%, and the highest at 33%. Percentage of 0% means no one answered correctly on the test item indicators of science process skills in five schools, percentage of 33% means that students only answer one question of three test questions on science process skill indicators, and the percentage of 25% means that students correctly answer one question out of four test questions on science process skill indicators. While the average percentage of science process skills in each indicator is presented in figure 2.

Figure 2. The average percentage science process skills each indicator.

Figure 2 shows the average percentage of the highest science process skill was obtained on predicting indicators of 29%, the lowest percentage is in the hypothesizing indicator of 10%. Indicator observing, planning, designing, inferring, and communicating have an average percentage of 20%, and then applying indicator has an average percentage of 15%. The average percentage is calculated from the total score of each science skill process indicator in five schools.

The hypothesis indicator has the lowest percentage because students have not understood and have difficulty in making hypothesis. Students do not fully understand the concept of hypothesis. Most of the students had the idea that a hypothesis is formulated after an experiment is conducted [14].

4. Conclusion
Based on the results of the answer analysis, science process skills on the lowest hypothesizing indicator, while the science process skills are highest on predicting indicators. But overall, the science process skills of each indicator are still low, this is indicated by the average percentage of science process skills for each indicator below 20%. Therefore, required a study involving and developing science process skills on the concept of electrical circuit in schools, especially in district Panjalu Ciamis and generally throughout Indonesia. So that enable the students to be prone to creativity, problem solving, reflective thinking, originality and invention which are vital ingredients for science and technological development.

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