Chemistry Learning Process: The Analysis of Science Process Skills of Eleventh Grade Students

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Abstract. This research is the preliminary research that aim to know the skill of science prosses level, in XI IPA in chemistry. This research was conducted in SMA N 1 Jekulo Kudus, SMA N 9 Semarang, SMA N 10 Semarang, and Bina Insani Islamic High School in the academic years 2018/2019. The research subjects were 110 students as respondents. The method used in this study is a qualitative description. Analysis of the level of science process skills is carried out by students' self-assessment sheets, chemistry teacher interviews, and student lab reports analysis. The results showed that the science process skills of students based on self-assessment sheets, namely students felt their science process skills were good, whereas based on teacher interviews and lab reports analysis, students' science process skills were in a fairly good category.

Keywords: Chemistry Learning, Chemistry Learning Process, Science Process Skill, The skill of science process level.

1 Introduction

Science Process Skills are skills that are used by scientists to transfer various natural sciences (science) into applications in daily life [6]. Process Science skill is also defined as a tool needed to use and process scientific information, conduct scientific research and solve the problems[19]. The Scientists use the process science skill to conducting the knowledge, problem solving, create the conclusion [10], find the concept, and developing the concept that already exists, and to denying the previous concept [8].

Science Process Skills consist of basic science process skills and integrated science process skills. Basic Science Process Skills include observing, measuring and using number, classifying, communication, predict, and conclude [15, 6, 18, 19, 8, 17, 1]. Integrated science process skill consist of data interpreting, identifying variable, designing investigations, formulating hypotheses, and modelling [15, 6, 18, 19, 14, 1, 7].

Science Process Skills are important for students as basic skills to supporting the other skills [3]. Science Process Skill is not the skill that suddenly happen. Students need to be guided to have it guidance given to students also requires an awareness of the importance of science process skills. Awareness of the importance of science process skills for students needs to be raised, so that students can be motivated to improve and develop their skills.

Science Process Skills have many advantages, so that it important for the students to have the skill. First, it uses inquiry approach to improve the effectiveness of the students' understanding concept [6]. The concept understanding obtained based on the students

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experience directly and can be reduced the level of misconception. The students' concept understanding can improve the result of their study [11]. Second, The Science Process skill can improve the curiosity, and make the decision [6]. Third, It can be improved in the teamwork, communication, and researching [13]. Fourth, It can be supported the other skills such as : (a) observing and experimenting skills [16, 10]; (b) problem solving [18, 13, 6]; (c) logical and creativity of thinking (Ergul, Simsekli, Calis, & Ozdilek, 2011); then (d) critical thinking [6]. These skills are included into the skills developed in the 21st century [2] as a provision for students to work and apply what they get in the community.

The advantages of Science Process Skills are taken into consideration to pay more attention to students' science process skills. Teachers should know the strengths and weaknesses of their students, so they can apply the right learning methods. The application of appropriate learning methods by paying attention to teaching material and science process skills students are expected to obtain high learning outcomes. In this study, the research subjects were XI grade because the core of chemistry teaching material was in XI grade and required science process skills compared to X grade. Detection of problems in science process skills of XI grade students is expected to be improved and applied to higher level classes . The considerations that have been conveyed indicate the importance of knowing the level of science process skills of students, therefore there is a need for research to analyze the level of science process skills of high school students of class XI in chemistry learning.

2 Methods

The method used in this research is descriptive through qualitative and quantitative approaches. The subjects are XI IPA at SMAN 1 Jekulo, SMAN 9 and 10 Semarang and also Bina Insani Islamic Center in accademic years 2018/2019. The data on science process skills of students is obtained from primary and secondary data. Primary data are the results of teacher interviews, field observations and self-assessment of student responses, while secondary data are in the form of data /document studies, literature studies, and internet sites related to the research title. The instruments of Data collection used includes: a) teacher interview guidelines, b) practicum activity observation sheets on a 1-4 scale, c) self-assessment sheets students' responses on a 1-4 scale.

The data analysis from this study is to describe all data obtained both qualitatively and quantitatively. Criteria for the level of science process skills of students are determined based on the criteria as presented in Table 1.

Table 1. The Students' Science Process Science Criteria

The students' self-assessment sheet		Practice Report	
Score	Explanation	Score	Explanation
$123< X \leq 152$	Very Good	$32< X \leq 40$	Very Good
$94< X \leq 123$	Good	$24< X \leq 32$	Good
$66< X \leq 94$	Enough	$16< X \leq 24$	Enough
$38< X \leq 66$	Bad	$10< X \leq 16$	Bad

3 Results and Discussion

The results of the science process skills analysis measured in practical activities are based on the indicators listed in the LKPD and are written in the form of a report on the implementation of the lab. In lab reports written by students individually can be assessed indicators of science process skills that have been determined. The results of the analysis of students' science process skills through the student practicum report are shown in Table 2.

Table 2. The results of the analysis of students' science process skills in the student practicum report

Indicators	Score	Criteria
Determine the type of variable correctly	1.00	Bad
Formulate the purpose of the experiment correctly	2.23	Enough
Formulate the hypothesis in the experiment correctly	1.15	Bad
listing the tools and materials that use completely	4.00	Very Good
Writing the procedure of the experiment correctly and easily	3.23	Good
Can be classified the result of experiment in the data analysis correctly	3.46	Good
Can be associated the result of experiment with concept (references) to discussion	1.46	Bad
can be concluded the result of the experiment correctly with the purpose of the experiment compatibility.	1.69	Bad
listing the lab report coherently and completely	1.92	Bad
Writing the lab report with standard sentences as EYD rules	2.85	Enough

Based on the results of the analysis of student practicum reports in Table 2, the results of the score of science process skills analysis from student lab reports are obtained, namely 23 with good enough categories. Practicum report is one way to communicate the results of experiments through writing. Student lab reports that are not yet complete and written do not coincide to show students' communication skills still need to be improved. The low communication skills of students were also shown in research conducted by Atmojo's research (2012).

The Science Process Skills Assessment students are also identified through a self-assessment sheet. The self-assessment sheet is spread through the *google form* application. This self-assessment sheet aims to determine students' self-awareness regarding the science process skills they have. There are several question items that show the low level of science process skills of students. Item statements that show the results of low science process skills are presented in Figure 1.

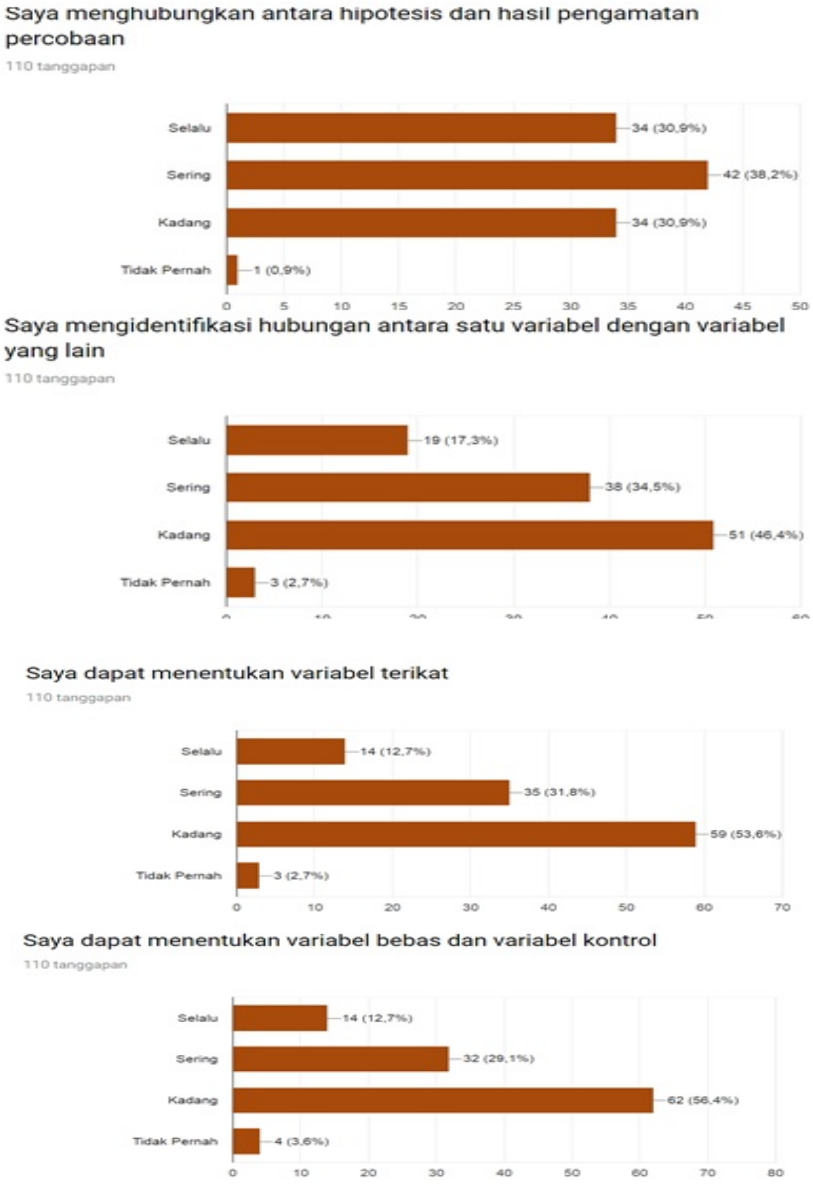

Fig 1. The Result of Science Process Skill self-assessment

Based on Figure 1, the Indicators of science process skills included in the less category include interpretation of data, drawing conclusions, communicating, formulating hypotheses and determining variables. The results obtained based on the analysis of the student's self-assessment sheet in accordance with the results of the student lab report analysis.

Data analysis both self-assessment sheets and student lab reports show mutually reinforcing results. In this study, students were asked to conduct self-assessments related to

their own KPS through questionnaires with 38 statements. The results of the student self-assessment are shown in Table 3.

Table 3. The students' questionnaire analysis report

Skills	Average	Criteria
Observing	3.17	Good
Predicting	2.96	Enough
Making the hypothesis	3.05	Good
Experiment planning	3.07	Good
Decide the Variable	2.89	Enough
Classifying	3.00	Good
Concluding	2.91	Enough
Data Interpretation	2.99	Enough
Measuring	3.07	Good
Presenting the result	3.12	Good

Based on the analysis of the student's questionnaire sheet in table 3 was found that students realized that some indicators of their science process skills were still in sufficient criteria, although overall scores of students' science process skills based on questionnaire were in good criteria.

The Student observation skills need more attention because observing can affect the other skills. The results of the analysis of the student's questionnaire sheet, show that the observing skills are good. Students observe the tools and materials that would be used before starting the lab. Most of students know the function of each instrument. The student rarely attends to up and down meniscus Although students' observing skills are good. From 110 respondents only 5 respondents that never show the up and down meniscus.

In a quantitative chemistry lab, the volume of solution used must be appropriate in order to obtain good results. The lower meniscus and upper meniscus when taking the solution will reduce or increase the volume of the solution from the specified amount so that it will affect the results obtained. Based on Figure 1 it is also shown that the skill of determining student variables must be increased again. Students feel confused when determining the dependent variable, the independent variable, or the control variable and students find it difficult to connect the interrelationships between variables. As many as 62 out of 110 students felt that they could only determine the control variables and independent variables occasionally, while as many as 43 out of 110 students felt that they could only determine the dependent variable occasionally. The relationship between variables both independent variables, control variables and dependent variables will direct students to practical conclusions, so that the determination of variables when practicum can affect students' skills in drawing conclusions.

Table 2 said the predicting and concluding is still in basic SPS. It found in the previous research [15, 6,18,19,14]. The lower basic SPS can be affect the integrated SPS [5]. The integrated SPS with enough category in table 2 they are deciding variable and interpreting, while the planning the experiment not yet developed.

The result is accordance to the interview. Based on the interview with the objects of the research, it shows the students SPS still in good enough category. The interpretation, deciding variable, planning the experiment, deciding hypothesis and creating need to developed. Low

SPS can be caused by several factor. They are family, social status, culture, education and critical thinking, also the media such as, book, laptop, and internet [12, 4, 9].

The other factor that influencing the low of SPS is the missing observation in the lab work. Observation through measuring skills is one way for students to get feedback on practicum [3]. This feedback helps students formulate problems and solve the problems. Another critical aspect is communicating. Research conducted without communication will be meaningless. There are many ways to communicate such as speaking, writing, drawing diagrams, drawing graphs, mathematical formulas, and tables [3].

4 Conclusion

Based on the results of the research and discussion above, it can be concluded that the science process skills of XI grade students of SMA N 1 Jekulo Kudus, SMA N 9 Semarang, SMA 10 Semarang, and Islamic Plus Bina Insani are in a good enough category, so they still need to be improved.

Because students 'science process skills are important to develop, there is a need for further research on efforts to improve students' science process skills using innovative learning models, approaches or strategies.

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