Integrated Science Education Journal
Vol. 4, No. 2, May 2023, pp. 54~61
ISSN: 2716-3725, DOI: 10.37251/isej.v4i2.322

Practicum Activity: Analysis of Science Process Skills and Students' Critical Thinking Skills

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Article Info

Article history:

Received Mar 28, 2023
Revised May 7, 2023
Accepted May 17, 2023
OnlineFirst May 30, 2023

Keywords:

Critical Thinking Ability
Practicum Activity
Science Process Skills

ABSTRACT

Purpose of the study: The purpose of this study was to determine how the science process and critical thinking skills of VII grade junior high school students were carried out through practicum activities.

Methodology: This type of research is qualitative research. The data collection technique used in this research is the interview instrument. The informants in this study came from Batanghari 2 Junior High School, Batanghari 8 Junior High School, and Batanghari 25 Junior High School, with the sample informants being 3 teachers and 6 students. Data analysis techniques use the Miles and Huberman methods.

Main Findings: The results of this study are that science teachers in the three schools have implemented practicum activities, and there has been an assessment of science process skills in practicum activities. Students have been trained and assessed for their science process skills and critical thinking skills but have not been trained optimally.

Novelty/Originality of this study: The novelty of this research is to analyze practicum activities in improving science process skills and critical thinking skills in three direct schools. Suggestions for further research are finding learning innovations or selecting learning models to improve students' science process skills and critical thinking abilities to make them even better.

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1. INTRODUCTION

One of the learning achievements based on Pancasila student profiles is to make students able to reason critically. Critical thinking skills need to be trained in students so they are able to face the demands of 21st century learning in accordance with the goals of education in Indonesia [1], [2]. Critical thinking skills involve activities, including analyzing, synthesizing, making judgments, creating, and applying new knowledge to real world situations [3], [4]. The indicators of critical thinking ability according to [5], [6] includes; providing simple explanations, basic clarifications), inferences, further clarifications, strategies and tactics. Critical thinking skills can be honed through Natural Science subjects.

IPA is a science that studies phenomena that occur in nature and is based on systematic experiments and observations [7]–[9]. Science learning felt by students will be more meaningful if the subject matter is related to activities in everyday life [10]. Four elements, such as attitudes, processes, products and applications, are expected to appear in the science learning process so that students can experience the learning process and fully understand natural phenomena through scientific methods, problem solving activities, and imitating the way

scientists work in discovering new facts [11]–[13]. The attitude in science is meant by a scientific attitude / in the science process it contains an attitude and way of thinking scientifically, the process in science is meant by having a number of skills to be able to study natural phenomena in a certain way to obtain knowledge development, science as a product is meant by having various tools and products produced by researchers and scientists in applying science, as well as science as an application meant by applying science to the concepts of life around. Science learning can be done through practicum activities in order to overcome learning difficulties such as difficulties in understanding the material, difficulty associating relationships between concepts, difficulties in understanding formulas, and operating formulas when solving problems. [14], [15]. The use of practicum activities in the learning process allows teachers to see student skills, one of which is science process skills [16]. By carrying out practicum activities students learn about the steps of observation before conducting experiments, then hypotheses and formulation of hypotheses, measurements and other things are carried out which are indicators of scientific process skills. Likewise with the formulation of hypotheses, proving the theory through experiments, and being able to conclude are indicators of critical thinking skills. Thus, practicum activities are closely related to the development of students' skills in the form of science process skills and critical thinking skills.

Science process skills are one of the important skills in the 21st century[8], [9], [12]. Science process skills are complex abilities that are commonly used by scientists in conducting scientific investigations into a series of learning processes [17]–[19]. As said by Gunawan et al (2019), science process skills is a behavior that encourages skills in acquiring knowledge. In fact, current students' science process skills still tend to be low and there are still students' assumptions that science is a difficult subject, full of theory, and boring learning [21], as well as the use of media and methods used by teachers who are less innovative result in students being lazy to learn science [22]–[24][25]. Some abstract physics concepts often become obstacles for teachers to convey and visualize concepts to students [20]. Likewise, the meaningfulness of lessons related to everyday life has not been optimally integrated into the learning process because teachers are pursuing teaching material targets. In laboratory learning, students do practicum to prove the truth of the theory, but have not been directed to "find" [26]–[28].

The thinking process of students needs to get the attention of the teacher to help students develop skills in solving problems both in everyday life and in the context of science. [29], [30]. However, so far the learning process in schools tends to use more teacher-centered learning methods [24], [31], [32]. Students only learn science as a product and memorize concepts, theories, and laws. Students only study science in the lowest cognitive domain and their learning activities have not touched the affective and psychomotor domains. Students are not accustomed to developing their thinking potential, so students become lazy to think independently [11], [33]. To overcome learning difficulties, the teacher can vary the use of teaching methods or approaches that can awaken students' analytical abilities and critical thinking skills [14], [34], [35]. According to [36], [37], if students have low science process skills, these students also have low critical thinking skills. Therefore, so that teaching and learning activities in schools can apply student involvement optimally and familiarize students with using their thinking skills, it is necessary to hold practical activities so that students are able to understand concepts well and can improve critical thinking skills and science process skills.

The purpose of this study is to find out how students' science process skills and critical thinking abilities are carried out through practicum activities. With this research, the researcher hopes that this research can contribute to schools or teachers, so they can find new innovations regarding effective, creative and innovative learning models or learning methods.

2. RESEARCH METHOD

This type of research is qualitative research. Qualitative research is research that contains sentences, opinions, or suggestions and is not in the form of numbers [38]. The samples in this study were 1 teacher and 2 students of class VII, each of which came from SMPN 2 Batanghari, SMPN 8 Batanghari, and SMPN 25 Batanghari with the total sample of informants being 3 teachers and 6 students. The sampling technique in this study was using a purposive sampling technique. The purposive sampling technique is a technique with certain criteria and considerations from the researcher [39]. Qualitative data obtained through interview instruments. The interview used in this study was an open interview. The interview instrument with the teacher contained 12 questions and the interview instrument with students contained 10 questions. The interview instrument grids are as follows.

Table 1. The Grid of interiew Instrument

The interview instrument grid with the teacher	
Grids	Number
Efforts made by the teacher to motivate students in learning science	1, 2
Practicum-based lesson plan	3,4
Student motivation	6
Ability to ask	7, 10
Teacher assessment based on science process skills	8, 9
Obstacles encountered	5, 11
Student learning outcomes	12
The interview instrument grid with the student	
Grids	Number
Practical activities	1, 2, 3, 4, 5
Science process skills	6
Motivation in learning science	7
Ability to ask	8
Critical thinking skills	9
Constraint	10

Data analysis techniques in this study used the Miles and Huberman methods which included data reduction, data presentation and conclusion/data verification [40]. The details can be seen in Figure 1.

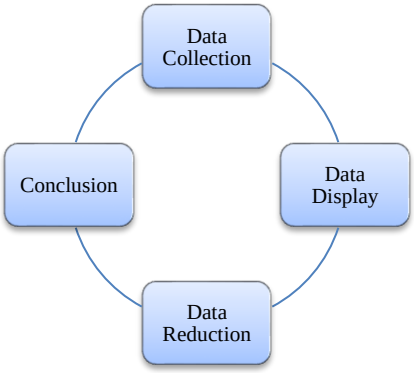

Figure 1. Research Steps

3. RESULTS AND DISCUSSION

Science process skills and critical thinking skills can be seen and improved through practicum activities. Therefore, researchers conducted interviews related to practicum activities. The interview results are as follows.

Table 2. Results of Interviews with Teacher Informants

Questions	Informan
What efforts are made to make students enjoy learning science?	By using interesting and appropriate learning strategies, approaches, and learning methods. Like holding a practicum or using a demonstration method.
Have you ever done practical work before?	Several schools have carried out practicum activities, but only a few subject matters. However, at this time it is still rarely done due to inadequate time and tools.
What are the main materials taught through practicum activities?	Mother once did practical measurements, photosynthesis, heat, and acid-base.
Is there a change in the learning plan every year in learning in which there is a practicum?	There must be.
What are the obstacles encountered by the teacher in carrying out practicum activities?	The obstacle in carrying out practicum activities was that dense science material resulted in delays in the

	implementation of practicum activities, because I also considered that there would be a lot of material left behind. In addition, mastery of teachers who are not in their field is also an obstacle. For example, before your study program was biology, the practicum that allowed you to do was experiments on science material in the biology section. the excessive activity of students towards new things, which is like an experimental tool so that it becomes one of the obstacles as well.
Are students enthusiastic when doing practicum activities?	Enthusiasm, even very deep curiosity, but because of this enthusiasm the teacher has to be a little careful because laboratory equipment is very expensive.
Do students actively ask questions when doing practicum?	Yes, active.
Have you ever conducted an assessment of students' science process skills?	There are and have been.
Is there a demonstration or trial steps before the practicum is held?	There is a demonstration before practicum activities are held.
Do students tend to actively ask questions during teaching and learning activities?	Yes, but only a few are active and the rest are passive.
Do students still see problems in answering practice questions or exams in science subjects?	Yes, there are still students who are constrained especially during this post-pandemic period. Students have difficulty but do not ask many questions.
Are the scores obtained by students during the test good?	Only a few were good. And sample 1 said that students still had difficulty working on exam questions and were marked by test and test scores that were still below average.

Then, the researcher conducted interviews with SMPN students in Batanghari Regency. The results of interviews with students can be seen in Table 3 below.

Table 3. Results of interviews with student informants

Question	Informan
Have you ever done practical work before?	There are practical activities, but rarely only a few times. More to the material biology.
If so, how many times do you do practicum activities in one semester?	The sample school 1 said that it was quite frequent, the second school only did it 2-3 times and school 3 said that at this time there were no practicum activities because there were still many obstacles.
Is there a demonstration or trial steps to be carried out?	Yes, there are directions before practicum activities are held, but only briefly.
Have you ever done practical activities on measurement material?	School sample 1 said they had, sample two schools said they had but did not go to the laboratory and the third school had never carried out measurement practicum activities.
Is it important to know the steps of practicum activities and design practicum activities?	Yes, it is very necessary to know the steps of practicum activities and also design practicum activities.
Do you know the steps in the measurement experiment?	Yes, you know a little.
Does doing practicum activities make students able to increase enthusiasm, motivation and easily understand the concept of the lesson?	Yes, if there is a practicum activity I become more aware of the material and it is easy to communicate results and give conclusions. With practicum activities, we became more enthusiastic in learning science.
Do students actively ask questions and explore science lessons in depth?	In class, my friends and I rarely ask questions, and tend to be silent when the teacher asks. Only a few students often ask questions in class. Because, confused about the material and also confused about

Question	Informan
	things to ask.
Can you easily answer science questions on tests and exams?	There are those who can do it easily and there are also those who still have difficulty working on the problem.
Do students still have difficulty answering practice questions or exams in science subjects?	There are still issues that we can't work on. Very difficult in working on the questions because the questions are difficult to understand.

Based on the results of interviews with teachers and students, it can be seen that SMPN in Batanghari has practicum activities, but they are rarely carried out. After conducting interviews the teacher has conducted an assessment of science process skills. Practicum activities that are rarely carried out result in student skills that are still not developed so that it also has an impact on students' critical thinking abilities where students still have difficulty understanding concepts, then during teaching and learning activities students still tend to be passive and do not delve into in-depth learning. During an interview with the teacher, the teacher said the same thing where students still had difficulty working on exam questions and it was marked by test and test scores that were still below average. Then, during teaching and learning activities students tend to be passive and do not ask in-depth questions in science lessons.

Science processing skills can improve thinking skills so that science processing skills is very important for developing good concepts for students [40]. The application of concepts is a very important skill because the application of concepts is the main goal of science education. Science processing skills is a prerequisite for learning thinking skills that are directly related to cognitive and psychomotor aspects so it is important to be taught in building knowledge and problem-solving skills [41], [42].

Today's teachers are required to be able to create learning that is not focused on memorization [43]. Teachers must be creative in adapting learning to the demands of the twenty-first century, one of which must be mastering science process skills [44], [45]. To be able to improve students' science process skills and critical thinking skills, a learning process is needed that can make students able to learn actively and discover concepts new. One effort that can be done is with practicum-based learning [46]. Practicum activities are important because they can generate motivation to learn science and develop basic skills in conducting experiments. Practicum activities can also be a vehicle for learning a scientific approach and supporting understanding of subject matter [47], [48]. Critical thinking skills are also very important for students to become more skilled in constructing arguments, checking the credibility of information sources, or making decisions [49]–[52].

Based on research [53] shows that there is an influence between science process skills and students' understanding of concepts. Where if students already have science process skills and are able to carry out according to the indicators of science process skills in direct experience then this can increase students' understanding of concepts because students are able to prove the truth of the theory independently.Likewise research conducted by [54] said that there was an influence of science process skills on students' critical thinking skills in two schools in Jambi City. In this case it shows that if students' science process skills are low then students' critical thinking skills will be low and vice versa if students' science process skills are high then students' critical thinking skills will also be high. The same thing is found in research [55], [56] that there is a strong relationship and there is influence between science process skills and critical thinking skills of 41.5%, while the remaining 58.5% is caused by other factors. In this case there is indeed a strong relationship and there is an influence of science process skills on critical thinking skills but besides science process skills there are other factors that can influence students' critical thinking skills.

The limitation of this research is that this research focuses on issues regarding science process skills and critical thinking skills. The data collection technique used by researchers only uses interviews so that it is still lacking to provide in-depth and representative conclusions. The novelty of this research is that this research analyzes science process skills and students' critical thinking skills through practicum activities. As for suggestions for future researchers, it is necessary to conduct research in certain areas so that later it can be traced to schools that require increased critical thinking skills and the need for research that discusses learning models or learning media innovations that can improve critical thinking skills and science process skills.

4. CONCLUSION

Based on the results of the study it can be concluded that the schools studied had practicum activities and there was an assessment of science process skills in supporting science learning but it was rarely done. The lack of training of students in direct experience makes students' science process skills less developed which affects their critical thinking skills, students still have difficulty working on exam questions and this is indicated by test scores that are still below average. Researchers' suggestions for future researchers to be able to carry out

further research on learning models or learning media innovations that are able to improve students' science process skills and critical thinking skills.

ACKNOWLEDGEMENTS

I gratefully acknowledge to all colleagues who have provided support so that this paper can be completed

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