



TEACHER ADAPTATIONS OF SCIENCE PROCESS SKILLS (SPS) IN JUNIOR HIGH SCHOOL 1 SIDOARJO DURING THE COVID-19 PANDEMIC

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Abstract

This study aimed to identify the teacher adaptation of Science Process Skills (SPS) implementations during the Covid-19 pandemic. This study uses multiple case studies. The subjects were three science teachers and fifteen students 7th grade from JHS 1 Sidoarjo. The instrument of this study consists of teacher and student questionnaires with the data collection techniques used the descriptive of observation, interviews, and documentation. The result showed that all of the teacher have changed their lesson plan and student worksheet for adjustment to online learning but it still used the SPS activities, but some SPS indicators can't be implemented properly. Teacher adaptations for the SPS during online learning are 1) improve the ability for use technology with applications used as learning media; 2) simple observation with uncomplicated tools and safety; 3) giving and collecting assignments by applications and presenting; 4) giving stimulus in the form of problems using images/videos to formulate hypotheses and variables before do the experiments, then presenting and analyzing the data individually at home. The results of this study are used as reference for all science teachers to coordinate on the selection of the right SPS activities, so all of the SPS indicators can be implemented optimally.

Keywords: Teacher Adaptation, Science Process Skills, Online Learning

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INTRODUCTION

Covid-19 first appeared at the end of 2019 and spread rapidly throughout the world (Marziali et al., 2020). The World Health Organization (WHO) in January 2020 has declared this virus to be a global emergency (Anugraha, 2020). One of the sectors most significantly affected is education (Wang et al., 2020). Education that is absolutely face-to-face learning turns into online learning (Rochman & Pertiwi, 2020). Changes in education system are listed in Circular Letter Number 4 of 2020 concerning the Implementation of Education System in the Emergency Period for the Spread of Covid-19 (Anugraha, 2020). Changes in education system cause schools to adapt learning in accordance with the Covid-19 pandemic (Erduran in Saribas & Cetinkaya, 2020).

The teachers as a learning facilitator must change the face-to-face learning system into online learning using applications (Mishra et al., 2020). Although online learning, changes in learning still adapted to education competencies goals, education not only understanding the theory but also student skills (Wisudawati & Sulistyowati, 2014).

Science subjects cannot be separated from students' skills because it is a science that studies natural phenomena, namely by observing and conveying the results (Eliyana, 2020). As stated in Permendikbud Number 12 of 2016 regarding the education competencies goals in the 2013 Curriculum, including asking questions about science phenomena, conducting experiments, writing and presenting research data in table or graphic, make conclusions, and reporting research results either oral or written to answer questions. Therefore, the expected learning outcomes are emphasized on students' science process skills (Wisudawati & Sulistyowati, 2014).

Science process skills (SPS) are process thinking skills using scientific methods and approaches to find science facts, concepts, and theories (Safaah, et al., 2017). Learning that emphasizes SPS means guiding students to have the skills to acquire knowledge and present the results (Hamadi, et al. 2018). According to Silay & Celik (2013), SPS is divided into two, namely basic and integrated. Basic SPS includes observing, classifying, measuring, communicating, inferring, and predicting. Integrated SPS includes formulating hypotheses, interpreting data, formulating models, experimenting, defining operations and identifying variables.

The implementation of SPS during face-to-face learning involves students actively doing practicum in the laboratory or classroom with direct monitoring from the teacher (Wegasanti & Maulidia, 2017). As implemented by science

teachers in JHS 1 Sidoarjo during face-to-face learning. JHS 1 Sidoarjo has three science laboratory rooms and quite complete equipment support the successful implementation of basic and integrated SPS, but during the Covid-19 pandemic, practicum in schools can no longer be carried out to support the implementation of SPS. Therefore, teacher adapt the SPS activities in order to all of the SPS goals can be implemented optimally to students during online learning.

The results of an interview with one of the science teachers at JHS 1 Sidoarjo said that all science teachers modified the SPS implementations by adjusting the conditions of the Covid-19 pandemic. Based on the background, this research was carried out by case study at JHS 1 Sidoarjo which aims to identify forms of teacher adaptations of SPS activities in science learning during the Covid-19 pandemic.

METHOD

Research Design

This research uses multiple case studies. The case used as the basis for this research is the modified implementation and the differences implementation of the SPS by each teacher during online learning. These cases were analyzed to obtain more detailed and in-depth information about the implementation of SPS during the Covid-19 pandemic (Yin, 2009).

Research Objectives

The subject of this research were three science teachers and 15 seventh grade students at JHS 1 Sidoarjo. The data from students used as a strengthening of research data by teachers.

Instrument

The instrument of this research consists of teacher and student questionnaires that aims to determine the implementation of SPS during offline and online learning on the topic of 1) Science Objects and It's Observations; 2) Heat and It's Transmission. The questionnaires were validated by two lecturers from Science Department. The questionnaires obtained validity score 81,4%. A score between 81%-100% is in the very high category (Arikunto, 2006). Then the results of the validator's assessment carried out a reliability test with *Alpha Cronbach* analysis, get a value of 0,778. The value was $\alpha > 0,6$; so the questionnaires were reliable (Sugiyono, 2015).

Data Collection Techniques

Data collection techniques used observation, interviews and documentation. The observation stage is given the questionnaires to teachers and students by online. Then, do an interviews with all teachers. The interview technique was an

unstructured interview, because it doesn't use a specific question instrument (Sugiyono, 2015). The interview's topic is about the teacher questionnaire data to confirm and obtain more detailed information. The results of the questionnaires and interviews were strengthened by documentation data in the form of offline and online lesson plans and student worksheets.

Data Analysis Techniques

Data analysis technique used descriptive analysis. The data is analyzed and then developed according to certain relationship patterns (Sugiyono, 2015). Teacher questionnaires data, also lesson plans and student worksheets are compared to the SPS implementations of each teachers during online and offline learning, then measure the percentage of SPS implementations in each sub-topic and each SPS indicators during online learning is grouped into 3 categories, 1)

Implemented without modification; 2) Modified; and 3) not implemented. The results of the questionnaire, lesson plan and student worksheet were associated with the interview's data with teachers about some factors that influence the adaptation.

RESULTS AND DISCUSSION

Changes in education system into online learning requires teachers to adapt the implementation of SPS. The implementation of SPS was obtained through a response questionnaires by 3 teachers. The online learning activities is compared with the offline learning activities, then we get the implementation that implemented without modification, implemented with modification, and not implemented as presented in table 1 and table 2 below.

Table 1. Differences implementation of SPS by each teacher on the topic science object and it's observations

Implementation	Teacher	Percentage Each Sub Topic (%)			
		Science Observations	Measurement	Base Quantities	Derivative Quantities
Implemented Without Modification	A	0	66.7	0	33.3
	B	0	33.3	0	33.3
	C	0	66.7	33.3	33.3
Modified	A	100	33.3	100	66.7
	B	100	66.7	100	66.7
	C	100	33.3	66.7	66.7
Not Implemented	A	0	0	0	0
	B	0	0	0	0
	C	0	0	0	0

Table 2. Differences implementation of SPS by each teacher on the topic heat and it's transmission

Implementation	Teacher	Percentage Each Sub Topic (%)		
		Heat Concept	Heat Relation Concept	Heat Transmission
Implemented Without Modification	A	0	0	16.7
	B	0	0	0
	C	0	0	16.7
Modified	A	100	42.9	83.3
	B	33.3	100	66.7
	C	100	42.9	83.3
Not Implemented	A	0	57.1	0
	B	66.7	0	33.3
	C	0	57.1	0

Note: A=Respondent 1; B=Respondent 2; C=Respondent 3

Table 1 showed there are differences in the adaptation of SPS by each teacher. Not all teachers adapted SPS activities during online learning in the same way. The SPS implementations on the topic Science Objects and

It's observations is mostly implemented with modification and just little activities still uses the same as offline learning/unmodified. These results are different from the topic Heat and it's Transmission, most of the activities can be

modification and adapted well but there are some activities that the teacher cannot adapt. The adaptation is certainly different for each SPS indicators, as presented in Figure 1 below.

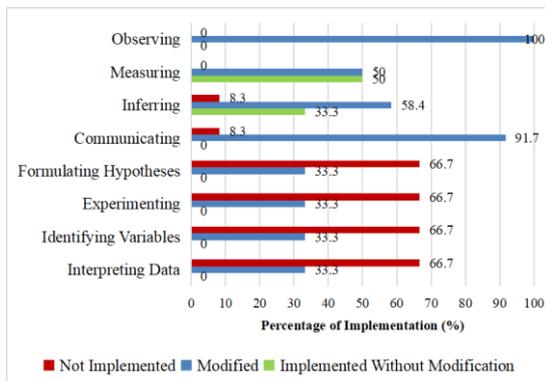


Figure 1. Graphics of implementation of each SPS indicators during online learning

The highest percentage of SPS indicators that were successfully adapted during online learning are inferring and communicating, then followed by observing. The highest percentage of SPS indicators that were unsuccessfully adapted are formulating hypotheses, experimenting, identifying variables, and interpreting data.

The early adaptation made by the science teacher at JHS 1 Sidoarjo during the online learning was increase the ability to use technology. Some applications that were used as learning media are the Google Meet, Zoom Meeting, Google Classroom, WhatsApp and YouTube. These results are relevant to Lindawati & Rahman (2020) research which states that in the implementation during online learning, teachers use smartphones and laptops to support learning activities and uses some applications as online learning media. Fleck, et al (2014) also said the learning materials shared to students in the form of PowerPoint, PDF/Word, and videos or images.

The results of the lesson plan and student worksheet's analysis all of the teachers have been included the SPS activities, but in implementing the activities there are differences for each teacher. One of the three teachers confirmed that all teachers still coordinate the goals of the topic either offline or online, but in practice, especially in adapting SPS activities, each teacher have a freedom to adapting the activities because each teacher's students have different conditions.

The adaptation of learning activities for each SPS indicators has differences. The "Observing" indicator can be adapted and modified properly according to online learning so that all observing activities implemented optimally. At the beginning of the pandemic, all teachers worked together to make learning videos then uploaded on

YouTube, in the form of several activities such as how to use measuring tools, simple experiments, and others which students were study independently. But only a few students watch the videos on YouTube because they are not guided directly by the teacher, so the teacher changes it by showing the video during a virtual meeting and then explains directly to students. The results of interviews with teachers showed that only Teacher B and Teacher C showed the learning videos by virtual meeting, while Teacher A only asked students to read the book about how to use measuring tools due to students has limited internet quotas and bad signals. Because of the lack of student interest in watching learning videos on YouTube, now all teachers didn't make their own videos again but only use the other people videos on YouTube.

Because of the social distancing policy, the teacher changes group observation activities in the laboratory with tools and materials provided by the school, the teacher turns it into an individual observation activity with safety tools and materials at home during online learning. One example is on the topic Heat and it's Transmission, there are many observation activities on boiling water in the laboratory, Teacher B and Teacher C turns it into observe the student's mother when boiling water, so students don't do it themselves. In addition, a adaptation made by Teacher A is asking students to hold and feel several types of spoons with different materials that are used when make hot tea or milk. Adaptation in observing activities as mentioned above can still implemented to students in finding the concept of heat.

The indicator "Measuring" only some of the activities that adapt to the online condition and some are modified. One example is taking measurements using measuring tools that available at home. Then the activity of measuring the leaf area using millimeter graph paper, but teachers give students the freedom to use any papers. Based on student questionnaires data, there are some students who didn't have millimeter graph paper so that students have an initiative to use folio papers and drawing books then give some lines so the paper formed like millimeter graph paper. Using limited tools and materials, students can still measure leaf area optimally.

The indicator "Inferring" most of it's activities are modified according to the online condition. After the students did a simple experiment at home, all teachers asked the students to present the observation data on the student worksheet that has been given through google classroom or WhatsApp group. In addition, students and teachers also conduct question and

answer sessions during the virtual meeting. For example, Teacher C asked students to pair units with their measuring tools directly during the virtual meeting learning. There are also activities that when offline learning involve inferring, but when online learning it was not implemented due to limited time. These obstacles occurred in all teachers but in different sub-topic.

The indicator "Communicating" most of the activities can be modified, but there is one activity by teacher B that should involve communicating but cannot implemented due to limited time. The communicating SPS activity which when offline learning is carried out with presentations in front of the class, but now all of the teachers are adapting it with presentations on virtual meeting by Google Meet/Zoom Meeting. Discussing the assignments in class and collecting assignment books or portfolios to the teacher is often implemented when offline learning, but when online learning mostly just collecting the assignments in Google Classroom and will be discussed at the next meeting if there is more times.

The indicator formulating hypotheses, experimenting, identifying variables, and interpreting data is the SPS indicators with the highest percentage of failure. The four indicators are contained in the sub-topic of the Concept of the Relationship of Heat with Changes in Substances in the experimental activity the effect of the surface area of a liquid on the rate of evaporation. Only Teacher B was successfully adapt it, while Teacher A and Teacher C were unable to adapt. The adaptation made by Teacher B were showing videos and pictures to compare the surface area, then students were asked to make hypotheses and experimental variables. Before do the experiment, students were given a stimulus to be able to formulate a hypothesis to be tested. Sifah & Sumarno (2016) explained that before doing the experiment it is necessary to formulate a hypothesis in order to guide students to think a tentative assumption in the experiment to be carried out. Then they were given the task of doing a simple experiment at home using a safety tools at home. The teacher distributes student worksheets to present experimental data and several questions related to variables and experimental results. Then, the teacher asks students to analyze the data and make conclusions. Through these experiments students can found the heat theory being tested. So the SPS indicators formulating hypotheses, experimenting, identifying variables, and interpreting data can be implemented to students optimally.

Teacher A does not ask students to do boiling water activities because it is too dangerous to do it

independently at home without direct monitoring from the teacher, while Teacher C does not carry out these activities because the meeting are cut off due to a national holiday. Instead of boiling water activities, Teacher A and Teacher C only ask students to read the sub-topic and observe the simple experiments contained in the book, so students can still learn the sub-topic even though the four SPS indicators above cannot be implemented.

Based on the analysis above, it is known that teachers has an important figure in the successful implementation of SPS during online learning. Therefore, teachers are required to manage learning activities and students can actively participate, so that learning goals both theory and science process skills, can be implemented to students optimally even though online learning in Covid-19 pandemic.

CONCLUSION AND SUGGESTION

Conclusion

Teacher adaptation for the SPS during online learning are 1) improve the ability for use technology with applications used as learning media such as Google Meet, Zoom Meeting, YouTube, WhatsApp, and google classroom; 2) simple observation with uncomplicated tools and safety; 3) giving and collecting assignments by google classroom, whatsapp and presenting; 4) giving stimulus in the form of problems using images/videos to formulate hypotheses and variables before do the experiments, then presenting and analyzing the data individually at home.

Suggestion

The results of this study are used as reference for science teachers to coordinate on the selection of the right SPS activities, so all of the SPS indicators can be implemented optimally by all science teachers.

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