PENSA E-JURNAL : PENDIDIKAN SAINS
https://ejournal.unesa.ac.id/index.php/pensa

Vol. 10, No. 1
Hal. 16-20
Januari 2022

IMPLEMENTATION OF SCIENCE PROCESS SKILLS DURING THE COVID-19 PANDEMIC

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Abstract

This study aims to identified the science process skills implementations and the barriers during online learning at State Junior High School 1 Sidoarjo. This study used case studies at State Junior High School 1 Sidoarjo with the participants of this study were 3 science teachers and 15 students 7th grade. Data collection techniques used observation, documentation, and interviews then analyzed descriptively to got more detailed information about SPS' implementations. The study's instruments were teacher and student questionnaires. The results showed that some indicators of science process skills decreased from offline to online learning. The most significant decreased on formulating hypotheses, experimenting, identifying variables, and interpreting data. Only one of three teachers has capability to implement it. Meanwhile, SPS' indicators that has been implemented optimally by all teachers were observing, measuring, inferring, and communicating. The barriers of the SPS' implementations in online learning were time, student condition, and teachers SPS' ability. The suggestion for the further research to giving a solution for science teachers to manage SPS' activities and make some training to improve teachers SPS' ability, from the SPS' theory and the skills to integrate SPS activities on student worksheet.

Keywords: *Science process skills, implementation, online learning*

***How to cite*:** Husniyyah, A. A., & Erman. (2022). Implementation of science process skills during the Covid-19 pandemic. *Pensa E-Jurnal: Pendidikan Sains*, *10*(1). pp. 16-20.

INTRODUCTION

Coronavirus Disease 2019 has spread across the world in the end of 2019. The Covid-19 pandemic has drastically affected all sectors, one of the most affected is education system (Das & Das, 2020). Because of the Covid-19 pandemic, the government provides a policy to close all educational institutions as an effort to prevent the spread of Covid-19 in Indonesia (Anugrahana, 2020). Classroom teaching and laboratorium observations was suspended then changes into online learning. For this pandemic situation, online learning could serve more effectively as a possible alternative way of learning from home (Ray & Srivastava, 2020). Makarim (2020) said, online learning as a new alternative in the education system will create a meaningful learning experience for students during the Covid-19 pandemic.

The changes of the education system have been strengthened by Circular Letter Number 4 of 2020 concerns the Implementation of the Education System in Emergency Periods for the Spread of Covid-19. No exception of State Junior High School 1 Sidoarjo has impacted by this new policy. The changes of the education system have made the teachers felt the harder challenge in managing learning activities. Especially for Science subjects that cannot be separated from observations activities. Observation activities required theoretical and practical. The statements above as stated in the educational achievement, education not only a theoretical understanding but also student skills (Kemendikbud, 2016).

Educational achievements in online learning still same the same as educational achievements in offline learning. Peraturan Menteri Pendidikan dan Kebudayaan Number 12 of 2016 regarding the educational achievements in the 2013 Curriculum including asking questions about science phenomena, do experiments, writing and presenting research data in table or graphic, make conclusions and reporting research results either oral or written report to answer the questions. The success of the implementation science learning in the 2013 Curriculum also be supported by science process skills (Apsari & Budiyanto, 2021). Science process skills are process thinking skills using scientific methods and approaches to find science facts concepts, and theories (Safaah et al., 2017).

e-ISSN: 2252-7710

According to Rustaman (2015), science process skills have presented in science learning and cannot be separated. Science process skills are very important for students, not only for science learning but also for the lives of students now and in the future. Therefore, science teachers should be competent to design SPS' activities properly, so the SPS can be implemented optimally (Permanasari et al., 2013). Science process skills divided into two groups, namely basic SPS and integrated SPS. Basic SPS includes observing, classifying, measuring, communicating, inferring, and predicting. Then, Integrated SPS includes formulating hypotheses, interpreting data, formulating models, experimenting, defining operations and identifying variables (Silay & Çelik, 2013). Due to the learning only virtual meetings, not all of the offline learning activities can be used in online learning. For the example, practical activities in the laboratory which is often carried out during offline learning (Apsari & Budiyanto, 2021).

The SPS' implementations during offline learning in State JHS 1 Sidoarjo, the science teachers guide students to be active in laboratorium observation activities. The results of a pre-interview with one of the science teachers at State JHS 1 Sidoarjo said that laboratorium observations suspended. Students' activities in online learning are different from offline learning. The teacher also said in SPS' implementations during the pandemic, the teachers faces some barriers, especially in 7th grade. Based on the problems above, it is necessary to conduct this study to identify the implementation and the barrier of science process skills at State Junior High School 1 Sidoarjo during the Covid-19 pandemic. This study focuses on two topic of 7th grade semester 1, are 1) Science Objects and Its Observations; and 2) Heat and Its Transmissions.

METHOD

Research Design

This study used case studies at State Junior High School 1 Sidoarjo in March 2021. The cases that was being the basis of this study contains the implementations and the barriers of science process skills during the Covid-19 pandemic. The results of a pre-interview with one of the science teachers at State JHS 1 Sidoarjo said that SPS's learning in pandemic are different from offline learning. The teacher also said that in the implementation of SPS during online learning there were differences between the three science teachers, so this study identified the implementation of SPS by each teacher and the factors that affected it.

Participant

The participants of this study were three science teachers and fifthteen students 7th grade. Student participants were obtained from the classes taught by each teacher, as many as five students from each teacher.

Instrument

The data of the study were collected from teacher and student questionnaires that were validated by two lecturers from Science Department The questionnaire indicators that used for validation were: (1) the completeness of the questionnaire; (2) the clarity of the instructions for filling out the questionnaire; (3) the compatibility of the materials with the 2013 Curriculum; (4) the compatibility of learning activities with sub-material; (5) the compatibility of SPS' indicators with learning activities; and (6) using simple language and compatible with the Indonesian rules. The questionnaires were considered valid by both validators with a very high score of 81,4%. According to Arikunto (2006), a score of 81%-100% is included in the very high category. The results of the validator's assessment carried out a reliability test with *Alpha Cronbach* analysis, obtained 0,778. The value was $\alpha > 0,6$; so the questionnaires were consistent or reliable (Sugiyono, 2018).

Teacher questionnaires contains the science process skills implementations by teachers during offline and online learning on the topic (1) Science Objects and Its Observations; and (2) Heat and Its Transmissions.. While the student questionnaire contains some questions about the science process skills implementations were achived by students during online learning.

Data Collection Techniques

Data collection techniques used observation, documentation, and interviews. Documentations data were lesson plans and student worksheets during offline and online learning from each science teachers. The teacher and student questionnaires distributed to teachers by online, then teachers distributed the student questionnaires to students. Interviews with the three teachers was conducted one by one at different times and repeatedly to increase the familiarity with the respondents, so the interview data obtained were more detailed.

Data Analysis Techniques

The data from questionnaires and documentations were analyzed descriptively with comparing SPS' implementations during offline and online learning by each teachers. Then, the SPS' activities from each indicators that can or can't implemented in online learning has been gained. The analyst result clasified and determined which indicator that have a problem in the implementation during offline to online and the not one. The result explained more detailed with interview data about factors and barriers that affected to the implementation of SPS. Then, students questionnaire being analyzed to found the implementation of SPS that achive by students during the online learning.

RESULTS AND DISCUSSION

Data from the analysis of the book that was used by science teachers in State Junior High School 1 Sidoarjo, Electonic Science Book for Junior High School Class VII 1st Semester Curriculum 2013 Revision 2017, showed that some science process skills's indicators on the topic

Science Objects and Its Observations also Heat and Its Transmissions as presented in Table 1.

Table 1 The Number of Each SPS' Indicators Actvities

No	SPS' Indicators	Activity	
		Topic 1	Topic 2
1	Observing	2	4
2	Measuring	2	-
3	Inferring	4	4
4	Communicating	4	4
5	Formulating Hypotheses	-	1
6	Experimenting	-	1
7	Identifying Variables	-	1
8	Interpreting Data	-	1

Based on Table 1, the most SPS' indicators that found in both topics were inferring and communicating, which was applied 4 activities for each topic. After that, followed by observing, which was applied 2 activities on Science Objects and Its Observations then 4 activities on Heat and Its Transmissions topic. The fewest SPS' indicators that found in both topics were formulating hypotheses, experimenting, identifying variables, and interpreting data only 1 activity on Heat and Its Transmissions topic. All activities of each SPS' indicators implemented optimally during offline learning. Based on teachers' questionnaires, SPS' indicators implementation during online learning has decrease as presented in Figure 1.

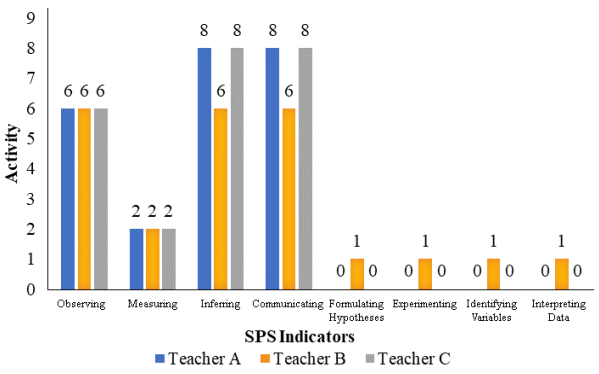

Figure 1 The implementation of each SPS's indicators during online learning

Figure 1 showed that some SPS' indicators decreased from offline learning to online learning. The basic SPS' indicators implemented optimally during online learning. Basic SPS' Indicators that did not have decreased by all teachers were observing and measuring, meanwhile the basic SPS' indicators that decreased slightly from 8 to 6 activities were inferring and communicating. Only one of the three science teachers have a barrier in the implementation of inferring and communicating. The results of the interview with Teacher B, the barrier were limited time.

Significant decreases occurred in the implementation of integrated SPS' indicators were formulating hypotheses, experimenting, identifying variables, and interpreting data. From three science teachers, only one teacher succeeded to implement it. The results of the teacher questionnaire accordance with the results of the student questionnaire, as presented in Figure 2 below:

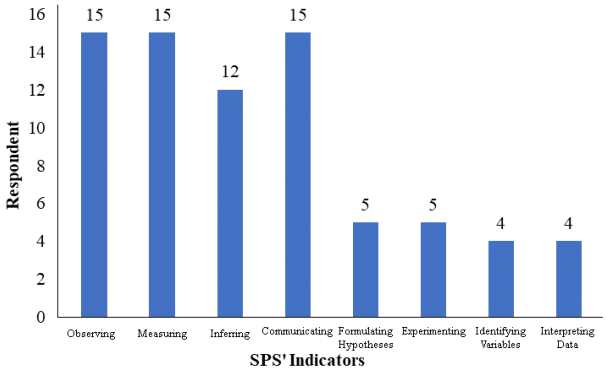

Figure 2 The implementation of SPS that achived by students during the online learning

Based on the results of the student questionnaire about the SPS' indicators that the students achieved during online learning, the highest SPS' indicators that applied by 15 students were observing, communicating, and measuring. Then followed by inferring, which was applied by 12 students. The results of this study were compatible with the Eliyana (2020) research, SPS' indicators that appeared in online learning include observing, inferring, and communicating. Formulating hypotheses, experimenting, identifying variables, and interpreting data indicators in online learning applied only by 4-5 from 15 students.

Formulating hypotheses, experimenting, identifying variables, and interpreting data were found in the practical activities of the relation between the liquid surface areas with the speed of water evaporation. The activities are boiling water and then observing that evaporation of the water in different containers. Based on the results of an interview with one of the teachers, the reason why didn't implement this activity during online learning because the teachers were too afraid of the risks if the students did it by themselves without any direct monitoring from the teacher. Then, this activities were modificated with simple and not risky activities, just observe the practical on the BSE Science Book without experimenting.

The results of the analysis above showed that there were differences between the three teachers in the implementation of SPS during online learning. One of the teacher said that when managed the SPS activities during online learning, the teacher have any problems due to some factors. According to Hamadi et al. (2018), some factors that affected the implementation of SPS include time, student's background, and school laboratory. State Junior High School 1 Sidoarjo has three laboratory rooms

with quite complete equipment that supports the successful implementation of SPS. In addition to the learning, the laboratory at State Junior High School 1 Sidoarjo, also be used for research on Adolescent Scientific Research extracurricular which improves the students' science process skills.

The learning activities are adjusted by the background of each teacher's students. The results of the interviews with all teachers regarding the different backgrounds of each students are: (1) the ability to understand the material during virtual learning; (2) student's motivation to doing the assignments and simple experiments at home; (3) availability of internet quota and signal for study; and (4) the economic condition of students. Susmiati (2020) said there were internal and external factors of students that affect the learning process. Internal factors include attention, intelligence, interest, motivation, readiness and student fatigue. External factors include the atmosphere of the home and the surrounding environment, economic conditions, and the teacher as the tuthor. So, the barriers of the SPS' implementation not only came from the student but can also the teacher (Diella et al., 2019).

The barriers in the implementation of SPS during online learning not only because the students can not do any laboratory activities at school and the learning process only virtual meetings, but also because of the teacher's roles as a facilitator. Hamadi et al. (2018) said that the teachers must have the science process skills in themselves to support and develop students' science process skills. The teachers as facilitators and the students more active in the learning process (Anugrahana, 2020). Therefore, the teachers wre required to be able to manage their learning activities well, so that learning objects could be implemented optimally to the students both in theory and science process skills even though only online learning.

Another factor that affects the implementation of SPS in State Junior High School 1 Sidoarjo due to the limited time of learning. Two science teachers didn't have carried out these activities because of the national holiday cuts the time. But, without a national holiday, the time of the learning at State Junior High School 1 Sidoarjo are shortened during the pandemic. So that, the students will not spend too much money to buy internet quotas. During offline learning, there were 2-3 meetings in a week for the science subjects, while during online learning only 1 meeting in a week. According to three science teachers, only 1 meeting in a week of science subjects was not enough to maximize the learning. Hamadi et al. (2018) said that the learning time during the pandemic very limited, while there were quite a lot of science materials. It is necessary to do an evaluation and improvement regarding the determination of learning time, so all of the topic will be teach optimally both theory and science process skills.

The lesson plans and student worksheets in State JHS 1 Sidoarjo either online or offline learning has been included science process skills activities, but there is one science teacher during online learning used offline learning lesson plans. In student worksheets there were some activities same as in science books and some are modified according to online learning conditions. Diella et al. (2019) claimed student worksheets that takes from textbooks or makes by others, not all student worksheets will be suitable for students. The advantage of making student worksheets by the teacher themselves is able to plan and implement an effective and efficient learning process for their students. One example of the efforts to solve the problems above is training to science teachers regarding science process skills both in theory and student worksheet development (Saleh et al., 2020). Increasing awareness and ability in science process skills to science teachers, also will be able to increase students' understanding of science. Previous studies done by Diella et al. (2019) show that the science process skills training to teachers can improve the teacher's ability to integrate science process skills in student worksheets and have deeper insights about the implementation of science process skills.

CONCLUSION AND SUGGESTION

Conclusion

The conclusion of this study showed that some indicators of science process skills decreased from offline to online learning. The most significant decreased on formulating hypotheses, experimenting, identifying variables, and interpreting data. Only one of three teachers has capability to implement it. Meanwhile, SPS' indicators that has been implemented optimally by all teachers were observing, measuring, inferring, and communicating. The barriers of the SPS' implementations in online learning were time, student condition, and teachers SPS' ability.

Suggestion

Based on the results of this study, the suggestion for the further research are: (1) giving solutions for teachers to manage SPS' activities, so all of the SPS' indicators will be implemented optimally; and (2) make some training to improve teachers SPS' ability, from the SPS' theories and the ability to intergtae SPS' activities on student worksheets.

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