



Implementation of Science Process Skills in Elementary Science Learning During the Covid-19 Pandemic

Irham Nugroho^{1*}, Norma Dewi Shalikhah¹

¹PGMI, Fakultas Agama Islam, Universitas Muhammadiyah Magelang, Magelang, Indonesia
Corresponding author's email: irhamnugroho@unimma.ac.id

ABSTRACT

The outbreak of the COVID-19 outbreak has led to the provision of an emergency curriculum that triggers online learning. However, the implementation of the distance learning system during the pandemic is still considered not running optimally. Moreover, it is necessary to develop science process skills through direct learning experiences. This study aims to examine the implementation of science process skills in elementary science learning during the Covid-19 pandemic. The research method uses qualitative methods, data on the implementation of the science learning process is collected through in-depth interviews with teacher respondents. As a result, the implementation of science process skills during the COVID-19 pandemic did not run optimally because it was dominated by learning oriented to material delivery. This is caused by; general knowledge of teachers is still varied, not all have mastered STEM-based learning, the blended learning design is not implemented. As well as the limitations of teachers in monitoring and assisting student learning. For this reason, elementary science teachers can develop instruments or procedures for science process skills that can be used to monitor, measure and implement science process skills during the COVID-19 pandemic.

Keywords: *Science Process Skills; Blended Learning; Covid-19*

1. INTRODUCTION

Currently the world of education is being tested by the outbreak of the covid-19 outbreak, in this case the government has declared it a national disaster [1]. One way that might be used as an improvement option is the provision of an emergency curriculum. As said by Fahriza Marta Tanjung, Deputy Secretary General of the Federation of Indonesian Teachers' Unions, "There is a need for an emergency curriculum or curriculum simplification because the current situation in the field will be different from normal conditions. He added that it is very important to prepare an emergency curriculum because of the limited situation due to the pandemic. ". So, the learning should be grouped into literacy, numeracy, science, life skills education, and character education [2].

The discourse on the provision of a cycle curriculum has not yet reviewed the implementation of science learning in elementary schools which pays more attention to science process skills. Indeed, it is the teacher who will be the spearhead in the implementation of learning activities. Elementary school teachers must be able to play the role of classroom teachers and subject teachers because of the demands of the applicable curriculum. The

curriculum implemented by various schools at this time is still diverse, there are schools that still apply the Education Unit Level Curriculum (KTSP) and 2013 Curriculum. Teachers as learning agents must have four competencies as stipulated in Law Number 14 of 2005, a teacher must have all the competencies to realize the goals of national education. These competencies include pedagogical abilities, personality competence, social competence, and professional competence that can be pursued through professional education. Therefore, prospective teachers must prepare themselves to fulfil the four competencies above [3].

The Ministry of Education and Culture has issued Secretary General Circular Number 15 of 2020 regarding guidelines for organizing learning from home in the emergency period of the spread of COVID-19. This was done in accordance with the direction of the Minister of Education and Culture Nadiem Makarim who asked for the curriculum to be reviewed according to the independent learning program. Minister Nadiem asked that the curriculum not be burdensome for students but that the minimum competency achievement can still be fulfilled and the mechanism going forward with an emphasis on the ideology of Pancasila [4].

However, the implementation of the distance learning system for children in Indonesia during the pandemic is still considered not running optimally. There are several things that are considered to be obstacles, especially regarding internet access. This happens because several regions of the archipelago do not yet have internet access, even electricity. Then, the problem of the ability of parents to accompany their children at home is also still lacking because many parents do not understand the current education system. The problems that arise while studying from home in the Covid-19 era need attention from various parties so that they can be overcome so that children get a complete education.

Based on Kompas R&D data, through an online survey in July 2020, 28.5% of respondents stated that distance learning made children and parents learn together by discussing various topics. Meanwhile, 34.1% of children use their time at home to do assignments from school. 31.5% do online classes from school. 2.6% took additional courses, and 3.3% answered others. The distance learning system does have a number of obstacles. However, this step must be taken to break the chain of the spread of COVID-19. Now, solutions must be found to be more optimal [5].

In addition, data from the national consultant for education in emergency situations, UNICEF-RDI states that 69% of children feel bored while studying from home (BDR), with 35% of the main challenges being internet access and 38% lacking guidance from teachers. Then, as many as 62% of respondents hope that the main support provided is internet access and the other 26% is support from teachers. The impact that appears on children as a result of this learning process from home [4].

The biggest challenge in the learning process during this pandemic is where every effort has been made by teachers starting from the distance learning strategy carried out during teaching from home (Teaching from Home) set by the Government through the Ministry of Education and the Ministry of Religion of the Republic of Indonesia, by using WhatsApp groups. (WA) for classes, giving assignments, exercises sent via WA then daily tests using the Kahoot, ZCM and Google Classroom applications. The author sends a character building video to each WA group [6]. But in fact, the main problem faced by the world of education is regarding the quality of education, especially the quality of science process skills which is still very low [7].

For elementary science learning, it is recommended that only certain types of process skills be mastered. Process skills at this basic level are called basic science process skills. The five recommended skills are observing (collecting data, measuring), planning (raising questioning, predicting, devising inquiries), hypothesizing (suggesting, explanation), interpreting (considering evidence, evaluating), and communicating

(presenting report, using secondary sources). While the classification of basic science process skills is more simply into six types of skills. These skills are what people do when they do 'science', namely: observing, classifying, measuring, inferring, predicting and communicating [8].

Process skills of students using experimental learning stages[9]which cannot be separated from the progress of science and the process in science develops a perception of the nature of science [10]. Therefore, science process skills play an important role in science education [11]. Other than that, science process skills serve as a driving factor for scientific inquiry[12]The next process skills required are recording data, classifying, measuring, communicating, observing, using the space-time relationship between numbers and space, predicting, and drawing conclusions [13].

With the various implementations of the curriculum for each educational unit, as well as the many learning methods during this pandemic, it is certainly interesting to conduct research on the implementation of science process skills in elementary science learning during the COVID-19 pandemic. Where Science Process Skills (SPS) is a set of skills used by scientists in conducting scientific investigations. Science Process Skills (SPS) can be developed through direct experience because students are more aware of the process or activity that is being carried out. Process skills involve intellectual, manual and social skills. The intellectual skills of students involved because doing SPS must use their intellectual abilities to think. Manual skills are clearly involved in SPS, because at the time of learning they involve the use of tools and materials, preparation, or assembly of tools. Social skills are intended so that they interact with each other in carrying out teaching and learning activities, for example discussing the results of their observations, asking questions, communicating. Process skills really need to be developed through direct experience as a learning experience. Through direct experience, one can better appreciate the process or activity that is being carried out [14].

2. METHOD

This study uses a qualitative method with descriptive data analysis that is inductive in nature based on the data obtained, then a certain relationship pattern is developed. The research was conducted at SD Muhammadiyah Magelang Regency. The subjects of this study were 61 teachers and 38 students who were involved in the elementary science learning process, which were selected with certain considerations. The object of this research is the activities of teachers and students, as well as the science learning process that was selected to be reviewed with certain considerations. The first step of this research is to develop interview questions that have been developed by finding indicators of process skills in

science learning during the covid-19 pandemic. The study begins with the collection and analysis of qualitative data. Types of data, data categories, data collection techniques.

All data obtained were analyzed and then made an interpretation of whether the results support or contradict each other.

Table 1 Types and categories of data/information collected, data collection techniques, instruments, and data sources in this study

No	Data types and categories	Data collection techniques and methods	Instrument	Data source
1	The learning process for elementary science learning - qualitative data	Interview (qualitative)	Interview guide	science teacher
2	Teacher and student responses to science learning carried out by qualitative data	Interview (qualitative)	Interview guide	science teacher Learners

3. RESULT AND DISCUSSION

The results of the qualitative research in this study inform the implementation of science process skills in elementary science learning during the COVID-19 pandemic in Magelang Regency.

Based on the data in Table 2. it can be obtained information that the implementation of science process skills in elementary science learning during the covid-19 pandemic did not run optimally because science learning activities were still dominated by material delivery-oriented learning. This is shown in the results of the first aspect of the interview which conveys that the general knowledge of teachers about process skills is still varied. In contrast to Evi's research, the application of science process skills during the COVID-19 pandemic was good and acceptable to students, although its application to online classes students remained enthusiastic in the stages of learning using science process skills.[14]. However, all respondents interpreted that science process skills in the implementation of the 2013 curriculum were required for students to have 5M skills, namely observing, asking questions, gathering information/testing, processing information and communicating the results of a series of processes in learning science. The results of this study are relevant to Evi that science process skills are seen from observing, asking questions, gathering information, associating, and communicating [14].

In addition, based on interview data, the second aspect explains that teachers try to play a role in designing science learning by utilizing various facilities and learning resources oriented to process skills. One of them uses STEM-based learning, a learning approach to teach science, technology, engineering, and mathematics. STEM is an effective way to facilitate and maintain the integration of science, technology, mathematics, and engineering[15]. Furthermore, the teacher educates and involves parents to accompany their children to study at home. However, there are some teachers who interpret

designing learning as being oriented to preparing assignments to be done online.

The third aspect explains if the implementation of science learning forces teachers to do blended learning. In this case, the teacher combines online and offline learning with the aim that science process skills can be implemented properly. The advantages of blended learning are that learning activities can be carried out in the classroom or outside the classroom by utilizing technology, to add subject matter and questions given in class or online so that learning activities can take place, and good communication between students and teachers can be established. when in class or online[16]. During the implementation of learning during the pandemic, there are teachers who only carry out online learning. The weakness in online learning is the lack of maximum student involvement[17].

The evaluation process on the fourth aspect carried out by the teacher includes an online learning evaluation with students sending proof of work via videos sent to the class WhatsApp group and filling out google forms for daily assessments. Furthermore, offline evaluation every weekend, students collect weekly assignments at school. However, offline/manual evaluation with printed evaluation instruments has several weaknesses, including: (1) it takes a lot of time and money to produce the instrument, (2) it takes a lot of time for the scoring process and score processing, (3) requires a considerable amount of time to provide feedback to respondents, and (4) psychologically manual evaluation often causes anxiety in test takers [18].

The fifth aspect, the teacher's role in student development in science learning during the covid-19 pandemic. Teachers have limitations in the development of students, when learning is carried out online the teacher cannot monitor and assist directly. These limitations include network/signal and device constraints when monitoring and evaluation are carried out. This of course hinders teachers from developing the creativity of students when learning science.

Personal approach with students in science learning during the covid-19 pandemic, as explained in the sixth aspect. The personal approach taken by teachers in learning during the pandemic is limited to various applications including WhatsApp, video calls, zoom, SMS, telephone and home visits. Furthermore, the communication built during online learning on the seventh aspect information is carried out by the teacher through video calls, zoom, SMS, telephone and home visits. However, there are some teachers who communicate offline due to signal problems.

Submission of material understanding to students in science learning during the covid-19 pandemic. In the eighth aspect of science learning activities, it was explained that improving students' understanding of the material was sought through YouTube, material summaries, learning videos, video calls, voice recordings, and google forms. Where in fact the delivery of material carried out by the teacher is still dominantly done offline.

Table 2 General description of the results of interviews on the implementation of science process skills in elementary science learning during the covid-19 pandemic

No	Aspect asked	Interview result
1	General knowledge of teachers about science process skills	General knowledge about science process skills varies from one teacher to another. There are teachers who interpret science process skills in implementing the 2013 curriculum. Students are required to have 5M skills, namely observing, asking questions, gathering information/testing, processing information and communicating the results of a series of processes in learning science.
2	The role of teachers in designing science learning during the covid-19 pandemic	Teachers try to design science learning by utilizing various facilities and learning resources oriented to process skills. One of them uses STEM-based learning, a learning approach to teach science, technology, engineering, and mathematics. Furthermore, the teacher educates and involves parents to accompany their children to study at home. However, there are some teachers who interpret designing learning as being oriented to preparing assignments to be done online.
3	Implementation of science learning during the covid-19 pandemic	The implementation of science learning forces teachers to do blended learning. In this case the teacher combines online and offline learning with the hope that science process skills can be implemented properly. During the implementation of learning during the pandemic there are teachers who only carry out online learning.
4	Evaluation of science learning during the covid-19 pandemic	The evaluation carried out by the teacher includes two things. First, evaluate students' online learning by sending proof of work via videos sent to the class WhatsApp group and filling out google forms for daily assessments. Second, offline evaluation of students is carried out every weekend by collecting weekly assignments.
5	The role of teachers in student development in science learning during the covid-19 pandemic	Teachers have limitations in the development of students, when learning is done online the teacher cannot monitor and assist directly. These limitations include network/signal and device constraints when monitoring and evaluation are carried out. This of course hinders teachers from developing the creativity of students when learning science.
6	Personal approach with students in science learning during the covid-19 pandemic	The personal approach taken by teachers in learning during the pandemic is through various applications including WhatsApp, video calls, zoom, SMS, telephone and home visits.
7	Communication with students in science learning during the covid-19 pandemic	Communication built during online learning through video calls, zoom, SMS, telephone and home visits. However, there are some teachers who communicate offline due to signal problems.
8	Submission of material understanding to students in science learning during the covid-19 pandemic	In science learning activities, improving students' understanding of the material is sought through YouTube, material summaries, learning videos, video calls, voice recordings, and google forms. Submission of material carried out by the teacher is still dominantly done offline.

4. CONCLUSION

The implementation of science process skills in elementary science learning during the COVID-19 pandemic did not run optimally because science learning activities were still dominated by material delivery-oriented learning. Factors not implementing process skills are caused by; The general knowledge of teachers about science process skills is still varied, not all teachers

have mastered STEM-based learning, the implementation of science learning that should be designed through blended learning is only carried out online. In addition, teachers have limitations in student development, when learning is carried out online the teacher cannot monitor and assist directly. The personal approach taken by teachers in learning during the pandemic is limited to various applications so that the communication built during online learning is less than optimal and far from expectations. Furthermore,

instruments or procedures for science process skills can be developed that can be used by teachers to monitor, measure and implement science process skills during the COVID-19 pandemic.

ACKNOWLEDGMENT

The author would like to thank LPPM UNIMMA for facilitating this research so that it becomes a meaningful learning event during this pandemic. Thanks also to the school for allowing this research to be carried out, as well as to the teachers and students who have assisted in data collection.

REFERENCES

- [1] Rokom, "Status Wabah Corona di Indonesia Ditetapkan sebagai Bencana Nasional," *Sehat Negeriku Sehatlah Bangsa*, 2021. .
- [2] T. Siallagan, "Sinergi Antara Keluarga, Sekolah, dan Gereja Menjadikan Rumah Tangga Sebagai Pusat PAK Anak di Masa Pandemi Covid-19," *Excelsis Deo: Jurnal Teologi, Misiologi, dan Pendidikan*, vol. 5, no. 1, pp. 29–44, 2021.
- [3] I. C. Sayekti and A. M. Kinasih, "Kemampuan Guru Menerapkan Keterampilan Proses Sains Dalam Pembelajaran IPA Pada Siswa Sekolah Dasar." 2018.
- [4] A. Putri, "Masalah Pendidikan Anak Selama Sekolah Online di Masa Pandemi Covid-19," *Popmama.com*, 2020.
- [5] F. Wijayanti, "Kendala Belajar Online di Tengah Pandemi Covid-19," *Kompas TV*, 2020.
- [6] O. Harahap, "Problematika Pembelajaran Daring Pada Masa Pandemi Covid-19," *STIT Al-Kifayah Riau*, 2020. .
- [7] N. & Senduk, *Pembelajaran Kontekstual dan Penerapannya dalam KBK*. Universitas Negeri Malang, 2004.
- [8] E. Y. Widayanti, "Pengembangan Tes Keterampilan Proses Sains Dasar SD/MI," *Dinamika Penelitian: Media Komunikasi Penelitian Sosial Keagamaan*, vol. 16, no. 1, pp. 27–58, 2016.
- [9] A. Halim, Elmi, Elisa, Susanna, Khaldun, and Irwandi, "Impact of guided inquiry and problem based learning models on science process skills," *AIP Conference Proceedings*, vol. 2320, no. March, 2021, doi: 10.1063/5.0037654.
- [10] E. Yap, "Analysis of the outcomes of the Turkish science curriculum in terms of science process skills, nature of science, socioscientific issues, and STEM," vol. 13, no. 2, pp. 925–949, 2021.
- [11] A. Sideri and M. Skoumios, "Science Process Skills in the Greek Primary School Science Textbooks," *Science Education International*, vol. 32, no. 3, pp. 231–236, 2021, doi: 10.33828/sei.v32.i3.6.
- [12] L. Halim and K. Osman, "Explicit Teaching of Scientific Argumentation as an Approach in Developing Argumentation Skills , Science Process Skills and Biology Understanding," *Journal of Baltic Science Education*, vol. 19, no. 2, pp. 276–288, 2020.
- [13] J. KALEMKUŞ, Ş. BAYRAKTAR, and S. ÇİFTÇİ, "Comparative Effects of Argumentation and Laboratory Experiments on Metacognition, Attitudes, and Science Process Skills of Primary School Children," *Journal of Science Learning*, vol. 4, no. 2, 2021, doi: 10.17509/jsl.v4i2.27825.
- [14] E. Eliyana, "Analisis Keterampilan Proses Sains Siswa Belajar IPA Materi Tumbuhan Hijau Pada Siswa Kelas V SDN 3 Panjerejo di Masa Pandemi Covid-19," *EDUPROXIMA: Jurnal Ilmiah Pendidikan IPA*, vol. 2, no. 2, pp. 87–100, 2020.
- [15] A. T. Estapa and K. M. Tank, "Supporting integrated STEM in the elementary classroom: a professional development approach centered on an engineering design challenge," *International Journal of STEM Education*, vol. 4, no. 1, 2017, doi: 10.1186/s40594-017-0058-3.
- [16] I. Magdalena, H. Firliyansyah, and R. Nurfitriah, "Belajar Efektif di Masa Pandemic Covid 19 dengan Blended Learning Method di Sekolah Dasar," *Pensa: Jurnal Pendidikan dan Ilmu Sosial*, vol. 2, no. 3, pp. 307–320, 2020.
- [17] A. Anugrahana, "Hambatan, Solusi dan Harapan: Pembelajaran Daring Selama Masa Pandemi Covid-19 Oleh Guru Sekolah Dasar," *Scholaria: Jurnal Pendidikan dan Kebudayaan*, vol. 10, no. 3, pp. 282–289, 2020.
- [18] K. Setemen, "Pengembangan evaluasi pembelajaran online," *Jurnal Pendidikan dan pengajaran*, vol. 43, no. 3, 2010.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

