



The Effectiveness of Animated Videos to Improve Science Process Skills and Creativity in Science Learning During COVID-19 Pandemic



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Abstract

The main objective of this research was to determine the effectiveness level of using animated videos in science learning to improve students' science process skills and creativity during COVID-19 Pandemic. The research approach used was development research. The subjects involved in the effectiveness test of animated videos were 60 students from the fifth grade of SD Negeri 4 Pringgabaya. The instruments used to obtain data on the effectiveness test results of utilization of animated videos in science learning were in the form of questionnaires. The analytical technique used in this research was descriptive quantitative. The research results showed that the effectiveness of animated videos used in science learning included in the good and excellence categories.

Keywords

*animated videos;
COVID-19 pandemic;
effectiveness level;
science learning;
science process skills;
students creativity;*

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Contents

| | |
|---------------------------------|-----|
| Abstract | 942 |
| 1 Introduction | 943 |
| 2 Materials and Methods | 944 |
| 3 Results and Discussions | 945 |
| 4 Conclusion | 952 |
| Acknowledgments..... | 952 |

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|----------------------------|-----|
| References | 953 |
| Biography of Authors | 955 |

1 Introduction

Science process skills and creativity in science learning are needed to determine the pure competencies possessed by students regarding science learning contents. Those skills and creativity can be generated by the teacher through the provision of appropriate teaching materials and assignments to students (Nina et al., 2022). However, the facts in the reality during COVID-19 pandemic show that not all science assignments and materials gave by the teacher are appropriate and able to improve students' science process skills and creativity (Zydney & Warner, 2016; Gelman & Brenneman, 2004). Therefore we need innovation to overcome it. One form of learning material that can be used as an innovation is animated videos. Animated videos present interesting and easy-to-understand material for students (Richardson & Mishra, 2018; Toivanen et al., 2011). Animated videos can also show examples of science and creativity processes that can be imitated by students so that later they can be implemented directly in the reality (Ho et al., 2019).

Based on those facts, the purpose of this research is to measure the effectiveness of animated videos used in improving students' science process skills and creativity in science learning during COVID-19 pandemic (Vaishya et al., 2020; Whitelaw et al., 2020). The research question is how effective the use of animated videos in science learning is to improve students' science process skills and creativity during COVID-19 pandemic?

Several previous studies that led to the emergence of this research, including: research conducted by Amali et al. (2020), has similarities with this research related to determining the effectiveness of using animated videos in learning. However, Amali et al. is only showing one animated video that is used in learning. Research conducted by Astuti et al. (2021), has similarities with this study related to testing the effectiveness of using animated videos in science learning, but the research's obstacles of Astuti et al. was that it had not shown animated videos for each theme in science learning, especially related to science process skills and students' creativity.

Research conducted by Muntiani et al. (2021), showed a test of the validity of animated video content used in learning, but it had not shown a test of the effectiveness of using animated videos in learning. Research conducted by Hapsari et al. (2019), demonstrated the use of animated videos to improve the learning outcomes of elementary school students. The obstacle of Hapsari et al.'s research was that it had not shown animated videos for each theme in one lesson. Research conducted by Ramadhani et al. (2020), showed the use of animated videos in improving students' speaking skills. The obstacle of Ramadhani et al.'s research was that it had not shown the appearance of the animated videos used. Research conducted by Pujiani et al. (2022), demonstrated the use of video animation in improving English learning for young children. The constraint of Pujiani et al.'s research was that it had not shown the form of the animated video used in English learning. Research conducted by Hanif (2020), has similarities with this study related to testing the effectiveness of using animated videos in science learning. The constraint of Hanif's research was that it had not shown all the videos for each science learning theme.

Research conducted by Munawaroh (2019), showed the use of animated videos in improving students' reading skills. The problem with Munawaroh's research was that it had not shown the effectiveness test of using animated videos and had not shown the learning themes described in the animated videos. Research conducted by Melda & Putri (2021), showed the use of animated videos in supporting microbiology learning for students at Padang State University. The constraint of Melda & Putri's research was that it had not shown the form of animated videos used to support microbiology learning. Research conducted by Safitri et al. (2021), demonstrated the use of animated videos in learning. Limitation of Safitri et al.'s research was that it had not shown animated videos for each theme in the lesson.

2 Materials and Methods

Research approach

This research approach was instrument development research. The development steps refer to the Borg and Gall model which consists of 10 stages, including (Arnyana *et al.*, 2017; Jampel *et al.*, 2017; Mahendra *et al.*, 2020; Martaningsih *et al.*, 2019; Said & Syarif, 2016; Setiadi *et al.*, 2016): 1) research and field data collection, 2) research planning, 3) design development, 4) initial trial, 5) revision of the results of the initial trial, 6) field trials, 7) revision of the results of the field trials. 8) use trial, 9) final product revision, and 10) dissemination and implementation of the final product. Following the purpose of this research, the stages used in this research were the use trial stage to determine the effectiveness of using animated videos (Shahali & Halim, 2010; Karsli & Ayas, 2009; Şimşek & Kabapınar, 2010).

Research subject

The research subjects involved in testing the effectiveness of using animated videos in science learning to improve students' science process skills and creativity were 60 students in fifth grade in SDN 4 Pringgabaya.

Research object

The object of this research was an animated video in science learning to improve students' science process skills and creativity during COVID-19 pandemic.

Data collection instruments

The instruments used to obtain data related to the results of the effectiveness test of the use of animated videos in science learning were in the form of questionnaires.

Research location

The location for filling out questionnaires to effectiveness test of science learning animation videos given to students was carried out at SDN 4 Pringgabaya. Especially in fifth grade in SDN 4 Pringgabaya.

Data analysis techniques

The analytical technique used in this research was descriptive quantitative by interpreting the effectiveness test results of using animated videos for science learning based on effectiveness standard that refers to five's scale. The formula used to determine the effectiveness level of using animated videos for science learning can be seen in equation (1) (Ginting, 2018; Maryansyah, 2016; Sugiharni, 2021; Sugiharni *et al.*, 2022), while the effectiveness standard which refers to five's scale can be seen in Table 1 (Ardana *et al.*, 2021; Mahayukti *et al.*, 2018).

The effectiveness level of using animated videos = $f/N \times 100\%$ (1)

Notes:

f = total of acquisition value

N = total of maximum value

Table 1
Standard of Effectiveness Referring to Five's Scale

| Percentage of Effectiveness | Category of Effectiveness |
|-----------------------------|---------------------------|
| 90-100 % | Excellence |
| 80-89 % | Good |
| 65-79 % | Moderate |
| 55-64 % | Less |
| 0-54 % | Poor |

3 Results and Discussions

Before showing the effectiveness test results of using animated videos in science learning, it is necessary to show the visualization of animated videos used in science learning to improve students' science process skills and creativity during COVID-19 pandemic. The display of the animated video completely can be seen in Figures 1 to 9.



Figure 1. The Display of Video 1 (Theme 8, Sub Theme 1, Lesson 1)

Video 1 (theme 8, sub-theme 1, lesson 1) contains material on the benefits of water for living things. To see the entire contents of video 1 (theme 8, sub-theme 1, lesson 1) can be accessed via the following URL: <https://drive.google.com/file/d/1siBf8KCNmuhQpNp3ZU1mE1DPX5z6GdFk/view?usp=sharing>.

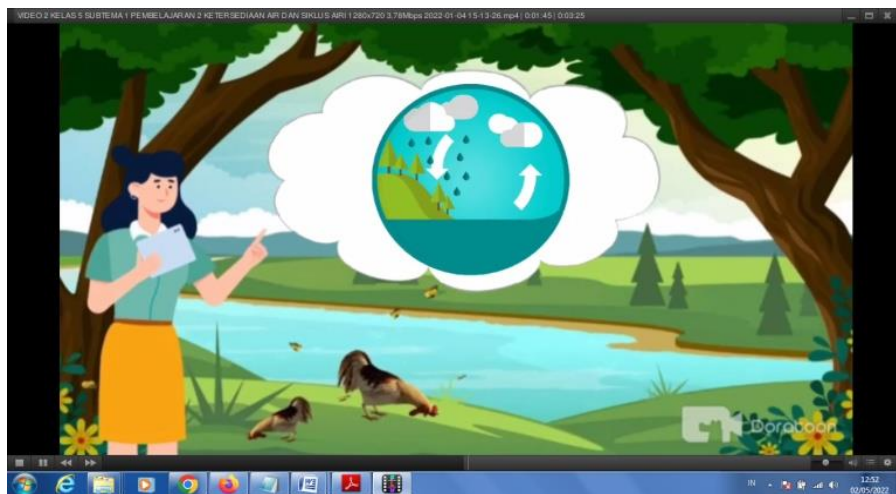


Figure 2. The Display of Video 2 (Theme 8, Sub-Theme 1, Lesson 2)

Video 2 (theme 8, sub-theme 1, lesson 2) contains material on the water cycle. To see the entire contents of video 2 (theme 8, sub-theme 1, lesson 2) can be accessed via the following URL: <https://drive.google.com/file/d/1qEOYjYNFFFABc1ECnYqPy71Dtg-go8uL/view?usp=sharing>.



Figure 3. The Display of Video 3 (Theme 8, Sub-Theme 1, Lesson 5)

Video 3 (theme 8, sub-theme 1, lesson 5) contains material on the effect of the water cycle on living things. To see the entire contents of video 3 (theme 8, sub-theme 1, lesson 5) can be accessed via the following URL: https://drive.google.com/file/d/1fTKaEdlXy-i5NxkoE0D6zVFoyQq_5Pba/view?usp=sharing.

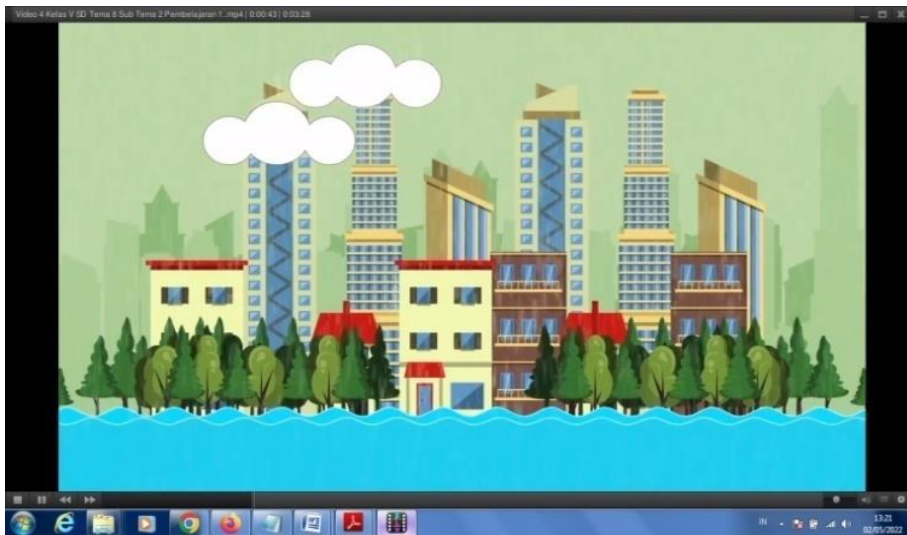


Figure 4. The Display of Video 4 (Theme 8, Sub-Theme 2, Lesson 1)

Video 4 (theme 8, sub-theme 2, lesson 1) contains material on factors affecting the water cycle. To see the entire contents of video 4 (theme 8, sub-theme 2, lesson 1) can be accessed via the following URL: <https://drive.google.com/file/d/1hgvQNEoOZRp2uG5kOX1QOv933eNsT2qH/view?usp=sharing>



Figure 5. The Display of Video 5 (Theme 8, Sub-Theme 2, Lesson 2)

Video 5 (theme 8, sub-theme 2, lesson 2) contains material on availability of clean water. To see the entire contents of video 5 (theme 8, sub-theme 2, lesson 2) can be accessed via the following URL: <https://drive.google.com/file/d/1vbfZVryEQ1FJewBkc6oivmPsI9xnNg14/view?usp=sharing>.



Figure 6. The Display of Video 6 (Theme 8, Sub-Theme 2, Lesson 5)

Video 6 (theme 8, sub-theme 2, lesson 5) contains material about the impact of the water cycle on life. To see the entire contents of video 6 (theme 8, sub-theme 2, lesson 5) can be accessed via the following URL: <https://drive.google.com/file/d/1Hd-pF59wmC0KDUq5JNv01gZ2sn8xXL8a/view?usp=sharing>.



Figure 7. The Display of Video 7 (Theme 8, Sub-Theme 3, Lesson 1)

Video 7 (theme 8, sub-theme 3, lesson 1) contains material about factors that affect water quality. To see the entire contents of video 7 (theme 8, sub-theme 3, lesson 1) can be accessed via the following URL: https://drive.google.com/file/d/1HuHAJUff4HOWGZ2IzUU00NAR5yDh_yC_/view?usp=sharing.



Figure 8. The Display of Video 8 (Theme 8, Sub-Theme 3, Lesson 2)

Video 8 (theme 8, sub-theme 3, lesson 2) contains material about influence of water quality on life. To see the entire contents of video 8 (theme 8, sub-theme 3, lesson 2) can be accessed via the following URL: <https://drive.google.com/file/d/1LewSFlyAHAObpMX23f5letb21MIs4MH/view?usp=sharing>.



Figure 9. The Display of Video 8 (Theme 8, Sub-Theme 3, Lesson 5)

Video 9 (theme 8, sub-theme 3, lesson 5) contains material about how to maintain the availability of clean water. To see the entire contents of video 9 (theme 8, sub-theme 3, lesson 5) can be accessed via the following URL: <https://drive.google.com/file/d/1mfCA4AyAwT2GKHZIOxeIzdF12rZgqe9M/view?usp=sharing>

After showing an animated video that is used in science learning to improve students' science process skills and creativity, the results of effectiveness test can be shown next. The effectiveness test results of the use of the animated video completely can be seen in Table 2.

Table 2
The effectiveness test results of using animated videos in science learning to improve students' science process skills and creativity during COVID-19 pandemic

| Respondents | Test Results | | | | | | | | |
|-------------|--------------|----|----|----|----|----|----|----|----|
| | V1 | V2 | V3 | V4 | V5 | V6 | V7 | V8 | V9 |
| Student-1 | 4 | 5 | 4 | 4 | 5 | 4 | 5 | 4 | 5 |
| Student-2 | 5 | 4 | 4 | 5 | 5 | 5 | 4 | 5 | 4 |
| Student-3 | 5 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 |
| Student-4 | 4 | 5 | 4 | 5 | 5 | 5 | 4 | 4 | 4 |
| Student-5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 5 | 4 |
| Student-6 | 5 | 4 | 4 | 4 | 5 | 5 | 4 | 4 | 4 |
| Student-7 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 |
| Student-8 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 4 | 4 |
| Student-9 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 5 | 4 |
| Student-10 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 5 | 4 |
| Student-11 | 4 | 4 | 4 | 4 | 5 | 4 | 5 | 4 | 5 |
| Student-12 | 5 | 4 | 5 | 5 | 4 | 5 | 4 | 5 | 4 |
| Student-13 | 5 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 4 |
| Student-14 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 5 |
| Student-15 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 4 |
| Student-16 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 |
| Student-17 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 |
| Student-18 | 4 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 4 |
| Student-19 | 5 | 4 | 5 | 4 | 4 | 5 | 4 | 5 | 4 |

| Respondents | Test Results | | | | | | | | |
|-----------------------------|--------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | V1 | V2 | V3 | V4 | V5 | V6 | V7 | V8 | V9 |
| Student-20 | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 4 | 4 |
| Student-21 | 4 | 5 | 4 | 4 | 5 | 4 | 5 | 4 | 5 |
| Student-22 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 |
| Student-23 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 5 | 4 |
| Student-24 | 4 | 5 | 4 | 5 | 5 | 4 | 4 | 5 | 5 |
| Student-25 | 5 | 4 | 5 | 5 | 4 | 5 | 4 | 4 | 5 |
| Student-26 | 5 | 4 | 4 | 4 | 5 | 4 | 5 | 5 | 5 |
| Student-27 | 4 | 5 | 4 | 4 | 4 | 5 | 4 | 5 | 5 |
| Student-28 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 5 |
| Student-29 | 4 | 5 | 4 | 4 | 4 | 5 | 4 | 5 | 5 |
| Student-30 | 5 | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 5 |
| Student-31 | 5 | 4 | 5 | 4 | 5 | 4 | 4 | 4 | 5 |
| Student-32 | 4 | 5 | 5 | 5 | 4 | 5 | 4 | 4 | 5 |
| Student-33 | 4 | 5 | 5 | 4 | 4 | 5 | 4 | 4 | 4 |
| Student-34 | 5 | 4 | 5 | 4 | 4 | 4 | 5 | 4 | 4 |
| Student-35 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 4 |
| Student-36 | 5 | 4 | 5 | 4 | 4 | 5 | 4 | 5 | 5 |
| Student-37 | 5 | 4 | 5 | 5 | 5 | 5 | 4 | 4 | 5 |
| Student-38 | 4 | 5 | 4 | 5 | 4 | 4 | 4 | 5 | 5 |
| Student-39 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 4 | 5 |
| Student-40 | 4 | 4 | 5 | 4 | 4 | 5 | 5 | 4 | 5 |
| Student-41 | 4 | 5 | 5 | 4 | 4 | 4 | 5 | 4 | 5 |
| Student-42 | 5 | 4 | 4 | 5 | 4 | 5 | 4 | 5 | 4 |
| Student-43 | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 5 | 4 |
| Student-44 | 4 | 5 | 5 | 4 | 5 | 5 | 4 | 4 | 5 |
| Student-45 | 5 | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 4 |
| Student-46 | 4 | 4 | 4 | 5 | 5 | 5 | 4 | 4 | 5 |
| Student-47 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 5 | 5 |
| Student-48 | 5 | 4 | 4 | 5 | 5 | 5 | 5 | 4 | 5 |
| Student-49 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 |
| Student-50 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 |
| Student-51 | 4 | 5 | 4 | 4 | 5 | 4 | 5 | 4 | 4 |
| Student-52 | 5 | 4 | 5 | 5 | 5 | 4 | 5 | 4 | 4 |
| Student-53 | 4 | 4 | 5 | 4 | 4 | 5 | 5 | 4 | 5 |
| Student-54 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 4 | 4 |
| Student-55 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 5 |
| Student-56 | 4 | 4 | 5 | 5 | 5 | 4 | 4 | 5 | 4 |
| Student-57 | 5 | 4 | 5 | 4 | 5 | 5 | 4 | 5 | 5 |
| Student-58 | 4 | 4 | 5 | 4 | 5 | 4 | 4 | 5 | 5 |
| Student-59 | 5 | 5 | 4 | 4 | 5 | 5 | 4 | 5 | 5 |
| Student-60 | 5 | 5 | 5 | 4 | 5 | 4 | 5 | 5 | 5 |
| Σ | 271 | 266 | 272 | 267 | 272 | 273 | 264 | 272 | 273 |
| Percentage of Effectiveness | 90.33 | 88.67 | 90.67 | 89.00 | 90.67 | 91.00 | 88.00 | 90.67 | 91.00 |

If seen from effectiveness results of the use of the 1st animated video (V1), it appears that the 1st animated video has been categorized as excellence in science learning to improve students' science process skills and creativity. This is based on the conversion of the effectiveness test results of the 1st animated video with an effectiveness standard that refers to the five's scale, where the percentage of V1 effectiveness was 90.33% in the range of 90-100% which was categorized as excellence.

The percentage result of the effectiveness of using the 2nd animated video (V2) shows that the 2nd animated video is categorized as good for use in science learning to improve students' science process skills and creativity. This is based on the conversion of the effectiveness test results of using the 2nd animated video with an effectiveness standard that refers to the five's scale, where the percentage of V2 effectiveness was 88.67% in the range of 80-89% which was categorized as good.

The percentage result of the effectiveness of using the 3rd animated video (V3) shows that the 3rd animated video is categorized as excellence for use in science learning to improve students' science process skills and creativity. This is based on the conversion of the effectiveness test results of using the 3rd animated video with an effectiveness standard that refers to the five's scale, where the percentage of V3 effectiveness was 90.67% in the range of 90-100% which was categorized as excellence.

The percentage result of the effectiveness of using the 4th animated video (V4) shows that the 4th animated video is categorized as good for use in science learning to improve students' science process skills and creativity. This is based on the conversion of the effectiveness test results of using the 4th animated video with an effectiveness standard that refers to the five's scale, where the percentage of V4 effectiveness was 89.00% in the range of 80-89% which was categorized as good.

The percentage result of the effectiveness of using the 5th animated video (V5) shows that the 5th animated video is categorized as excellence for use in science learning to improve students' science process skills and creativity. This is based on the conversion of the effectiveness test results of using the 5th animated video with an effectiveness standard that refers to the five's scale, where the percentage of V5 effectiveness was 90.67% in the range of 90-100% which was categorized as excellence.

The percentage result of the effectiveness of using the 6th animated video (V6) shows that the 6th animated video is categorized as excellence for use in science learning to improve students' science process skills and creativity. This is based on the conversion of the effectiveness test results of using the 6th animated video with an effectiveness standard that refers to the five's scale, where the percentage of V6 effectiveness was 91.00% in the range of 90-100% which was categorized as excellence.

The percentage result of the effectiveness of using the 7th animated video (V7) shows that the 7th animated video is categorized as good for use in science learning to improve students' science process skills and creativity. This is based on the conversion of the effectiveness test results of using the 7th animated video with an effectiveness standard that refers to the five's scale, where the percentage of V7 effectiveness was 88.00% in the range of 80-89% which was categorized as good.

The percentage result of the effectiveness of using the 8th animated video (V8) shows that the 8th animated video is categorized as excellence for use in science learning to improve students' science process skills and creativity. This is based on the conversion of the effectiveness test results of using the 8th animated video with an effectiveness standard that refers to the five's scale, where the percentage of V8 effectiveness was 90.67% in the range of 90-100% which was categorized as excellence.

The percentage result of the effectiveness of using the 9th animated video (V9) shows that the 9th animated video is categorized as excellence for use in science learning to improve students' science process skills and creativity. This is based on the conversion of the effectiveness test results of using the 9th animated video with an effectiveness standard that refers to the five's scale, where the percentage of V9 effectiveness was 91.00% in the range of 90-100% which was categorized as excellence.

The results of this study were strengthened by the results of several previous studies conducted by several researchers, including the research of [Puspitarini et al. \(2019\)](#), which also has similarities with this study related to testing the effectiveness of animated videos, but the Puspitarini et al.'s research places more emphasis on the use of Powtoon applications to create animated videos. The results of [Stadlinger et al. \(2021\)](#), also strengthen the position of this research concerning the use of animated videos in supporting the improvement of the learning process. The research results of [Nuni et al. \(2019\)](#), also strengthen the position of this research as a solution to overcome the obstacles of Muntiani's previous research by demonstrating the existence of a process of testing the effectiveness of animated videos that support learning. The results of [Sutisna et al. \(2019\)](#), also strengthen the position of this research by showing the use of animated videos in the learning process, but Sutisna et al.'s research places more emphasis on testing students' perceptions of using animated videos made from Powtoon software. The results of [Dzebeq & Gunawan's \(2020\)](#), also strengthen the position of this research because it has similarities regarding the use of animated videos in learning. The results of [Barut Tugtekin & Dursun's \(2022\)](#), also strengthen the position of this research

concerning testing the effectiveness of using animated videos in learning. Likewise, research by [Maredia et al. \(2018\)](#), and research by [Ariska et al. \(2022\)](#), reinforce this research position by demonstrating the use of animated videos in the learning process.

In principle, this research has succeeded become the solution to the constraints of previous studies that had not been able to show in detail the themes of science learning, especially in showing examples of the science process and student creativity. However, this research also has limitations, where it has not shown the form of animated videos that are automatically attached to mobile technology.

4 Conclusion

In general, this research has been able to show the effectiveness level of each animated video used in improving students' science process skills and creativity in science learning during COVID-19 pandemic. This is evidenced by the effectiveness tests percentage for each video that can be measured accurately. The average results of each video being categorized as good and excellent in the view of the effectiveness standard that refer to the five's scale. Future work that can be done to overcome the limitations of this research is to develop animated videos that are integrated with mobile technology so that later the learning process can be carried out whenever and wherever students are.

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