

# Analysis of the Effectiveness Simulation-based Visual Media in Learning Physics on Students Skills and Learning Outcomes During the Covid-19 Pandemic

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## ABSTRACT

The Covid-19 pandemic has occurred all over the world, one of which is Indonesia. This affects all fields, including education. Learning activities are carried out online with the help of media, not face to face. This study aims to analyse the effectiveness of using simulation-based visual learning media in online physics learning on the skills and learning outcomes of students. The type of research used is library research method. There are four steps of this method, namely, designing reviews, conducting reviews, analyzing reviews, and writing reviews. Research subjects are journals that have a relationship with the research title and can be accounted for. The results of the literature research show that simulation-based learning media can be studied more effectively than learning with teachers who provide material without simulation media, can improve students' understanding of concepts, and improve skills and learning outcomes obtained.

**Keywords:** Visual media, COVID-19 pandemic, Students' skills, Learning outcomes.

## 1. INTRODUCTION

The plague of the Covid-19 pandemic has occurred in almost 200 countries around the world, one of which is Indonesia [1]. This has an impact on various sectors, especially in the sectors of education. Anticipating virus transmission, various countries have implemented regulations or policies, one of which is in the sectors of education. The Indonesian government, for example, has issued various policies, such as self-isolation, social distancing, and even large-scale social restrictions (PSBB). As a result of this condition, an educator has difficulty in carrying out learning in the classroom. Learning during a pandemic must not stop but must continue. Learning must still be carried out even during the pandemic COVID-19 and educators must still provide quality learning so that students are not left behind in learning. During this period pandemic, so that learning continues, educators conduct online learning through applications. This is based on the Circular of the Minister of Education and Culture Number 4 of 2020 concerning the Implementation of the Covid-19 Emergency Education Policy, which states that all learning activities are carried out at home, online, or remotely.

During online learning, the teacher must teach all the material to students, and it is hoped that students can

understand all of the material. However, there are some learning materials that are difficult and cannot be explained verbally or abstractly, one of which is the material in learning physics. Online learning makes it difficult for educators to explain the abstract material, so a media is needed to assist educators in explaining the material. The development of technology makes an educator able to develop new discoveries in the sectors of media that can provide stronger visual displays of various phenomena, abstract information, as well as simulations or experiments [2]. Therefore, online learning using media such as simulations can provide interesting and effective services for students to understand the material [3].

The use of visual media is very necessary based on the Herliandry study which shows during the pandemic, interesting learning media required so that it increases students' motivation and interest in learning [4]. In its application, several studies have been carried out, one of which by Rahma on the use of PhET media in learning and getting effective results in its application [5]. In another study conducted by Putra stated that the application of media in learning is quite effective but there are few constraints [6]. Based on the results of the descriptions of the 2 studies above, the researchers tried to determine the effectiveness of visual learning media

from several sources and countries so that the researchers conducted a study with the research title “Analysis of the Effectiveness of Simulation-Based Visual Media in Learning Physics on Skills and Learning Outcomes of Students During the Covid-19 Pandemic Period.”

## 2. METHODS

This type of research is library research, so this research method uses literature study. The technique of data collection in this study used secondary data, namely data collected indirectly on the object being studied [7]. Secondary data used in the form of articles and journals in the field of education that can be accounted for both nationally and internationally related to the use of visual media (simulation) while studying during the Covid-19 pandemic and other sources on web pages. The following is a list of journal sources that are used as references:

1. Reputable International Journal (Journal of Baltic Science Education);
2. International Journal (journal of Physical Review Special Topics and Physics Education Research);
3. Proceedings of International Seminars Indexed by Scopus and SCImago JR (IOP Conf. Series Journal of Physics, ICIS);

4. Accredited National Journal (Indonesian Science Education Journal).

The data analysis in this study used qualitative data analysis techniques. There are three qualitative data analysis techniques, the first of which is data reduction. The step which the researcher selects the appropriate and necessary data and those that are not needed, the second is data presentation, namely the researcher presents data in the form of selected journals or articles, and the third draws conclusions. The last step that is the researcher submit the results of the analysis based on a review of the journals or articles that have been presented [8].

## 3. RESULTS AND DISCUSSION

Learning activities during the pandemic are carried out online using interesting learning media. Many studies have been carried out to apply media in online physics learning in the form of simulation learning. In this study, analyze and examine 12 journals consisting of national and international journals. The presentation of the analysis data takes place in the form of a table to facilitate understanding and the results from journals that apply physics learning with simulation media during the Covid-19 pandemic can be seen clearly.

**Table 1.** Analysis of the application of physics learning journals using simulation media during Covid-19 pandemic

Source Journal	Review Journal
[9]	<p><b>Title:</b> Virtual Lab as Distance Learning Media to Enhance Student’s Science Process Skills During the COVID-19 Pandemic.</p> <p><b>Authors:</b> M. Usman et al.</p> <p><b>Study Result:</b> Based on this journal, it can be concluded that the use of simulation means in the form of a virtual laboratory has better effectiveness than traditional labs when applied during a pandemic and can improve students’ science process skills in measuring visualized materials such as effort and energy.</p>
[10]	<p><b>Title:</b> Studying Physics During the Covid-19 Pandemic: Student Assessments of Learning Achievement, Perceived Effectiveness of Online Recitations, and Online Laboratories.</p> <p><b>Authors:</b> P. Klein et al.</p> <p><b>Study Result:</b> From the research results, it can be seen that the use of simulation means in the form of online physics laboratory can support learning activities so that they become more effective. Learning activities using simulation media are not only applied in Indonesia but also in Germany, Austria, and Croatia.</p>
[11]	<p><b>Title:</b></p>

Source Journal	Review Journal
	<p>Improving Student Understanding of the Concepts of Weight and Mass with a Computer Simulation.</p> <p><b>Authors:</b> C. Sarabando et al.</p> <p><b>Study Result:</b> Use of visual media such as computer simulation in heavy and mass physics learning makes online learning more effective and can increase students' understanding because it uses attractive and clear visual media.</p>
[12]	<p><b>Title:</b> The Effect of Students' Metacognition and Digital Literacy in Virtual Lectures During the Covid-19 Pandemic on Achievement in the "Methods and Strategies on Physics Learning" Course.</p> <p><b>Authors:</b> S. Sukarno and M. El Widdah.</p> <p><b>Study Result:</b> From the results of this journal, it can be obtained that during the Covid-19 pandemic digital literacy skills such as meeting applications and virtual simulation applications in the form of virtual labs or others are very important and affect online learning, especially in physics.</p>
[13]	<p><b>Title:</b> Development of Physics Mobile Learning Media in Optical Instruments for Senior High School Student using Android Studio.</p> <p><b>Authors:</b> S. H. Aji et al.</p> <p><b>Study Result:</b> Use of visual media such as simulations, namely android-based physics media, has been proven to make learning more effective when learning online during the covid-19 pandemic in physics material, namely optical devices.</p>
[14]	<p><b>Title:</b> PPT-Audio; The Alternative Audio-Visual Media for Online Learning during the Corona Pandemic.</p> <p><b>Author:</b> E. P. E. Syafril and W. Kurniawati.</p> <p><b>Study Results:</b> Based on research in journals, it can be seen that the application of audio-visual media in learning can facilitate the work of teachers in teaching and improve students' understanding of abstract material, especially physics material.</p>
[15]	<p><b>Title:</b> The Effectiveness of Quantum Phenomenon Learning Media with Think Pair Share Model Implementation on Understanding Concept of Students.</p> <p><b>Authors:</b> A. Doyan et al.</p> <p><b>Study Result:</b> From this journal we can see that use of visual media such as videos of quantum phenomena is applied in physics learning on abstract material so that students become more aware of the abstract concept.</p>
[16]	<p><b>Title:</b></p>

Source Journal	Review Journal
	<p>The Effect of Virtual Laboratory Assisted Online Learning on Interest and Cognitive Physics Learning Outcomes.</p> <p><b>Authors:</b> E. Dewa et al.</p> <p><b>Study Result:</b> In the application of learning using a virtual laboratory, good results were obtained, namely the media used greatly influenced the interests and student learning outcomes when learning online during the covid-19 pandemic.</p>
[17]	<p><b>Title:</b> Application of PhET Simulation Media in Physics Learning During a Covid-19 Pandemic.</p> <p><b>Authors:</b> E. F. Sari et al.</p> <p><b>Study Result:</b> From the journal, it can be seen that the application of simulation media in the form of PhET in learning during the pandemic can make learning more effective and can improve students' understanding of concepts in abstract materials such as physics.</p>
[18]	<p><b>Title:</b> The Effectiveness of the Animation Video Learning Earth's Layer Media to Improve Students' Concept Understanding.</p> <p><b>Authors:</b> L. Rosdiana and R. M. Ulya.</p> <p><b>Study Result:</b> The application of visual media such as animated videos in the learning of Earth material physics has been proven to make learning more effective and increase students' understanding during online learning.</p>
[19]	<p><b>Title:</b> Lab Instruction During the COVID-19 Pandemic: Effects on Student Views About Experimental Physics in Comparison with Previous Years.</p> <p><b>Authors:</b> M. F. J. Fox et al.</p> <p><b>Study Result:</b> From this journal we can know that the application of virtual labs in learning during the pandemic is very necessary and effective from the early years of the pandemic until now. And the application of this virtual lab media is also carried out in America.</p>
[20]	<p><b>Title:</b> Improving Students' Scientific Literacy through Distance Learning with Augmented Reality-based Multimedia amid the Covid-19 Pandemic.</p> <p><b>Authors:</b> M. Ahied, L. K. Muharrami, A. Fikriyah, and I. Rosidi.</p> <p><b>Study Result:</b> Use of visual media such as simulations, namely Augmented Reality media, has been proven to make learning more effective and improve students' scientific literacy skills when learning online during the covid-19 pandemic.</p>

According to Table 1, obtained that learning during the Covid-19 pandemic was carried out online using

simulation learning media and could be done well and effectively. These results are also by the theory of

research by Hikmat which states that online learning using media is more effective than offline learning in theories such as experiments/practices [21].

The results of the analysis also show that the use of visual learning media in the form of pandemic simulations can help teachers achieve several aspects: (1) Concept Understanding: Concept understanding is the ability of students to master a number of materials where students are able to re-explain the concept in other forms not only just remember without being able to interpret it [22]; (2) Skills: The ability of students to apply knowledge to perform certain tasks in various contexts which include the realm of thinking and acting [23]; and (3) Learning Outcomes: Learning outcomes are the results of students' abilities after receiving learning with results in the form of learning outcomes test scores at the end of each lesson [24].

The three aspects that can be achieved according to the results of the analysis of this journal refers to the results of research conducted by Halim which states that the application of simulation media such as PhET in learning during the pandemic can increase student learning outcomes in the realm of understanding concepts and skills [25].

#### 4. CONCLUSION

According to the results of the analysis conducted in several national and international journals, it can be obtained that the learning during the Covid-19 pandemic is carried out online using meeting applications such as google meet, zoom meeting, and others. In the application of online learning, visual media assistance is needed, one of which is in the form of simulations such as PhET, Virtual Laboratories, or others so that it can increase student motivation and interest as well as positive responses and make learning activities more effective. The application of visual media is not only carried out in Indonesia but also in Germany, America, and Croatia. Learning using simulation media during the COVID-19 pandemic can be applied to abstract materials such as physics to help teachers improve conceptual understanding, improve science process skills, and improve student learning outcomes. So, the researchers hope that the results of this study can be a reference and motivation for educators to apply learning using visual media, especially simulations in online learning of physics during the current Covid-19 pandemic.

#### AUTHORS' CONTRIBUTIONS

All authors conceived and designed this study. All authors contributed to the process of revising the manuscript, and at the end all authors have approved the final version of this manuscript.

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