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Online Learning Media on Science Learning during the COVID-19 Pandemic: A Literature Study in Indonesia

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Abstract

This study aims to analyze online learning media used in science learning during the COVID-19 pandemic. This research uses a literature study method by conducting three stages of research, namely data collection, data analysis, and conclusions. This study analyzed 18 science journals in Indonesia. It is found that the science learning media used during the COVID-19 pandemic are e-modules, Google Classroom, smartphone sensors, and virtual laboratories through PhET and LiveWire. Each learning media application must be adjusted to the indicators and the level of education. The findings of this study can improve learning outcomes, learning motivation, critical thinking, problem-solving, concept mastery, and science process skills.

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INTRODUCTION

From 2019 to date, the World Health Organization (WHO) recorded 173,331,478 cases of coronavirus (COVID-19) infection (WHO, 2021). The spread of COVID-19 throughout the world affect all fields, including education (Makhrus et al., 2021). The Ministry of Education in Indonesia has sought various ways to prevent and mitigate the spread of COVID-19 by wearing masks, maintaining distance, avoiding crowds, and conducting online learning (Jariyah & Tyastirin, 2020; Kelana et al., 2021).

Online learning needs adaptation between teachers and students (Utomo et al., 2021). The teachers and students face many obstacles in conducting online education, namely lack of technological knowledge, lack of access to online learning, constrained internet access, and lack of preparation for online learning (Jamaluddin et al., 2020). Therefore, teachers need to prepare for online education by preparing learning media (Prastikawati et al., 2020; Ulfah, 2020; Utomo et al., 2021). For young teachers, it is not an obstacle to make an online learning media. However, older teachers will face difficulties, especially in science learning which is very closely related to the environment and education practice (Jariyah & Tyastirin, 2020; Sadikin & Hamidah, 2020; Widiyono, 2020). Several studies address various ways to prepare science learning media through online learning applications (Jannah & Nurdiyanti, 2021; Kelana et al., 2021; Sugiharti & Sugandi, 2020; Utomo et al., 2021), and some even conduct training in making online learning media (Handayani et al., 2021). This study focuses on analyzing several scientific journals on learning media in science learning during the COVID-19 pandemic. The results of this study are expected to make it easier for further researchers to apply online knowledge during and after the COVID-19.

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METHOD

This research uses a literature study method. The data sources consist of primary sources (published journals) and secondary sources (internet sources or books). The primary sources are focused on science learning media used during the COVID-19 pandemic. This research consists of three stages, namely data collection, data analysis, and conclusions. The stages of the study are described in Figure 1.

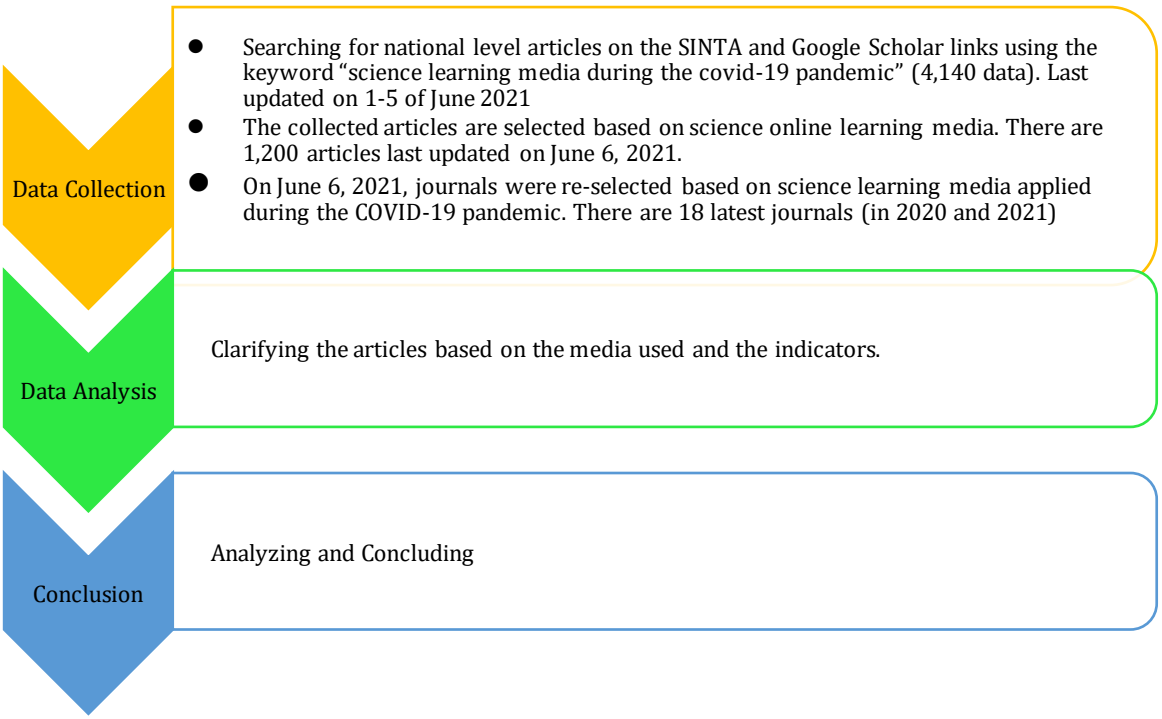

Figure 1. Research Procedure

RESULTS AND DISCUSSION

The researchers conducted the study by analyzing the literature. The results are presented in Table 1.

Table 1. Review of online learning media journals on science during the covid-19 pandemic

Authors	Publisher	Publishing Year	Research Results
Kamila, Arina Umu; Rahmawati, Ratih Galuh; Jumadi	Proceedings of the 6th International Seminar on Science Education	2021	PBL-STEM-based students worksheet assisted by PhET can improve students' problem-solving skills during the COVID-19 pandemic (Kamila et al., 2021)
Martanti, N; Malika, E R; Setyaningsih, A	KONSTELASI: Konvergensi Teknologi dan Sistem Informasi Pengaruh	2021	Virtual laboratory-based physics learning using PhET during the COVID-19 pandemic can improve students' cognition (Martanti et al., 2021)
Efendi, Nur; Sartika, Septi Budi	Jurnal Pendidikan Sains (JPS)	2021	Science learning using interactive PhET simulations can improve Junior high school students' science process skills in the COVID-19 pandemic (Efendi & Sartika, 2021)
Handayani, Iryan Dwi; Suharyo, Seno; Wahjoerini	Jurnal Pengabdian Masyarakat Berkemajuan	2021	PhET training during the COVID-19 pandemic as an alternative to online practicum for elementary school teachers (Handayani et al., 2021)

Authors	Publisher	Publishing Year	Research Results
Sari, Amelia Cintya; Kartikawati, Sulistyaning; Prastyaningrum, Ihtiari	Jupiter (Jurnal Pendidikan Teknik Elektro)	2021	Gallery walk learning assisted by PhET can improve students' critical thinking skills during the COVID-19 pandemic (Sari et al., 2021)
Masruroh, Nufus, Choirum Vivianti, Amelya Anggraeni, Putri Maulida; Waroh, Siti Nailil; Wakhidah, Nur	Jurnal Insecta: Integrative Science Education and Teaching Activity Journal	2020	Physics' electrical material using PhET simulation can improve elementary school students' learning outcomes during the COVID-19 pandemic (Masruroh et al., 2020)
Ulfah, Yunitha	Al-Jahiz: Journal of Biology Education Research	2020	The application of PhET learning media through the inquiry model can improve the science concept mastery of junior high school students during the COVID-19 pandemic (Ulfah, 2020)
Sugiharti, Sindi; Sugandi, Muhamad Kurnia	Transformasi Pendidikan sebagai Upaya Mewujudkan Sustainable Development Goals (SDCs) di Era Society 5.0	2020	Online practicum through virtual laboratories can improve students' understanding during the COVID-19 pandemic (Sugiharti & Sugandi, 2020)
Makhrus, Muh; Wahyudi, Wahyudi; Zuhdi, Muhammad	Jurnal Penelitian Pendidikan IPA	2021	Virtual practicums through LiveWire can assist practicum activities during the COVID-19 pandemic (Makhrus et al., 2021)
Jannah, Miftahul; Nurdiyanti	JRIP: Jurnal Riset dan Inovasi Pembelajaran	2021	Online learning through Google Classroom can improve students' learning outcomes during the COVID-19 pandemic (Jannah & Nurdiyanti, 2021)
Putra, I Putu Surya Adi; Wardika, I Wayan Gede	Jurnal Emasains: Jurnal Edukasi Matematika dan Sains	2021	Google Classroom can increase students' mathematic learning motivation during the COVID-19 pandemic (Putra & Wardika, 2021)
Agustina, Handinda Putri; Zannah, Siti Nur	Jurnal Kependidikan Betara (JKB)	2020	Students' scientific process skills can be improved through the Quizizz application during the COVID-19 pandemic (Agustina & Zannah, 2020)
Lusiani	Science and Physics Education Journal	2020	Cognitive test results can be achieved through the Quiziz application when pandemic covid-19 (Lusiani, 2020)
Kisworo, Banu; Cahyani, Mutiara Dwi; Azizah, Dewiantika	Jurnal Zarah	2021	The PjBL model assisted by Moodle is appropriate for lectures during the COVID-19 pandemic (Kisworo et al., 2021)
Kristiyani, Yoana; Sesunan, Feriansyah; Wahyudi, Ismu	Jurnal Pendidikan Fisika	2020	Smartphone sensor applications in physics learning can improve students' critical thinking during the COVID-19 pandemic (Kristiyani et al., 2020)
Shofiyah, Noly; Wulandari, Ria; Setiyawati, Enik	Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan	2020	Creating a particle dynamics module based on local wisdom as online learning material during the Covid-19 pandemic (Shofiyah et al., 2020)

Authors	Publisher	Publishing Year	Research Results
Imaduddin, M; Suharningsih, D; Aufa, F A; Nurona, A; Handayani, P; Melati, R; Murti, W B	Buletin Udayana Mengabdi	2020	Youtube publication on biotechnology practicum as a science learning resource during the COVID-19 pandemic (Imaduddin et al., 2020)
Novitasari, Shelin; Tulandi, Djeli Alvi; Lolowang, Jimmy	Charm Sains	2021	Smartphone online guide using the Phyphox application is suitable for online learning during the COVID-19 pandemic (Novitasari et al., 2021)

Based on the analysis, online learning media applied during the COVID-19 pandemic is varied. For example, some journals use learning by producing e-modules learning media. Also, several studies apply existing applications as online learning media, namely implementing Google Classroom and smartphone sensor applications. Furthermore, various methods have been done to replace science practicum with online practicum using virtual laboratory applications, such as PhET and LiveWire. Table 1 discusses the application of science learning at the elementary school, junior high school, senior high school, and college levels. Some of the functions of learning media in Table 1 are described in table 2.

Table 2. Functions of Learning Media Applied to Science in the COVID-19 Pandemic

Learning Media	Functions
E-modules	Written works to direct the learning process on certain electronic-based materials.
Google Classroom	Online communication application for students and teachers by sending various files.
Smartphones Sensor	sensors function to automatically detect light ambient.
Virtual laboratory	Directs users to do online practicums according to their needs, tools, and materials.
PhET Simulation	Direct users to perform simulations in learning mathematics and science (physics, chemistry, and biology)
LiveWire	Electronic simulation to design, analyze, and display animations to demonstrate electronic circuits' essential functions or principles.

Based on tables 1 and 2, several media have been applied during the COVID-19 pandemic.

1. E-modules can integrate local wisdom in science learning.
2. Google Classroom can improve students' learning outcomes and learning motivation.
3. Smartphone sensor can improve students' critical thinking, especially on light material.
4. Virtual laboratory (PhET and LiveWire) can help students do practicum on electronics learning material and improve students' critical thinking, problem-solving, concept mastery, learning outcomes, and science process skills.

Some of the learning media that have been applied are in line with the indicators to run smoothly. This study found media schemes and achievement indicators based on the analysis of published scientific journals (the schematic is described in Figure 1).

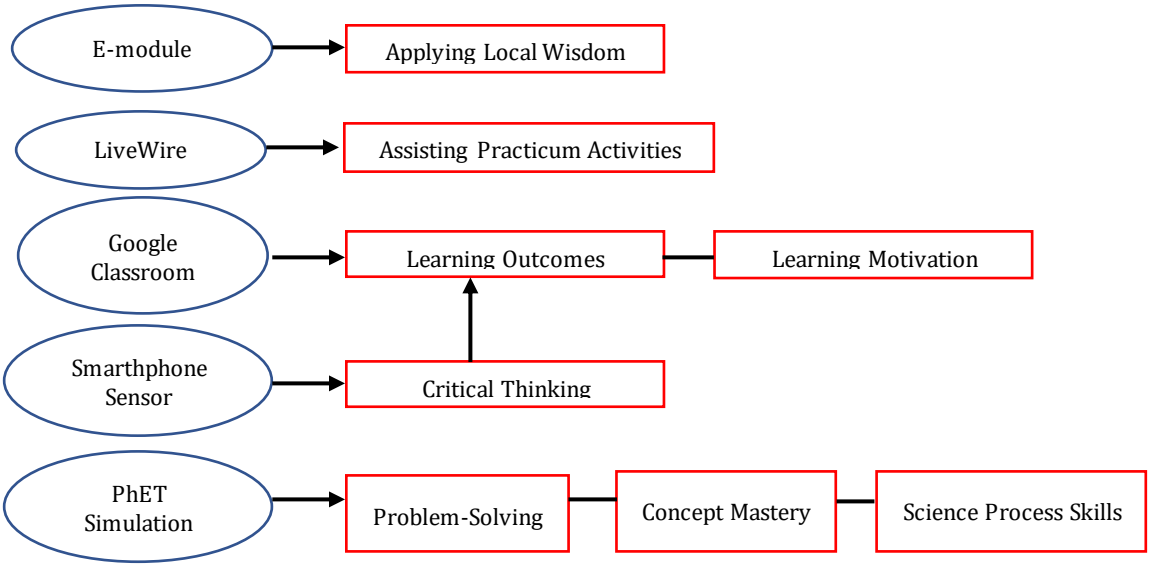

Figure 2. The Schematic of Learning Media and Research Indicators

The indicators achieved in learning align with 21st-century developments by meeting the 4C needs, namely critical-thinking, communication skills, collaboration, and creativity (Harjono et al., 2019). All the media applied are also easy to do in online learning, which makes the indicators achievable. This research is conducted in the field of science. Therefore, it is recommended for further researchers to use the results of this study to be applied in other areas during the COVID-19 pandemic.

CONCLUSION & SUGGESTION

Based on an analysis of literature studies in Indonesia found in various journals (18 journals), science learning media used during the COVID-19 pandemic are e-modules, Google Classroom, smartphone sensors, and virtual laboratories through PhET and LiveWire. Each application of learning media must be adjusted to the achievement indicators and the level of education. The findings of this study can improve learning outcomes, learning motivation, critical thinking, problem-solving, concept mastery, and science process skills.

Further researchers can apply or collaborate several media that have been used in science learning (e-modules, Google Classroom, smartphone sensors, and virtual laboratories) into one study to achieve several indicators (learning outcomes, learning motivation, critical thinking, problem-solving, concept mastery, and science process skills).

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