International Journal of Education and Literature
Volume. 3 No. 1 April 2024
e-ISSN : 2829-6249, dan p-ISSN : 2829-6656, Hal. 52-61
DOI: https://doi.org/10.55606/ijel.v3i1.31
Available online at: https://ijel.amikveteran.ac.id/index.php/ijel

Implementation Of Blended Learning In Improving Science Literacy Of SMA/MA In Indonesia : A Meta-Analysis

Ichsan Ichsan[1], Erwinsyah Satria[2], Tomi Apra Santosa[3], Sisi Yulianti[4], Khodzijah Nur Amalia[5]

[1] Pontianak State Polytechnic, [2] Bung Hatta University , [3] Padang State University , [4] Andalas Andalas University, [5] IAIN Kerinci, Jambi, Indonesia

Author correspondence: ichsanida@yahoo.com

ARTICLEINFO

Article history:
Received, 19 January 2024
Received, 20 February 2024
Accepted, 27 March 2024
Published, 30 April 2024

Keywords:
Learning, Blended Learning, Science Literacy .

ABSTRACT

This study aims to determine the implementation of blended learning in improving the scientific literacy of SMA/MA students in Indonesia. This research is a type of meta-analysis research. The sample of this research comes from the analysis of 14 articles that have been published from 2017-2022. The sampled articles have been indexed by SINTA, DOAJ, Google Scholar, Scopus and Copernicus. Research sample search through google scolar and sciencedirect. The sampling technique is purposive sampling technique. The data that can be sampled only has a relationship between the independent variable and the dependent variable, namely blended learning and students' scientific literacy. The data analysis technique in this study is a quantitative data analysis technique with SPSS 21 and JSAP applications with a value of sig.0.005. The application is to calculate the value of Effect Size (ES), Mean and Standard deviation (SD). The results of this study concluded that the application of blended learning was able to increase the scientific literacy of SMA/MA students in Indonesia with an Effect size (ES) of 0.494 and an n-Gain of 0.391. So, teachers in the 4.0 revolution era must be able to apply blended learning models to students so that students are able to face current global competitors.

Correspondent authors: : **Ichsan Ichsan**
Pontianak State Polytechnic, Indonesia
E-Mail: ichsanida@yahoo.com

INTRODUCTION

After the coronavirus disease -19 pandemic, the world of education has had a very significant impact in the world of education (Manullang & Satria, 2020). The spread of coronavirus disease -19 has caused problems for the Indonesian people in various fields, especially education (Oktarina et al., 2021). Education has a role for students to provide opportunities and knowledge in their lives (Satria, 2015). Coronavirus disease-19 better known as Covid-19 was first discovered in Wuhan, China in 2020 (Sukiman *et al*., 2022; Santosa *et al*., 2021). The Covid-19 virus is a new disease for humans that has not been identified (Dewi & Sadjiarto, 2021). Furthermore, this virus has infected ± 4,667,554 Indonesian residents (Suhaimi et al., 2022), so that the learning system from face-to-face (offline) to online learning (online) (Mustajab et al., 2020; Santosa & Sepriyani., 2020). Online learning is a type of learning based on the use of internet-assisted technology (Fauzi & Chano, 2022; Santosa et al., 2021).

Online learning is the best solution to prevent the spread of Covid-19 in the world of education (Santika, 2020). This online learning is carried out by teachers and students in

carrying out the learning process in the classroom (Hamad, 2022; Mphahlele et al., 2021; Oducado & Estoque, 2021). Online learning provides a quite meaningful experience for a student (Santosa et al., 2021). Furthermore, online learning also trains students to learn more independently (Syarifudin, 2020; Mohammed & Mudhsh, 2021). However, according to Abidin et al.,(2020) There are still many online learning that have not been able to be implemented by teachers and students. Online learning has many obstacles faced by teachers and students, especially the low mastery of technology, limited facilities and infrastructure, internet networks and very low student motivation in understanding technology. (Pratama & Mulyati, 2020; Zulyusri et al., 2022).

Learning based on mastery of technology is very important to be mastered by students (Sudarsana et al., 2019). Technology has a big role in the world of education (Yusuf et al., 2020; Sudarsana et al., 2019). Technology will help students and teachers more easily interact in teaching and learning in the post-Covid-19 pandemic (Sudarsana et al., 2019) Furthermore, students must have the ability to master technology. Therefore, it is necessary for a teacher to improve students' technological abilities by increasing their scientific literacy. Scientific literacy is a part of practical science regarding the phenomena of science (Zahro et al., 2019; Zeher & Abdul, 2015). Scientific literacy skills are indispensable for students in facing the 21st century (Baharudin et al., 2016). Based on PISA data, the level of scientific literacy of Indonesian students is still in the low category, which is ranked 73 out of 79 member countries (Ichsan et al., 2022). Therefore, the quality of scientific literacy is an indicator of the progress of a country's human resources (Suharyat et al., 2022). Furthermore, the teacher must be able to adapt the learning model applied to students. One of the effective learning models used is the blended learning model.

After the Covid-19 pandemic, blended learning has become highly recommended learning in schools. Blended learning is a learning model that can be done face-to-face (offline) and online (online). (Santosa et al., 2021). The blended learning model is very effectively applied to students (Amin, 2017). In addition, blended learning has characteristics that can be implemented with the help of technology (Nasution et al., 2020; Katasila & Poonpon, 2022; Setiawan et al., 2022). According to research Abroto et al., (2021) blended learning model is able to improve critical thinking skills and mastery of concepts in students. In addition, blended learning is in accordance with the challenges of today's education world which aims to train students' scientific literacy (Sari, 2021). Not only that, according to (Nande & Irman, 2021) Blended learning has benefits for students, namely students can access information about learning without limits.

Further research by Lestari et al., (2020) blended learning affects students' scientific literacy. Research by Williams et al., (2021) blended learning learning model is effective in improving scientific literacy. Menurut Li et al., (2022) blended learning is highly recommended in increasing the level of students' science knowledge. Research by Twiningsih (2022) explained that the use of the blended learning model affected students' scientific literacy skills during the Covid-19 pandemic. Based on the background of the problem, this study aims to determine the implementation of blended learning in improving the scientific literacy of SMA/MA students in Indonesia.

RESEARCH METHODS

This research is a type of meta-analysis research. Meta-analysis research is a type of research that takes data samples from quantitative data that can be analyzed statistically (Santosa et al., 2021). This research data comes from an analysis of 14 articles published in 2017-2022. This research data comes from articles that have been indexed by SINTA, Google Scholar, Scopus, DOAJ and the Copernicus Index. The search for data sources comes from Google Scholar, ScienceDirect and Eric Journal. The data collection technique is purposive sampling technique. The data that is used as a sample has criteria that are related to the blended learning model and scientific literacy. Data collection in this study was carried out very strictly and thoroughly according to the research variables. The data analysis technique in this research is quantitative data analysis technique using SPSS version 21 and JSAP applications. The application is used to calculate the value of Effect Size (ES), Mean, and Standard Deviation (SD) and N-Gain. Calculations use a standard significance of 0.05 to calculate the effect size (ES) view and N-Gain. The effect size (ES) and N-Gain categories can be seen in Table 2.

Table 1. Category Effect Size (ES)

Effect Size	Kategori
0 ES 0.2	Rendah
0 ES 0.8	Sedang
ES > 0.8	Tinggi

Table 2. Criteria for N-gain

Nilai N-Gain	Kategori
N-Gain > 0.7	Tinggi
0.3 < N-gain <0.7	Sedang
N-gain < 0.3	Rendah

Sumber: Hooke dalam (Zulyusri et al., 2022)

RESULT AND DISCUSSION

Result

The results of research from 10 journals that have been published from 2017-2022 related to the blended learning learning model in improving the scientific literacy of SMA/MA students in Indonesia can be seen in the table. 3 and Diagram 1.

Table 3. Meta-analysis of Research Samples

No	Author	Variabel Dependen	Journal Type	Index
1	Kurniati & Hidayah, 2021)	scientific literacy	National	SINTA
2	Kade et al., 2019	scientific literacy dan learning outcomes	National	SINTA
3	Setiawan et al., 2022	scientific literacy	Internasional	Scopus
4	Yudhana, 2021	scientific literacy	International	DOAJ
5	Fitri & Zahari et al., 2019	scientific literacy (concept understanding)	International	Scopus
6	(Cukurbasi, 2022)	scientific literacy	International	Copernicus
7	(Agung et al., 2020.)	scientific literacy (concept understanding)	National	SINTA
8	(Alsalhi et al., 2019)	scientific literacy (attitude)	International	Scopus
9	Pratama & Zilhakim, 2022	scientific literacy	National	Google Scholar
10	(Deta et al., 2021)	scientific literacy	National	SINTA
11	(Safitri, 2021)	scientific literacy	National	SINTA
12	(Nurhayati, 2022)	scientific literacy	National	Google Scholar
13	(Shofiyah et al., 2020)	scientific literacy	National	SINTA
14	(Agustini, 2022)	scientific literacy (learning outcomes)	National	Google Scholar

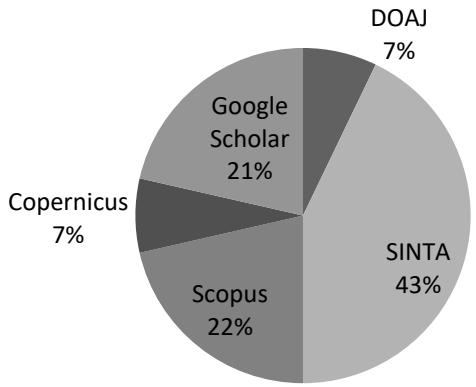

Diagram.1 Meta-Analysis Based on Article Indexation

Based on diagram 1. It shows that there are 43% SINTA indexed articles, 22% Scopus indexed articles, 7% Copernicus indexed articles and 21% Google Scholar indexed articles. So, all research

samples on the implementation of blended learning in improving scientific literacy of SMA/MA students in Indonesia come from quality journals. Furthermore, to determine the effect of the blended learning learning model on the scientific literacy ability of SMA/MA students in Indonesia, see the table. 4

Table 4. Value of Effect Size sample

Sampel	Effect Size	Criteria
1A	0.23	Medium
2A	0.06	Low
3A	0.61	Medium
4A	0.22	Medium
5A	0.14	Low
6A	0.07	Low
7A	0.78	Low
8A	2.09	Hight
9A	0.91	Hight
10A	0.32	Medium
11A	0.41	Medium
12A	0.56	Medium
13A	0.43	Medium
14A	0.09	Low
Mean Effect size	**0.494**	**Medium**

Based on Table 4, the effect size value of 14 journals is 0.494 in the medium category. It means that the implementation of the blended learning model has a significant influence on the level of scientific literacy of SMA/MA students in Indonesia. Furthermore, blended learning is very effective at the SMA/MA level in the post-Covid-19 pandemic. This can be seen from the results of the N-Gain test in Table 5

Table 5. N-Gain Value of Blended Learning Model > Science Literacy

Class	Value		N-Gain	Criteria
	Pretest	Postest		
Ekseprimen	75	84	**0.391**	**Medium**
Kontrol	50	70		

Based on Table. 5 shows the posttest average value of the experimental class that uses blended learning learning is greater than the control class, namely the pretest value of 75 and the posttest value of 84 and the pretest control class of 50 and the posttest value of 70 with an N-Gain value of 0.391 medium category. Therefore, it can be concluded that blended learning is very effective to be applied to SMA/MA students in Indonesia in increasing scientific literacy in the learning process.

Discussion

The blended learning model is a learning that can be carried out face-to-face in class and online through a learning platform. Learning Blended learning model makes students learn to be more independent in accessing information in learning. The application of blended learning learning affects the literacy level of students. This can be seen from the results of the study where the effect size (ES)

value is 0.494 with a medium category. This is in line with research by (Kade et al., 2019) blended learning is able to influence scientific literacy and student learning outcomes. In addition, blended learning also affects students' critical thinking skills in learning (Al-ghoweri & Al-zboun, 2021). Next according to Faridah et al.,(2022) blended learning is very effective in increasing student learning activities.

In the learning process, students and teachers determine the learning objectives that are carried out (Satria & Sari, 2018). For that we need teachers who have high professionalism in carrying out the learning process. The learning that is needed at this time is learning that leads to scientific literacy skills (Razak et al., 2021). Scientific literacy is the ability of students to solve problems related to science issues in life. So, teachers are required to be able to develop learning models that encourage students to improve scientific literacy (Turiman et al., 2012). Scientific literacy is indispensable for students to face the development of the 21st century (Kaur & Kaur, 2014). The challenge of the 21st century is big enough for teachers to encourage the quality of student literacy. According to (Setiawan., 2019) learning the concept of scientific literacy is very helpful for students in solving scientific problems.

The effectiveness of blended learning is one of the solutions to encourage the scientific literacy skills of SMA/MA students in Indonesia. The effectiveness of this learning model can be seen from the results of the N-gain calculation of 0.391 in the medium category. This is in line with research (Setiawan & Pamulang, 2020) learning with blended learning is effective in supporting the quality of students' scientific literacy in the post-covid-19 pandemic. In addition, research by Maarif, (2022) This blended learning learning model is highly recommended to be applied to students in improving the scientific literacy of SMA/MA students in Indonesia. Scientific literacy is the main asset for students in accessing big data. Various kinds of information related to the learning process can be opened with technology. This scientific literacy ability is the main challenge for students and teachers to improve the quality of education in Indonesia.

CONCLUSION

From the results of this study, it was concluded that the application of blended learning was able to increase the scientific literacy of SMA/MA students in Indonesia with an Effect size (ES) of 0.47, a mean of 82.13 and a standard deviation of 0.41. So, teachers in the 4.0 revolution era must be able to apply blended learning models to students so that students are able to face current global competitors.

DAFTAR PUSTAKA

Abidin, Z., Hudaya, A., & Anjani, D. (2020). Efektivitas Pembelajaran Jarak Jauh Pada Masa Pandemi Covid-19. *Research and Development Journal of Education*, *1*(1), 131. https://doi.org/10.30998/rdje.v1i1.7659

Abroto, A., Maemonah, M., & Ayu, N. P. (2021). Pengaruh Metode Blended Learning Dalam Meningkatkan Motivasi dan Hasil Belajar Siswa Sekolah Dasar. *Edukatif : Jurnal Ilmu*

Pendidikan, *3*(5), 1993–2000. https://edukatif.org/index.php/edukatif/article/view/703

Agung, A., Rita, I., & Kusuma, S. (n.d.). *Exploring the Influence of Blended Learning Method in English Recount Text Writing for Senior High School Students*. *6*(October 2020), 193–203.

Agustini, R. (2022). Penerapan blended learning tentang ikatan kimia untuk peningkatan hasil belajar siswa kelas x ipa 4 sma negeri 14 pekanbaru. *Jurnal Pendidikan Taman Widya Humaniora (JPTWH)*, *3*(12), 252–273.

Al-ghoweri, J. A., & Al-zboun, M. S. (2021). *The Extent of the Impact of Blended Learning on Developing Habits of Mind from the Standpoint of Students of Learning and Scientific Research Skills Course at the University of Jordan*. *10*(4). https://doi.org/10.5430/ijhe.v10n4p196

Alsalhi, N. R., Eltahir, M. E., & Al-qatawneh, S. S. (2019). Heliyon The effect of blended learning on the achievement of ninth grade students in science and their attitudes towards its use. *Heliyon*, *5*(January), e02424. https://doi.org/10.1016/j.heliyon.2019.e02424

Amalia, K. N., Santosa, T. A., & Yulianti, S. (2022). Pengaruh Model Pembelajaran Problem Based Learning Berbaisis TPACK Terhadap Ketrampilan Literasi Sains Dalam Pembelajaran IPA Siswa Tingkat SD Sampai SMA: Sebuah Meta-Analisis. *Jurnal Pendidikan Dan Konseling*, *4*(5), 2173–2181.

Amin, A. K. (2017). Kajian Konseptual Model Pembelajaran Blended Learning berbasis Web untuk Meningkatkan Hasil Belajar dan Motivasi Belajar. *Jurnal Pendidikan Edutama*, *4*(2), 51–64.

Baharudin, M., Bahasa, P. P., Pinang, P., Ikhsan, S. A., Bahasa, P. P., & Pinang, P. (2016). *The Interesting Teaching and Learning of Malay Language to Foreign Speakers : Language through Cultures*. *16*(1), 1–13.

Cukurbasi, B. (2022). Review of student opinions on blended educational implementations in the pandemic process : A case study. *Journal of Educational Technology & Online Learning*, *5*(2), 66–83.

Deta, U. A., Zulaiha, P., Agustina, R., Khoir, E. F., Fisika, J., Matematika, F., & Alam, P. (2021). Pembelajaran Blended Learning Berbasis Edmodo Dalam Peningkatan Kemampuan Literasi Sains. *Jurnal Ilmiah Pendidikan Fisika*, *5*(3).

Dewi, T. A. P., & Sadjiarto, A. (2021). Pelaksanaan Pembelajaran Daring Pada Masa Pandemi Covid-19. *Jurnal Basicedu*, *5*(4), 1909–1917. https://doi.org/10.31004/basicedu.v5i4.1094

Faridah, E., & The, T. (2022). *The Effectiveness of Blended Learning Model on Rhythmic Activity Courses Based on Complementary Work Patterns To cite this article : The Effectiveness of Blended Learning Model on Rhythmic Activity Courses Based on Complementary Work Patterns*.

Fauzi, I., & Chano, J. (2022). Online Learning: How Does It Impact on Students' Mathematical Literacy in Elementary School? *Journal of Education and Learning*, *11*(4), 220. https://doi.org/10.5539/jel.v11n4p220

HAMAD, W. (2022). Understanding the foremost challenges in the transition to online teaching and learning during COVID'19 Pandemic: A systematic literature review. *Journal of Educational Technology and Online Learning*, *5*(2). https://doi.org/10.31681/jetol.1055695

Hidayah, K. &. (2021). Pengaruh Pembelajaran Problem Based Learning Berbasis Blended Learning terhadap Kemampuan Literasi Sains. *Bioedusiana*, *6*(2).

Kade, A., Syarif, M., & Syukur, S. A. (2019). Pengaruh Model Blended Learning terhadap Literasi Sains dan Hasil Belajar. *Jurnal Pendidikan Fisika Tadulako Online (JPFT)*, *7*(3), 51–55.

Kaur, S., & Kaur, G. (2014). Evaluating the Critical Literacy Practices of Tertiary Students. *Procedia - Social and Behavioral Sciences*, *123*, 44–52. https://doi.org/10.1016/j.sbspro.2014.01.1396

Lestari, H. (2020). Literasi Sains Siswa Melalui Penerapan Model Pembelajaran Blended Learning Dengan Blog. *Naturalistic: Jurnal Kajian Penelitan Dan Pendidikan Dan Pembelajaran*, *4*(2),

597–604.

Li, B., Yu, Q., & Yang, F. (n.d.). *The Effect of Blended Instruction on Student Performance : A Meta-Analysis of 106 Empirical Studies from China and Abroad*. https://doi.org/10.15354/bece.22.ar018.How

Maarif, S. (2022). Jurnal Cakrawala Pendas EFEKTIVITAS MODEL BLENDED LEARNING BERBASIS LEARNING MANAGAMENTS SYSTEM TERHADAP KEMAMPUAN LITERASI. *Jurnal Cakrawala Pendas*, *8*(4), 1208–1219.

Manullang, S. O., & Satria, E. (2020). The Review of the International Voices on the Responses of the Worldwide School Closures Policy Searching during Covid-19 Pandemic. *Jurnal Iqra' : Kajian Ilmu Pendidikan*, *5*(2), 1–13.

Mustajab, M., Baharun, H., & Fawa'iedah, Z. (2020). Adapting to Teaching and Learning During Covid-19: A Case of Islamic School's Initiative of Self-regulated Learning. *Nadwa: Jurnal Pendidikan Islam*, *14*(2), 241–264. https://doi.org/10.21580/nw.2020.14.2.6515

Nande, M., & Irman, W. A. (2021). EDUKATIF : JURNAL ILMU PENDIDIKAN Penerapan Model Pembelajaran Blanded Learning dalam Meningkatkan Hasil Belajar Siswa Sekolah Menengah Kejuruan. *Edukatif*, *3*(1), 180–187.

Nasution, R. H., Hapidin, H., & Fridani, L. (2020). Pengaruh Pembelajaran ICT dan Minat Belajar terhadap Kesiapan Membaca Anak Usia Dini. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *4*(2), 733. https://doi.org/10.31004/obsesi.v4i2.411

Nurhayati, U. M. I. (2022). Implementasi Blended Learning Metode Flipped Classroom untuk Meningkatkan Kemampuan Literasi Matematis Siswa. *Jurnal Reforma*, *11*(1), 21–30.

Oktarina, K., Santosa, T. A., Razak, A., & Ahda, Y. (2021). Meta-Analysis : The Effectiveness of Using Blended Learning on Multiple Intelligences and Student Character Education during the Covid-19 Period. *IJECA International Journal of Education & Curriculum Application*, *4*(3), 184–192.

Pratama, R. E., & Mulyati, S. (2020). Pembelajaran Daring dan Luring pada Masa Pandemi Covid-19. *Gagasan Pendidikan Indonesia*, *1*(2), 49. https://doi.org/10.30870/gpi.v1i2.9405

Razak, Abdul, Santosa, Tomi Apra, Lufri., et al. (2021). Meta-Analisis: Pengaruh Soal HOTS (Higher Order Thinking Skill) Terhadap Kemampuan Literasi Sains dan Lesson Study Siswa Pada Materi Ekologi dan Lingkungan Pada Masa Pandemi Covid-19. *Bioedusiana*, *6*(1), 79–87. http://jurnal.unsil.ac.id/index.php/bioed

Review, L., Listiana, N., & Jaharadak, A. A. (2019). *The implementation of blended learning to improve understanding of mathematics The implementation of blended learning to improve understanding of mathematics*. https://doi.org/10.1088/1742-6596/1188/1/012109

Safitri, I. (2021). *Pengaruh Blended Learning Terhadap Peningkatan Literasi Matematika Siswa*. *05*(01), 735–743.

Santika, I. W. E. (2020). Efektifitas. *Indonesian Values and Character Education Journal*, *3*(1), 8–19.

Santosa, T. A., Lufri, L., & Zulyusri, Z. (2021). Problematika Dalam Pembelajaran Berbasis Virtual Learning Environment (VLE) Terhadap Siswa dan Guru SMA/MA Pada Materi Biologi Di Masa COVID-19. *Journal on Education*, *3*(01), 93–103. https://doi.org/10.31004/joe.v3i01.346

Santosa, T. A., Razak, A., Anhar, A., & Sumarmin, R. (2021). The Effectiveness of the Blended Learning Model on Student Learning Outcomes in Zoology Subjects in the Covid-19 Era. *Pendidikan Biologi*, *7*(1), 77–83.

Santosa, T. A., Razak, A., Arsih, F., & Sepriyani, E. M. (2021). Meta-Analysis : Science Learning Based on Local Wisdom Against Preserving School Environments During the Covid-19 Pandemic. *Journal of Biology Education*, *10*(2), 244–251.

Sari, I. K. (2021). Blended Learning sebagai Alternatif Model Pembelajaran Inovatif di Masa Post-Pandemi di Sekolah Dasar. *Jurnal Basicedu*, *5*(4), 2156–2163. https://jbasic.org/index.php/basicedu/article/view/1137

Satria, E. (2015). IMPROVING STUDENTS ' ACTIVITIES AND LEARNING OUTCOMES IN NATURAL SCIENCE IN CLASS V by USING SOMATIC AUDITORY VIS ... NATURAL SCIENCE IN CLASS V by USING SOMATIC AUDITORY. *ICOMSET*, 1–8.

Satria, E., & Sari, S. G. (2018). Penggunaan Alat Peraga Dan KIT IPA Oleh Guru Dalam Pembelajaran Di Beberapa Sekolah Dasar Di Kecamatan Padang Utara Dan Nanggalo Kota Padang. *Ikraith-Humaniora*, *2*(2), 1–8. https://journals.upi-yai.ac.id/index.php/ikraith-humaniora/article/view/109/44

Setiawan, A. A., Muhtadi, A., & Hukom, J. (2022). Blended Learning and Student Mathematics Ability in Indonesia: A Meta-Analysis Study. *International Journal of Instruction*, *15*(2), 905–916. https://doi.org/10.29333/iji.2022.15249a

Setiawan, T. H., & Pamulang, U. (2020). EFEKTIFITAS PENERAPAN BLENDED LEARNING DALAM MAHASISWA MELALUI JEJARING SCHOOLOGY DI MASA PANDEMI COVID-19. *Urnal Pembelajaran Matematika Inovatif*, *3*(5), 493–506. https://doi.org/10.22460/jpmi.v3i5.493-506

Shofiyah et al. (2020). Modul Dinamika Partikel Terintegrasi Permainan Tradisional Berbasis E-Learning untuk Meningkatkan Literasi Sains. *Jurnal Kependidikan: Jurnal Hasil Penelitian Dan Kajian Kepustakaan*, *6*(2), 292–299.

Studi, P., Ilmu, T., & Alam, P. (2019). Thabiea : Journal of Natural Science Teaching Efektivitas Pembelajaran Biologi Berorientasi Literasi Saintifik. *Thabiea : Journal of Natural Science Teaching*, *02*(02), 83–94.

Sudarsana, I. K., Nakayanti, A. R., & Sapta, A. (2019). *Technology Application In Education And Learning Process*. https://doi.org/10.1088/1742-6596/1363/1/012061

Suhaimi, Tomi Apra Santosa, S. A. (2022). Analisis Pendekatan Saintifik Dalam Pembelajaran IPA Selama Pandemi Covid-19 di Sekolah Dasar. *Jurnal DIDIKA : Wahana Ilmiah Pendidikan Dasar*, *8*(1), 92–101.

Suharyat, Y., Santosa, T. A., Yulianti, S., & Amalia, K. N. (2022). *International Journal of Education and Literature (IJEL) Literature Review : TPACK-Based Science Learning in Supporting Teacher Quality in Indonesia*. 2014–2020.

Sukiman et al. (2022). The Pattern of Hybrid Learning to Maintain Learning Effectiveness at the Higher Education Level Post-COVID-19 Pandemic. *European Journal of Educational Research*, *10*(3), 1075–1088. https://www.researchgate.net/profile/Suntonrapot-Damrongpanit/publication/356662582_Effects_of_Mindset_Democratic_Parenting_Teaching_and_School_Environment_on_Global_Citizenship_of_Ninth-grade_Students/links/61a6dda685c5ea51abc0f7b6/Effects-of-Mindset-Dem

Syarifudin, A. S. (2020). Impelementasi Pembelajaran Daring Untuk Meningkatkan Mutu Pendidikan Sebagai Dampak Diterapkannya Social Distancing. *Jurnal Pendidikan Bahasa Dan Sastra Indonesia Metalingua*, *5*(1), 31–34. https://doi.org/10.21107/metalingua.v5i1.7072

Turiman, P., Omar, J., Daud, A. M., & Osman, K. (2012). *Fostering the 21 st Century Skills through Scientific Literacy and Science Process Skills*. *59*, 110–116. https://doi.org/10.1016/j.sbspro.2012.09.253

Twiningsih, A. (2022). *EDUKATIF : JURNAL ILMU PENDIDIKAN Penggunaan Media Si Pagar Air Berbasis Blended Learning untuk Meningkatkan Keterampilan Literasi Sains di Masa Pandemi*. *4*(2), 2267–2274.

Williams, P. (2021). education sciences Higher Education. *Educ. Sci.*, *11*(494), 1–15.

Yudhana, S. (2021). *The Implementation of Blended Learning to Enhance English Reading Skills of*

Thai Undergraduate Students. *14*(7). https://doi.org/10.5539/elt.v14n7p1

Yusuf, M., Witro, D., Diana, R., Santosa, T. A., Alfikri, A. 'Alwiyah, & Jalwis, J. (2020). Digital Parenting to Children Using The Internet. *Pedagogik Journal of Islamic Elementary School*, *3*(1), 1–14. https://doi.org/10.24256/pijies.v3i1.1277

Zahro, I. F. et al. (2019). Strategi Pembelajaran Literasi Sains Untuk Anak Usia Dini. *Jurnal Ilmiah Potensia*, *4*(2), 121–130.

Zilhakim, P. &. (2022). Berbasis Blended Learning Terhadap Literasi Sains Siswa. *Jurnal Jendela Pendidikan*, *02*(01), 54–60.

Zulyusri, Asra Indah, T. A. S. (2022). Meta-analysis : The Effectiveness of Using Socio-scientific Issues on Science Literacy and Students ' Higher-Order Thinking Ability in Science Learning. *LITERACY : International Scientific Journals Of Social, Education and Humaniora*, *1*(2).