

Analysis of Blended Learning Model on *Digital Literacy Skills*

Maya Sari ^{a,b}, Muntholib Muntholib ^{a*}, Sri Rahayu ^a, Habiddin Habiddin ^a, Sumari Sumari^a

^a *Department of Chemistry, Faculty of Mathematics and Science, Malang State University
Jl. Semarang No.5, Sumber Sari, Kec. Lowokwaru, Kota Malang, Jawa Timur 6514, Indonesia*

^b *Chemistry Education, State Islamic University of Mahmud Yunus, West Sumatera*

**Corresponding author: muntholib.fmipa@um.ac.id*

Abstract

Blended learning is the same as hybrid learning, which combines the concept of traditional school teaching with online learning through personalized instruction for an entire group of students. The Systematic Literature Review follows the structure of the PRISMA framework (Preferred Reporting Items for Systematic Review and Meta Analysis). The literature search was carried out in the web database eric.go.ed under the keyword “Digital Literacy”. Based on the extraction, 40 articles were selected for analysis. The following results were obtained: (1) The research trend on the impact of digital skills on blended learning is still dominated by the social science field; (2) The inclusion of digital devices in blended learning is dominated by the use of LMS (Learning Management System); several studies have reported combining the use of LMS with metaverse devices such as augmented reality; (3) The analysis of the differences in digital skills before and after the Covid-19 pandemic can be seen based on the use of digital platforms.

Keywords: Systematic Literature Review; Blended learning; Digital Literacy

I. Introduction

Blended learning is a model that contributes by combining science technology, learning theory and instructional delivery in a learning framework [1]. The term blended learning has appeared since the 18th century, when the University of Chicago offered a correspondence-based distance learning program in 1892 [2]. This model is considered the first generation of blended learning. Nowadays, this teaching platform has been explored in many ways for assisting effective teaching and learning, including how it contributes to students' better performance such as high level of thinking [3]. As it evolved, blended learning underwent modifications and adaptations as digital technologies evolved. In the 2000s, the term “blended learning” was interpreted as lectures in which the amount of sitting in class was reduced. In fact, in 2008, 35% of universities worldwide offered blended learning services [4]. The next development was the term blended learning with the term learning that combines “face-to-face” with “online teaching” [4]. The controversial term blended learning is equated with hybrid learning, which combines the concept of traditional school teaching with online learning through

personalized instruction for an entire group of students [5]. Blended learning then emerged as a preferred choice in the learning process because blended learning not only provides more experience to students but also offers several other benefits that can be considered while applying this blended learning model such as: B. better accessibility and usability for students to access learning materials, improve the quality of learning and reduce learning costs [6]. Given the benefits and massive digitalization, it is predicted that the next blended learning model will include more ICT, which is why it is called “new normal blended learning”. Online teaching, email, teaching websites, interactive presentations, learning management systems and virtual devices that are increasingly being introduced into the learning process [5]. The dramatic changes that have occurred during Covid-2019 are fulfilling scientists' predictions. In an isolated context during the lockdown, students were forced into the online dimension of learning [7]. This phase is the starting point for the emergence of more sophisticated technologies in the blended learning model. It is reported that there are different types of technologies used, such as cloud development and interactive augmented reality or blended learning models with virtual reality media [6] The presence of digital technology in the blended learning model should also be able to improve students' abilities in certain aspects such as the competence to adapt, receive, design and find information on digital devices. This competence is interpreted as digital competence, which is closely related to the ability to understand and use digital technology in the continuity of life [8]. Digital competence is one of the 21st century skills that need to be trained and improved [9].

Digital literacy can make it easier for students to use information from different sources. Students who have the ability to search for information make it easier for them to learn independently [10]. Lee (2020) explains that digital literacy is the ability to understand and use information in different formats (text, images, audio, video and animation) from different sources presented through electronic devices [11]. Digital literacy can also be interpreted as the interests, attitudes and abilities of individuals to appropriately use digital technology and communication devices to access, manage, integrate, analyze and evaluate information, to build new knowledge and using intellectual and technical to create and communicate talent [8]. It can be concluded that digital literacy is inextricably linked to digital-based learning, including the blended learning model. Because digital technologies play a key role in blended learning, a certain level of digital literacy is required for students to learn effectively. From 2000 to 2013, 42 studies were reported on the effect of digital competence on various learning approaches, including 13 studies on the effect of digital competence on learning through blended learning [12]. Considering that the learning process has undergone significant changes during this period, associated with the dominance of digitalization of learning, this should also have an impact on digital skills. Therefore, it is important to look at the research demographics related to the impact of digital literacy on blended learning in the period 2014 to 2023 (RQ1) and to see how the developed blended learning

models impact digital literacy (RQ2) and most importantly see the comparison of digital literacy skills in blended learning before and during the literature period (RQ3). The problem formulation in this systematic literature review is: What are the research trends of blended learning worldwide in terms of academic fields and implications for digital devices? How is blended learning implemented to improve digital skills? How does blended learning impact digital skills before and after Covid 19?

II. Method

The Systematic Literature Review follows the structure of the PRISMA framework (Preferred Reporting Items for Systematic Review and Meta Analysis) [13]. The literature extraction steps are shown in Figure 1 below. The literature search was carried out in the web database eric.go.ed under the keyword “Digital Literacy”. This keyword resulted in a search for 3290 articles. Time range restrictions have been placed for the last 10 years. From this restriction, 2260 articles were obtained. Restrictions were made by removing articles that were only from research journals and then adding the keywords “digital literacy + blended learning” so that 812 articles were extracted. In addition, by adding the keywords digital literacy + blended learning + higher education and then removing articles not relevant to the problem formulation, 410 articles were extracted. Extraction was done again by searching based on the following reasons: (1) whether it is an internationally respected journal (Q1 to Q4); (2) whether the article is a type of experimental research; (3) whether the research uses experimental methods (quantitative and mix method), (3) whether the research variables are able to answer the problem formulation of the literature review. This extraction process resulted in the removal of 40 articles. However, due to the need for analysis, 2 articles in the form of systematic reviews were included back in the articles to be analyzed as they could answer the problem statement and were used as base data in the analysis of the literature review that would be developed. Based on this extraction, 40 articles were selected for analysis. In summary, the identity of the articles can be determined from the supporting information.

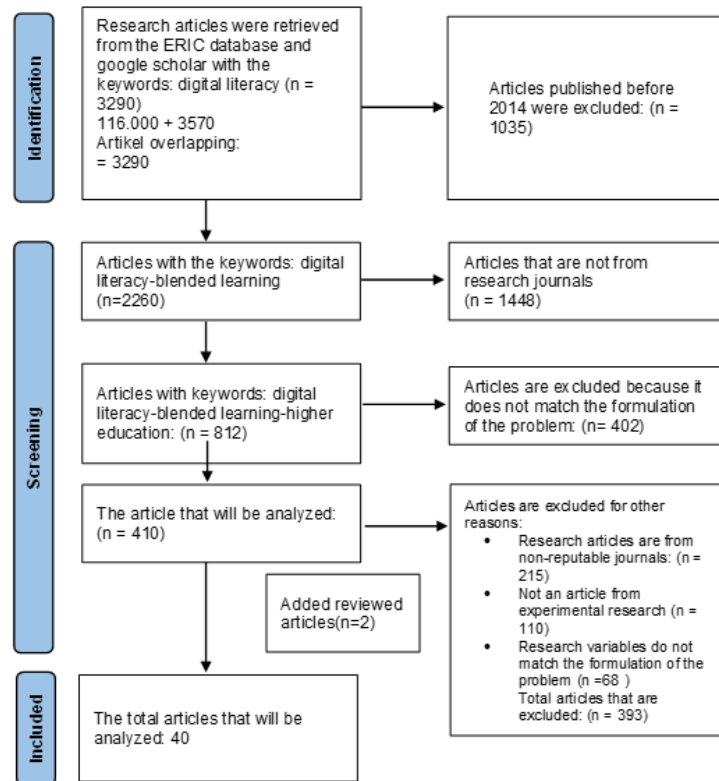


Figure 1. Literature Review Prism adopted from Worner

III. Results And Discussion

a. Research Trend on the Effect of Digital Literacy Skills on Blended Learning Globally

The research trend on the impact of blended learning on digital skills from 2014 to 2023 can be seen from several aspects, such as the academic areas involved and the digital tools integrated into the research. To see the aspects of scientific integration in the research trend, see Figure 2 below.

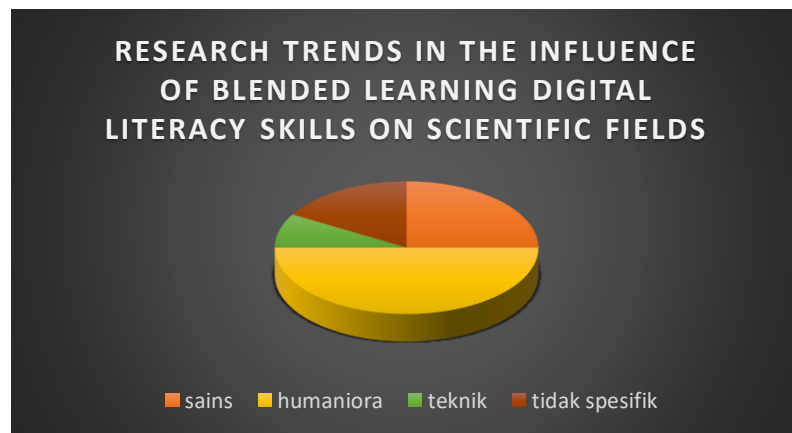


Figure 2: Blended Learning Research Trend against Scientific Fields

Figure 2 shows that over the last nine years, 53% of research on the impact of blended learning on digital skills was conducted in the humanities, 20% in the sciences, 13% in unspecified fields, and only 6% in engineering. The humanities field is dominated by English studies [14]–[16]. There are several other fields such as education [6], [7], [12], [17]–[20] and basic education [21]–[24]. In the field of natural sciences, research on blended learning is dominated by the study of life sciences [25][26] as well as the field of medicine [27] and MINT (natural sciences), technology, engineering and Mathematics). Only one study was found in the field of engineering[28] and the others did not specifically describe the scientific area studied [29]–[37].

Digital literacy is defined as the ability to engage critically with technological developments while developing a social awareness of how a range of factors, including commercial and cultural understandings, shape the way and use of technology to convey information and meaning can influence [38]. Digital literacy requires the ability to communicate and present knowledge in different contexts and for different audiences (visual, audio or textual). Based on this understanding, it can be hypothesized that the dominance of research related to the impact of digital skills on blended learning may be due to the limitations of recognizing the impact of digital skills in certain areas such as science with rigid scientific concepts. In addition, the demand for internships in the natural sciences poses a difficulty in implementing blended learning.

Blended learning is an educational style in which students learn through electronic and online media as well as regular face-to-face classroom instruction, allowing students to determine the time, pace and place of their learning [39]. The presence of digital devices to support online learning in the blended learning concept is a must. Figure 3 below illustrates the integration of digital devices into blended learning to see the impact of digital skills.



Figure 3. Data on the Integration of Digital Devices in Blended Learning to See the Effect of Digital Literacy Skills

Figure 3 shows that 46% of the research analyzed used a digital platform in the form of LMS (Learning Management System) for blended learning. The LMS used are very different, such as

Edmodo, Google Classroom, etc. However, there are also those that use personal resources. However, there are also those who use personal resources. There is also research that combines LMS with metaverse tools such as augmented reality. Interestingly, blended learning research from developing countries has not really utilized digital platforms in the application of blended learning. There are only Gmeet or Zoom Meet platforms, which are often used in blended learning. The concept of self-study combined with classroom study is still in demand.

b. The Implementation of Blended Learning to Improve Digital Literacy Skills

The implementation of blended learning varies around the world. The literature review found that some institutions have developed their own definition, language and typology[40]. These different definitions allow institutions to adapt and use the term according to the goals and objectives of their respective institutions. However, from the data in table 1 below, it can be seen that blended learning is preferred over fully online learning, although classroom learning is still the preferred choice [41].

Table 1.

Data on students' liking of the Learning Implementation

	Classroom learning		Online learning		Blended learning	
	N	%	N	%	N	%
Strongly not prefer	2	1.2	2	1.2	0	0.0
Not prefer	2	1.2	12	7.5	8	5.0
Maybe	37	23.0	44	27.3	50	31.1
Prefer	72	44.7	82	50.9	60	37.3
Strongly prefer	48	29.8	21	13.0	43	26.7
Total	161	100	161	100	161	100

Chun Meng Tang reported that there are three main percentages in the implication of blended learning based on the different terminology of blended learning as shown in Table 2.

Table 2.

Data on learners' favorability of online media engagement in *blended learning*

	Face to face meetings		Online interaction		Physical resources		Online resources	
	N	%	N	N	N	%	N	%
Not very effective	2	1,2	3	1.9	2	1.2	0	0
Not effective	1	0.6	15	9.3	14	8.7	9	5.6
Maybe	26	16.1	69	42.9	43	26.7	39	24.2
Effective	67	41,6	63	39.1	80	49.7	83	51.6
Very effective	65	40.4	11	6.8	22	13.7	30	18.6
Total	161	100	161	100.0	161	100,0	161	100

Table 2 shows that 78.5% preferred online resources, 52.1% preferred online course announcements, and only 47.9% preferred online assignment submission. It can be concluded that incorporating e-books, digital databases, audio or video webcasts is still the first choice rather than just using online

media to collect assignments. The implementation of blended learning will be very effective when combined with multiple learning techniques, as shown in Figure 4 [19].

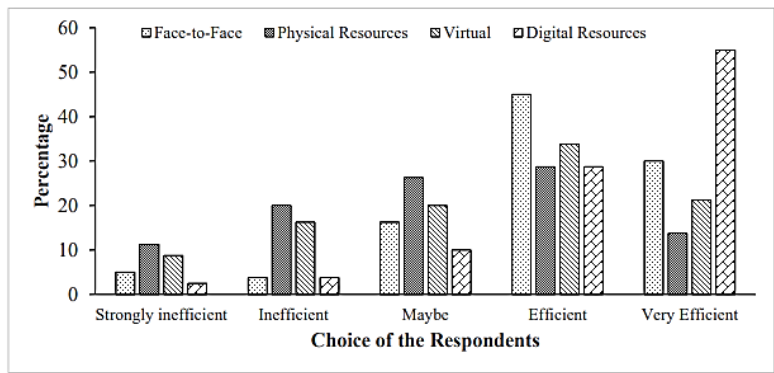


Figure 4: Respondents' Data on Choice of Blended Learning Implementation Techniques

Respondents believed that blended learning is best and most effective when there are learning components with the following percentages: Face-to-face meetings (75%) outperform online interactions (42.5%), and in terms of effectiveness, online Resources (83.75%) better. exceeded physical resources (42.5%). Blended learning involving digital devices can automatically support the improvement of digital skills. Digital literacy includes the ability to understand, analyze and evaluate various information received through digital platforms [11]. Thus, the impact of blended learning on digital skills can be analyzed, as shown in Figure 5 below.

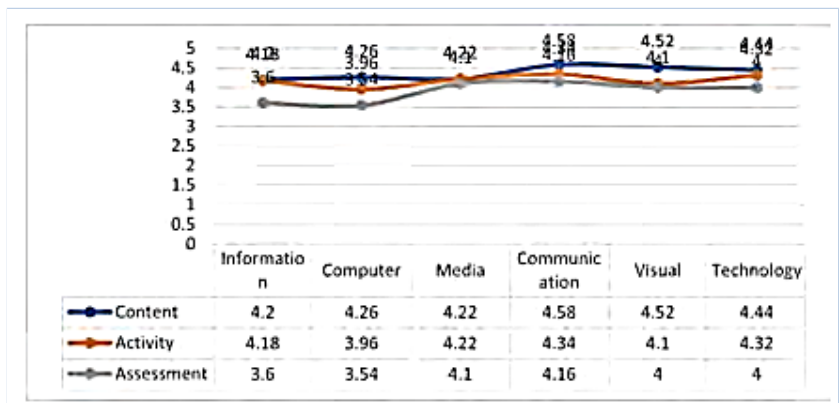


Figure 5. Aspect analysis data of the effect of *blended learning* on *digital literacy* skills

Based on the data in Figure 5, the content aspect has higher practical utility than the other components of the blended learning support system. It can be concluded that the blended learning platform can generally be used to improve digital skills if the aspects of content, activities and assessment are available in blended learning [8]. It has been found that the development of digital platforms supported by Metaverse devices can better improve digital skills [6]. It can be seen table 3.

Table 3.

Results of assessment analysis of learning outcomes using blended learning

Assessment issues	Level of appropriateness		
	Mean	S D	Interpretation
1. Inputs			
Learning objectives	4.78	0.44	Highest
Teacehers	4.67	0.50	Highest
Contents	4.33	0.71	High
Technology	4.67	0.50	Highest
Average input	4.60	0.54	Highest
2. Teaching and learning processes			
Preparation	4.56	0.65	Highest
Teaching and learning	4.57	0.63	Highest
Presentation and summary of learning results	4.67	0.52	Highest
Average teaching and learning process	4.60	0.60	Highest
3. Outcomes			
Learning achievement	4.47	0.73	High
Digital Literacy	4.67	0.50	Highest
Satisfaction	4.67	0.50	Highest
Average outcomes	4.59	0.58	Highest
Average outcomes	4.59	0.58	Highest
4. Feedback			
Learning achievement	4.67	0.50	Highest
Digital literacy	4.56	0.73	Highest
Expert opinions	4.78	0.44	Highest
Average feedback	4.67	0.56	Highest
Overall average	4.60	0.59	Highest

Thongkhane Southaboualy reported that one of the most important learning outcomes when using blended learning is digital literacy. The results in table 3 demonstrate that blended learning, supported by digital platforms and combined with augmented reality, can deliver the best assessment results for digital skills. It can be concluded that there is a clear connection between the complexity of digital devices and digital skills.

c. The Effect Of Blended Learning On Digital Literacy Skills Before And After Covid-19

The effect of blended learning on digital skills cannot be compared holistically. However, this can be seen by comparing the implementation of blended learning before and after Covid-19. The use of LMS as a supporting medium has increased significantly in blended learning after Covid-19. The combination model of face-to-face and online learning is no longer used as often because digital platforms allow it to take both aspects into account.

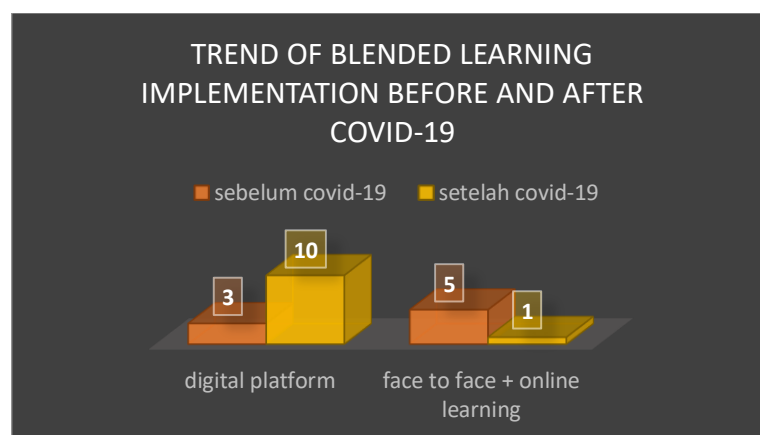


Figure 6. Trend of *blended learning* implementation before and after covid-19

The trend towards blended learning can be seen in Figure 6. The use of LMS as a supporting medium has increased significantly after the emergence of Covid-19 in blended learning. The combination model of face-to-face and online learning is no longer used as often because digital platforms allow it to take both aspects into account. This obviously impacts digital literacy skills. The improvement in digital skills can be seen from the fact that students find it easier to participate in online learning and solve all problems using digital devices [4].

IV. Conclusions

Based on the analysis, can concluded that the research trend on the impact of digital skills on blended learning is still dominated by the social science field, the inclusion of digital devices in blended learning is dominated by the use of LMS (Learning Management System); several studies have reported combining the use of LMS with metaverse devices such as augmented reality, the analysis of the differences in digital skills before and after the Co-19 pandemic can be seen based on the use of digital platforms. It is known that during and after the pandemic, the use of digital platforms has become more common than before the pandemic, where face-to-face meetings combined with online learning are still required. It can therefore be assumed that high use of digital devices also has an impact on digital skills.

References

- [1] A. G. Fegely, H. N. Hagan, and G. H. Warriner, "A practitioner framework for blended learning classroom inquiry-based virtual reality lessons," *E-Learning Digit. Media*, vol. 17, no. 6, pp. 521–540, 2020, doi: 10.1177/2042753020926948.
- [2] L. Fuller, "Negotiating a New Blend in Blended Learning: Research Roots.," *Inquiry*, vol. 24, no. 1, pp. 5–7, 2021.
- [3] L. M. Sulistiyani, H. Habiddin, and Y. Yahmin, "HOTS & Problem-Based Learning (PBL) with blended learning," *J-PEK (Jurnal Pembelajaran Kimia)*, 2022. <http://journal2.um.ac.id/index.php/j-pek/article/view/23688> (accessed Feb. 28, 2022).
- [4] C. Dziuban, C. R. Graham, P. D. Moskal, A. Norberg, and N. Sicilia, "Blended learning: the new normal and emerging technologies," *Int. J. Educ. Technol. High. Educ.*, vol. 15, no. 1, pp. 1–16, 2018, doi: 10.1186/s41239-017-0087-5.
- [5] J. Watson *et al.*, *Blended Learning: The Evolution of Online and Face to Face Education Fom 2008-2015*, no. July. 2015.
- [6] T. Southaboualy, P. Chatwattana, and P. Piriyaawong, "The Blended Instruction on Cloud via an Interactive Augmented Reality Technology Model to Enhance Digital Literacy," *High. Educ. Stud.*, vol. 11, no. 3, p. 144, 2021, doi: 10.5539/hes.v11n3p144.
- [7] Z. Yu, "Sustaining Student Roles, Digital Literacy, Learning Achievements, and Motivation in Online Learning Environments during the COVID-19 Pandemic," *Sustain.*, vol. 14, no. 8, 2022, doi: 10.3390/su14084388.
- [8] U. Rahmi, A. Azrul, and R. D. Mahande, "the Prototype of Blended Learning'S Support System To Improve the Pre-Service Teacher'S Digital Literacy," *J. Educ. Online*, vol. 19, no. 3, 2022, doi: 10.9743/JEO.2022.19.3.5.

- [9] N. Chaiyama, "The development of blended leaning model by using active learning activity to develop learning skills in 21st century," *Int. J. Inf. Educ. Technol.*, vol. 9, no. 12, pp. 880–886, 2019, doi: 10.18178/ijiet.2019.9.12.1321.
- [10] D. E. Silalahi *et al.*, *Literasi Digital Berbasis Pendidikan*. 2022.
- [11] A. Irhandayaningsih, "Pengukuran Literasi Digital Pada Peserta Pembelajaran Daring di Masa Pandemi COVID-19," *Anuva J. Kaji. Budaya, Perpustakaan, dan Inf.*, vol. 4, no. 2, pp. 231–240, 2020, doi: 10.14710/anuva.4.2.231-240.
- [12] F. M. Røkenes and R. J. Krumsvik, "Development of student teachers' digital competence in teacher education," *Nord. J. Digit. Lit.*, vol. 2014, no. 4, pp. 250–280, 2014.
- [13] S. Wörner, J. Kuhn, and K. Scheiter, "The Best of Two Worlds: A Systematic Review on Combining Real and Virtual Experiments in Science Education," *Rev. Educ. Res.*, vol. 92, no. 6, pp. 911–952, 2022, doi: 10.3102/00346543221079417.
- [14] R. Dashtestani and S. Hojatpanah, "Digital literacy of EFL students in a junior high school in Iran: voices of teachers, students and Ministry Directors," *Comput. Assist. Lang. Learn.*, vol. 35, no. 4, pp. 635–665, 2022, doi: 10.1080/09588221.2020.1744664.
- [15] N. Churchill, "Development of students' digital literacy skills through digital storytelling with mobile devices," *EMI. Educ. Media Int.*, vol. 57, no. 3, pp. 271–284, 2020, doi: 10.1080/09523987.2020.1833680.
- [16] T. J. Fola-Adebayo, "Perceptions of undergraduates on the relationship between exposure to blended learning and online critical literacy skills," *Read. Writ. (South Africa)*, vol. 10, no. 1, pp. 1–9, 2019, doi: 10.4102/rw.v10i1.200.
- [17] O. Demir, S. Akti Aslan, and M. Demir, "Examination of the Relationship between Teachers' Lifelong Learning Tendencies and Digital Literacy Levels," *J. Educ. Technol. Online Learn.*, vol. 5, no. 2, 2022, doi: 10.31681/jetol.1034697.
- [18] P. Dankers, J. Stoltenkamp, and T. Donson, "The Perception of Digital Academic Literacy Tutors during the COVID-19 Pandemic at the University of the Western Cape," *Int. J. Technol. Educ. Sci.*, vol. 6, no. 1, pp. 1–13, 2022, doi: 10.46328/ijtes.318.
- [19] A. Shahzadi, "Digital Literacy : An Insight Into Precondition For Blended Learning," no. April, 2022.
- [20] K. Cicha, P. Rutecka, M. Rizun, and A. Strzelecki, "Digital and media literacies in the polish education system—pre-and post-covid-19 perspective," *Educ. Sci.*, vol. 11, no. 9, 2021, doi: 10.3390/educsci11090532.
- [21] R. A. K. Dewi and K. Fatkhiyani, "Blended Learning: Can It Be a Solution to Improve Digital Literacy and HOTS for PGSD Students in a Pandemic Situation?," *Int. J. Elem. Educ.*, vol. 5, no. 4, p. 601, 2021, doi: 10.23887/ijee.v5i4.39411.
- [22] F. M. F. Fauzan, Fatkhul Arifin, Maulana Arafat Lubis, "Cypriot Journal of Educational Sciences (CJES)," *Cypriot J. Educ. Sci.*, vol. 10, no. 4, p. 2, 2015, doi: 10.18844/cjes.v10i4.154.
- [23] S. Wilkes *et al.*, "Measuring the impact of a blended learning model on early literacy growth," *J. Comput. Assist. Learn.*, vol. 36, no. 5, pp. 595–609, 2020, doi: 10.1111/jcal.12429.
- [24] C. McGuinness and C. Fulton, "Digital literacy in higher education: A case study of student engagement with e-tutorials using blended learning," *J. Inf. Technol. Educ. Innov. Pract.*, vol. 18, pp. 1–28, 2019, doi: 10.28945/4190.
- [25] M. Yustina, "The Effect of Problem - Based Learning Through Blended Learning on Digital Literacy of Eleventh-Grade Students," *J. Pendidik. IPA Indones.*, vol. 11, no. 4, pp. 567–577, 2022, doi: 10.15294/jpii.v11i4.38082.
- [26] B. J. Burkott, "D Igitall L Iteracy With Minoriy Students," *2018 HAWAII Univ. Int. Conf. STEAM - Sci. Technol. Eng. ARTS, Math. Educ. JUNE 6 - 8, 2018 PRINCE WAIKIKI, HONOLULU, HAWAII*, 2018.
- [27] C. M. Baker-Smith, E. Sood, C. Prospero, V. Zadokar, and S. Srivastava, *Impact of Social Determinants and Digital Literacy on Telehealth Acceptance for Pediatric Cardiology Care*

- Delivery during the Early Phase of the COVID-19 Pandemic*, vol. 237. Elsevier Inc., 2021.
- [28] B. Le, G. A. Lawrie, and J. T. H. Wang, "Student Self-perception on Digital Literacy in STEM Blended Learning Environments," *Journal of Science Education and Technology*, vol. 31, no. 3, pp. 303–321, 2022, doi: 10.1007/s10956-022-09956-1.
- [29] C. Wang and L. Si, "A Bibliometric Analysis of Digital Literacy Research from 1990 to 2022 and Research on Emerging Themes during the COVID-19 Pandemic," *Sustain.*, vol. 15, no. 7, 2023, doi: 10.3390/su15075769.
- [30] V. Prachagool, P. Nuangchalerm, and P. Yawongsa, "Digital Literacy of Pre-service Teachers in the Period Time of COVID-19 Pandemic," *J. Educ. Issues*, vol. 8, no. 2, p. 347, 2022, doi: 10.5296/jei.v8i2.20135.
- [31] M. Uygur, "Applications of blended learning method enriched by developing materials and their effects on students," vol. 14, no. 3, pp. 2229–2249, 2022.
- [32] M. Mailizar, K. Umam, and E. Elisa, "The Impact of Digital Literacy and Social Presence on Teachers' Acceptance of Online Professional Development," *Contemp. Educ. Technol.*, vol. 14, no. 4, 2022, doi: 10.30935/cedtech/12329.
- [33] J. Gault and J. Cuevas, "Uses of Blended Learning and its Impact in a High School Social Studies Classroom," *Int. J. Technol. Educ.*, vol. 5, no. 3, pp. 383–410, 2022, doi: 10.46328/ijte.247.
- [34] P. Tiernan, "Exploring digital literacy: How do undergraduate students evaluate digital video for inclusion in assignment work?," *Digit. Educ. Rev.*, no. 40, pp. 110–121, 2021, doi: 10.1344/der.2021.40.110-121.
- [35] D. L. Bell, "A qualitative investigation of the digital literacy practices of doctoral students," *J. Inf. Lit.*, vol. 15, no. 3, pp. 82–99, 2021, doi: 10.11645/15.3.2829.
- [36] V. Darlis and D. K. Sari, "The Effectiveness of Blended Learning: The Impact of Student's Characteristics and Digital Literacy on Student Performance," *Proc. 3rd Int. Conf. Educ. Dev. Qual. Assur. (ICED-QA 2020)*, vol. 506, pp. 561–566, 2021, doi: 10.2991/assehr.k.210202.097.
- [37] L. Y. C. Chun Meng Tang, "Digital Literacy: A Prerequisite for Effective Learning in a Blended Learning," *Electron. J. e-Learning*, vol. 14, no. 1, pp. 54–65, 2016.
- [38] C. H. and S. Payton, *Digital Literacy across the curriculum*. 2010.
- [39] K. J. Topping, W. Douglas, D. Robertson, and N. Ferguson, "Effectiveness of online and blended learning from schools: A systematic review," *Rev. Educ.*, vol. 10, no. 2, pp. 1–41, 2022, doi: 10.1002/rev3.3353.
- [40] B. Li, Q. Yu, and F. Yang, "The Effect of Blended Instruction on Student Performance: A Meta-Analysis of 106 Empirical Studies from China and Abroad," *Best Evid. Chinese Educ.*, vol. 10, no. 2, pp. 1395–1403, 2022, doi: 10.15354/bece.22.ar018.
- [41] A. K. Putra, Sumarmi, I. Deffinika, and M. N. Islam, *The effect of blended project-based learning with stem approach to spatial thinking ability and geographic skill*, vol. 14, no. 3. 2021.