

The Role of Digital Literacy in The IT-Mediated Learning: a Bibliometric Analysis

Khairuddin Ependi Tambunan¹, Tri Effiyanti^{2*}, Ali Fikri Hasibuan³, Gaffar Hafiz Sagala

{pagaraji@unimed.ac.id¹, trieffiyanti@unimed.ac.id², hasibuanalifikri@gmail.com³}

Faculty of Economics, Universitas Negeri Medan, Medan, Indonesia

Abstract. Online learning environments have become commonplace nowadays. The disruptive force of information technology (IT) in education has made learning more complex but also necessitates adaptation. IT integration will assist teachers in sharing materials, finding information, working on projects, quizzes, or games, collecting assignments, and various other activities related to the teaching and learning process in the classroom. Therefore, learning activities will become more challenging and require students to have adequate skills to follow online learning. The researcher suspects that students must have sufficient digital literacy to get an optimal learning experience from online learning. Based on a systematic literature review, this study explores the conception of literacy in education and its relation to student engagement. The results of the bibliometric analysis found influential literature in digital literacy, indicating that the conception of literacy and its meaning has evolved due to information technology innovation. Literacy can no longer be seen as the ability to read and write but more than as the skill to understand, sort, and convey information from various media sources, including text, images, audio, and video. In pedagogical practice, students must have digital literacy to experience the sensation of meaningful learning through digital technology-mediated learning. Therefore, digital literacy reflects the new nature of literacy, which is essential in maintaining student engagement in IT-mediated learning.

Keywords: digital literacy, online learning, bibliometric analysis

1 Introduction

Information technology (IT) disruption has affected all dimensions of life, including business activities and education. In the education sector, technology disruption must be addressed with effort. The essence of instructional design, which emphasizes valuable learning experiences for students, means that the availability of IT cannot simply be implemented in learning activities [1]–[3]. Special adjustments are needed for IT utilization to align with learning interests. Empirical studies have found that the massive intensity of IT use without thoughtful instructional design can increase boredom, weak engagement, and academic dishonesty in learning [4]. Indeed, IT integration is inevitable due to its massive availability and accessibility. Moreover, IT tools have great potential to improve the quality of traditional learning systems through information accessibility, interactive media delivery, collaborative platform services, and learning information system services [5], [6]. These developments and challenges have triggered responses from educational technology researchers. Some view IT disruption as a threat to traditional learning methods, while others see it as an opportunity to

enhance student engagement. These varying perspectives have led to a rich discourse on the topic [7]–[9].

The euphoria of digitalization cannot be absorbed without careful and reasonable management because the challenges present are commensurate with the resulting learning optimization opportunities [4]. Educational researchers and practitioners have proposed various concepts to construct the digital readiness of schools, teachers, and students, including digital literacy, computer self-efficacy, absorptive capacity, technical support, IT alignment, and a healthy knowledge management culture [5], [8], [10], [11]. However, this readiness is not enough to control the risk of learning engagement due to intense IT mediation and/or social loafing, free-riders, and even plagiarism due to the massive accessibility of information [12], [13]. These actions directly deprive students of learning experiences. This can result in misleading IT investments in educational entities. Instead of producing constructive learning for learners, digital transformation without digital literacy risks encouraging instant actions that ignore the learning process. Therefore, digital literacy needs to be taught curricularly to student teachers so that teachers are better prepared to implement IT-mediated learning. This is important in targeting two things, namely 1) controlling the digital orientation of teacher students so that it does not conflict with the principles of learning, and 2) preparing digital literacy in prospective teacher students so that they can design IT-oriented learning without ignoring the student learning experience.

In addition, measuring student engagement in online learning is essential due to the risks of integrating information technology into learning activities. Online learning media has limited interaction, communication, and concentration with long time allocation due to the mediation of technology itself. Moreover, online, face-to-face communication cannot produce the same sensation as offline face-to-face communication. Lecturers cannot face all students at once and simultaneously cannot respond to all conditions faced by students spontaneously. In addition, technical and network problems often make students unable to transmit images and can only transmit sound. Thus, there are many opportunities for disruption of learning activities by various extraneous variables. This condition makes controlling student engagement a vital variable to ensure that the online learning program effectively produces student learning activities. Therefore, students retain their learning experience even though it is implemented online. Education researchers need to explore the relationship between digital literacy and student engagement to determine the strategies to control student engagement in online learning. Therefore, based on a systematic literature review, this research seeks to investigate the conception of digital literacy and its relationship with student engagement.

Kuh [14] defines student engagement as the time and effort learners put into activities that are empirically related to achieving learning objectives. Activities that require learner engagement are ideally designed and prepared by education providers, including universities and lecturers. Carini et al. [15] suggest that student engagement is an excellent predictor of learning performance and personal development. This is because the more students desire to interact in learning activities, interact with teaching materials, respond to learning activities, and improve their learning methods, the greater the tendency to carry out intense and in-depth learning activities [15]. Thus, it's important to investigate and consider the role of student engagement as a controlling indicator of student learning activities, as it can make student gain valuable experience from teaching and learning activities.

2 Research Method

We used a systematic literature review (SLR). In SLR, this research uses bibliometric analysis and co-citation analysis to review published research related to digital literacy in the field of learning and learning registered in the Scopus database. Bibliometric and co-citation analysis are useful for generating knowledge maps and structures in a scientific study [16]. The formulation of this knowledge map and structure is important to identify relevant competencies related to digital literacy in education that are theoretically developed globally. Furthermore, co-citation analysis was used to trace the reference base of each literature collected from the publication database. Co-citation analysis helps researchers to identify linkages between past and recently published research [16]–[18]. Thus, SLR will help researchers to get theoretical justification of the urgency of digital literacy for teachers in IT-disrupted learning activities.

This research searches for scientific articles in the field of digital literacy and student engagement on the Scopus database with the following query : (TITLE-ABS-KEY (digital AND literacy) AND TITLE-ABSKEY (student AND engagement)) AND (LIMIT-TO (SUBJAREA, “SOC”) OR LIMIT-TO (SUBJAREA, “ARTS”)) AND (LIMIT-TO (DOCTYPE, “ar”) OR LIMIT-TO (DOCTYPE, “cp”)) AND (LIMIT-TO (LANGUAGE, “English”)). The search resulted in 534 related articles that were further used to analyze research trends and topic modeling in the field of digital literacy and its relation to student engagement. In this study, the documents collected were limited to scientific articles instead of books because scientific articles generally contain research findings in theoretical, qualitative, and quantitative studies. So the study of scientific articles tends to provide information related to the development of science and research related to the field under study. The demographics of articles collected from searches in the Scopus repository can be reviewed in Table 1 below.

Table 1. Demographics of Collected Articles

No.	Description	Results
<i>Main Information About Data</i>		
1.	Timespan	2001:2024
2.	Sources (Journals, Books, etc)	286
3.	Documents	534
4.	Annual Growth Rate %	18,44
5.	Document Average Age	5,35
6.	Average citations per doc	13,71
7.	References	20727
<i>Document Contents</i>		
8.	Keywords Plus (ID)	742
9.	Author's Keywords (DE)	1788
<i>Authors</i>		
10.	Authors	1254
11.	Authors of single-authored docs	155
<i>Authors Collaboration</i>		
12.	Single-authored docs	160
13.	Co-Authors per Doc	2,51
14.	International co-authorships %	9,176
<i>Document Types</i>		
15.	article	475
16.	conference paper	59

Based on the demographics of the collected articles, the collected articles have a publication range between 2001 and 2024. This data shows that topics related to digital literacy and student engagement have been researched in the last two decades. Furthermore, there are 286 publication *channels* in publishing articles related to this field and there are 534 documents collected. On average, there are 18.44 publications per year related to this field and the average age of publications is 5 years. Then, publications related to this field have an average citation of 13.71 times and the references used from all collected articles are 20,727 references. Based on the article content, there are 1788 keywords used by researchers. Furthermore, the authors involved in writing the collected articles were 1254 people with 474 collaborative authors. Thus, articles related to this topic are mostly researched collaboratively. In terms of document form, the collected articles consist of 475 articles published in scientific journals and 59 published in proceedings from scientific conferences.

3 Result and Discussion

Bibliometric data from the articles collected above could then analyzed using co-citation analysis (intellectual structure) and co-occurrence (topic modeling). However, this study focussing the analysis on co-citation analysis. Co-citation analysis is conducted to determine the intellectual structure of related articles that will help researchers understand related fields' knowledge structure. Co-citation analysis helps researchers understand the knowledge roots of the field, in this case, digital literacy and student engagement, so that, in turn, it can provide a comprehensive understanding of the field.

In general, the results of the co-citation analysis can be reviewed in Table 2 and Figure 1 below. In this study, researchers will describe the ideas of several articles that highly influence related fields. Furthermore, these views will be discussed to understand the relationship between digital literacy and student engagement. Strong influence can be seen from the betweenness centrality value of the articles detected in the co-citation analysis. The betweenness centrality value indicates a reference has centrality among two or more articles that cite it. The co-citation analysis found seven reference clusters in related fields with 39 primary references. Of these main references, 16 articles have a high betweenness centrality. Furthermore, the review and discussion of the results of this research will refer to the sixteen pieces of literature.

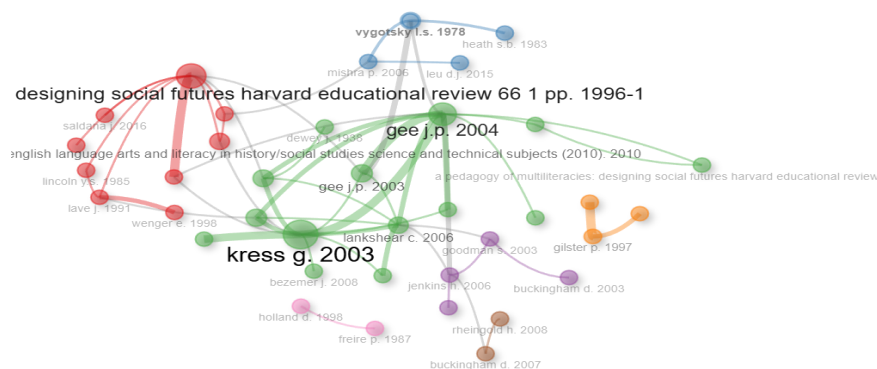


Fig. 1. Co-Citation Analysis

In the first cluster, the co-citation analysis detected five works of literature that strongly influence published articles in the field of digital literacy and *student engagement* and belong to cluster 1. The first article was written by a group of authors who are members of *The New London Group*. The title was "*A Pedagogy of Multiliteracies: Designing Social Future*" and was published in the *Harvard Educational Review*. The article discusses the connection between students and teachers' changing social environment and a new approach to literacy pedagogy called multiliteracies. The authors argue that the multiplicity of communication channels and increasing cultural and linguistic diversity in the world demands a broader understanding of literacy than the traditional view of literacy as only language skills (reading). The authors are also of the view that a multiliteracies development approach in pedagogical activities can help students achieve the literacy learning goals of access to linguistic skill development (comprehension of reading, context of reading, and communicating ideas) and sustaining the *critical engagement* necessary for students to design their social futures and achieve career success.

The second literature is the learning outcome indicators published by education standards bodies in the United States related to English language and literacy in history, social sciences, natural sciences, and engineering. The development of these standards aims to address literacy needs in K-12 education to help ensure students will be college and workforce-ready in terms of literacy before they graduate from secondary education. In this case, students must be able to read, write, speak, listen, and use language effectively in knowledge content in various areas or fields of study. Therefore, standards must be developed specifically so that literacy skills and related understanding in multiple disciplines can be prepared to meet the needs of higher education and career readiness.

Furthermore, the third literature is a *Book Chapter* written by Jean Lave titled *Situating Learning in Communities of Practice*. In this chapter, Lave [19] argues that a person will experience socio-cognitive activities often seen as purely *cognitive* in a social structure. Thus, he offers to consider the learning process as becoming a member of society that can develop students' identities as knowledgeable and skilled members of society from the learning process in schools. This process will involve the formation of motivation and meaning in cultural and theoretical views and demands student participation in cultural, historical, community, and cognitive analysis through communities of practice, learning processes, internalization, and knowledge transfer as *situated critique*. In this case, literacy leads to understanding the social conception of where students will live and have a career later.

The fourth literature is a scientific article by Rowsell et al. [20] titled "*Confronting the Digital Divide: Debunking Brave New World Discourses*." In this article, Rowsell et al. [20] question whether the younger generation as literacy learners have limitations due to weak technological accessibility. Digital literacy gives everyone constant access to technology, applications, videos, and social media, allowing anyone to explore, learn, and connect. However, this should not apply to everyone, especially children and adolescents. Rowsell et al. [20] concentrated their research on addressing the need for digital literacy in 21st-century learning in young people to develop their thinking and learning skills, as it is known that the level of digital literacy varies among learners, especially learners who are in poverty and have difficulty in accessing technology compared to their peers who have adequate economic capabilities. Therefore, normalizing the privileged situation in certain socio-economic conditions will disadvantage students in the lower middle class and disrupt the inclusiveness of technology-mediated education and learning.

Finally, for the first cluster, in the fifth literature, the co-citation analysis refers to a textbook by Brian V. Street (1984) titled "*Literacy in Theory and Practice*." In this book, Street [21]

proposes a new conception that corrects conventional theories about literacy. Street [21] offers a perspective that considers the diversity of literacy practices in various cultures, scientific fields, and academic communities that impact the development of a diversity of literacy practices in terms of understanding information, information delivery styles, and communication practices. The practical issues in literacy are observed through in-depth field studies conducted in Iran and the Department of Social Anthropology at the University of Sussex.

Table 2. The Result of Co-Citation Analysis

No.	Node	Cluster	Betweenness	Closeness	PageRank
1.	a pedagogy of multiliteracies: designing social futures harvard educational review 66 1 pp. 1996-1	1	137,5076923	0,004901961	0,071862457
2.	common core state standards for english language arts and literacy in history/social studies science and technical subjects (2010). 2010	1	14,6	0,004524887	0,020527985
3.	Lave J. 1991	1	37,70769231	0,003533569	0,033537189
4.	Rowse J. 2017	1	26	0,003322259	0,021338376
5.	Lincoln Y.S. 1985	1	0	0,002906977	0,018923654
6.	Shanahan T. 2008	1	0	0,002785515	0,011219165
7.	Street B.V. 1984	1	71,38461538	0,005235602	0,020652678
8.	Saldana J. 2016	1	0	0,002785515	0,011219165
9.	Wenger E. 1998	1	0	0,002283105	0,015504102
10.	Vygotsky L.S. 1978	2	178,6923077	0,005555556	0,029600899
11.	Heath S.B. 1983	2	0	0,002985075	0,014011674
12.	Mishra P. 2006	2	44	0,003333333	0,028314576
13.	Leu D.J. 2015	2	0	0,002197802	0,014887091
14.	Kress G. 2003	3	98,78461538	0,005	0,080772824
15.	Gee J.P. 2004	3	280,9	0,005847953	0,088426956
16.	Kress G. 2010	3	31	0,004424779	0,035271367
17.	Cope B. 2000	3	38	0,003676471	0,027101958
18.	Gee J.P. 2003	3	102	0,005154639	0,030116763
19.	a pedagogy of multiliteracies: designing social futures harvard educational review 66 1 pp. 1996-2	3	0	0,003115265	0,016406456
20.	Lankshear C. 2006	3	77,80769231	0,004878049	0,050195809
21.	Bezemer J. 2008	3	0	0,002816901	0,009269609
22.	Gee J.P. 1996	3	0	0,002985075	0,017370831
23.	Gee J.P. 2007	3	0	0,003115265	0,016406456
24.	Jewitt C. 2003	3	0	0,002816901	0,014591849
25.	Patton M.Q. 2002	3	0	0,003174603	0,017499125
26.	Charmaz K. 2006	3	0	0,003067485	0,009433712
27.	Dewey J. 1938	3	0	0,002624672	0,00971288
29.	Jenkins H. 2006	4	156,6153846	0,005319149	0,032996506

30.	Buckingham D. 2003	4	0	0,002570694	0,014746012
31.	Prensky M. 2001-1	4	0	0,002915452	0,014335157
32.	Goodman S. 2003	4	31	0,004273504	0,02794943
33.	Gilster P. 1997	5	1	0,1	0,038406828
34.	Lankshear C. 2008	5	0	0,066666667	0,017938427
35.	Bawden D. 2001	5	0	0,066666667	0,022602113
36.	Rheingold H. 2008	6	0	0,002688172	0,020645088
37.	Buckingham D. 2007	6	31	0,004608295	0,023573251
38.	Freire P. 1987	7	0	0,2	0,026315789
39.	Holland D. 1998	7	0	0,2	0,026315789

In cluster 2, two influential solid pieces of literature exist: Vygotsky [22] and Mishra & Koehler [23]. Literature written by Vygotsky [22] is a textbook entitled "Mind of Society: Development of Higher Psychological Processes." In this book, Vygotsky [22] explains the sociocultural theory of a person's cognitive development. Vygotsky [22] believes that the mind cannot be understood in isolation from society. Humans only use their minds to form conceptions of their world and the world around them. Vygotsky [22] explains the unique characteristics of humans and offers a hypothesis of how human nature is formed in terms of human history and how it is formed throughout a person's life. Vygotsky [22] believes that society provides a person with technologies that enable him to shape the profound processes of the mind. In *Mind in Society*, Vygotsky [22] applied this theoretical framework to developing perception, attention, memory, language, and play and tested its educational implications. The results have influenced education and learning practices, especially in child development, cognitive psychology, education, and modern psychological thought.

Furthermore, Mishra and Koehler [23] published the Technological Pedagogical Content Knowledge (TPACK) framework as a journal article. In this article, Mishra Koehler [23] proposed the TPACK conceptual framework as a theoretical foundation in the field of educational technology that extends the concept of PCK (Pedagogical Content Knowledge) proposed by Shulman [24]. Mishra & Koehler [23] argued that wise pedagogical practices in the utilization of technology in learning require the development of a complex formed from a strong combination of knowledge, referred to as TPACK. In this regard, Mishra and Koehler [23] positioned the complex role between the main knowledge components, namely content, pedagogy, and technology.

Furthermore, in cluster 3, there are six influential literatures, namely Kress [25], Gee [26], Kress [27], Cope [28], Gee [29], and Lankshear & Knobel [30]. Kress's (2003) textbook, "Literacy in the New Media Age." In his book, Kress [25] argues that screens have replaced books as the dominant communication medium. Even today, images have become the center of communication that exceeds writing. In this regard, Kress [25] considers the impact of a radical revolution that disrupts the relationship between writing and books. Kress [25] explores the changes that will impact literacy in the future by considering social, economic, communication, and technological factors. These changes will lead to the goodness or usefulness of information and communication technology and the democratic potential associated with the need and development of literacy.

Then, Gee [26], in a reference book entitled "Language in the Science Classroom: Academic Social Languages as the Heart of School-Based Literacy," in this book Gee [26] argues that there are differences in the meaning of how to translate or understand writing in different social and cultural groups, institutions, and social practices. So Gee [26] interprets literacy in a diverse sense. Literacy generally involves oral language with various gestures, interactions, and thinking processes that go beyond reading and writing [26]. In terms of

learning in schools, teachers need to pay attention to the acquisition of language in academic activities adapted to specific social practices, which prevail among learners and generally apply more than just reading and writing processes [26]. The process of reading and writing should be reinforced by the process of learning, interaction, language use, and disclosure related to the content learned so that students gain a strong understanding [26].

Then, Kress [25] wrote a scientific article entitled "The profound shift of digital literacies." In this article, Kress [25] proposes the concept of multiliteracy in addressing the development or evolution of digital technology. Kress [25] offers an approach to developing digital literacies by considering several factors, including 1) The rapid evolution of digital technology; 2) An emphasis on aspects of multimodality in digital communication; 3) A communication and interaction approach characterized by an emphasis on design that goes beyond 'writing' and 'reading.' This is important because children's use of screens has implications for using technological devices for pedagogical purposes [25]. As such, the forms and styles of writing need to be fully understood so that screens can encourage practical approaches to learning [25]. This is, of course, very different from the traditional way of reading. This hyper-textuality phenomenon is coupled with more extensive social changes, moving away from hierarchical structures and towards more lateral ones [25]. Therefore, if schools continue to use traditional semiotic and social characteristics, there will be a growing gap in the practice, understanding, and disposition toward knowledge [25].

Cope & Kalantzis [31] wrote a book chapter entitled "Multiliteracies: Literacy Learning and the Design of Social Futures" with the chapter title "Introduction: Multiliteracies: The Beginnings of an Idea." This paper addresses the issue of what to do in literacy pedagogy based on different national and cultural experiences and based on different fields of expertise. The focus is on the big picture of word changes and the demands of enacting different texts or content in particular workplaces, spaces, and dimensions of people's lives. Practically speaking, Cope and Kalantzis [31] draw on their experience in discussions related to the importance of immersion and explicit teaching, the different interests of experts in multimedia, workplace literacy, and cultural and linguistic diversity, and the issue of the extent of learning expectations and the ethos of particular workplaces.

Gee [29], is an article entitled "What Video Games Have to Teach Us About Learning and Literacy". Gee [29] takes an analogy of the learning process from machine learning applied in game development. A game must learn the gamer's characteristics and adjust the game challenge's difficulty level so that the game becomes fun and has many enthusiasts. This is translated by Gee [29] to produce engaging learning. Learning designers are faced with the challenge of solving engaging learning in terms of how to make students learn and master something with long time consumption and provide challenges so that students can enjoy it [29].

The last literature in cluster 3 is Lankshear & Knobel [30]. Lankshear & Knobel [30], an influential textbook in new literacies entitled "New Literacies: Everyday Practices and Classroom Learning." This book discusses the conception of new literacies and the challenges to how students think. So, students need a new form of literacy, more than just the ability to read and write. This is one of the responses to technological developments that impact media development in learning. In turn, Lankshear and Knobel [30] demand that new literacy learning be integrated into classroom learning. Therefore, teachers must update their learning design or pedagogical planning to meet students' new literacy needs.

In cluster 4, there are two influential literatures: Jenkins [32] and Goodman [33]. Jenkins [32] is a scientific article entitled "Confronting the Challenges of Participatory Culture: Media Education for 21st Century (Part One)". Jenkins et al. (2006) suggest that their article is the essence of a white paper from the Catherine and John Mac Arthur Foundation as part of their

Youth and Digital Learning initiative. Jenkins [32] explains how the opportunities and risks posed by the new participatory culture force us to reassess media education for the 21st century. In the next section, Jenkins [32] identifies an essential social and cultural skills framework as the foundation for new media literacy education.

Furthermore, Goodman [33] is a reference book entitled "Teaching Youth Media: A Critical Guide to Literacy, Video Production, and Social Change". For over twenty years, the EVC curriculum has intervened in this dynamic with introductory documentary workshops, advanced documentary internships, and professional development for teachers. With the goal of critical literacy, Goodman [33] posits that the ability to analyze, evaluate, and produce various forms of communication, whether print, audio, or visual, requires critical literacy. Critical literacy assists students in familiarizing themselves with unfamiliar living conditions [33]. Teaching Youth Media is a welcome addition to the study of teaching for social change in composition, education, and communication. This mission aligns with John Dewey's view of the importance of cooperative experiences that engage students in authentic work in education aimed at developing independent-minded and critical citizens capable of solving social problems. The development of critical literacy is, therefore, essential. Moreover, its successful implementation depends on the relationships between students and students, between students and teachers, and between students and society.

Finally, cluster 6 has one influential piece of literature, Buckingham [34]. This literature is a reference book edited by Buckingham [34] entitled "Youth, Identity, and Digital Media". The concepts presented align with those of Goodman [33] and Jenkins et al. [32]. The contributors to this reference book discuss how the development of digital media affects the development of young people's individual and social identities. This is important because young people are growing up in a world filled with digital media that has the potential to influence their sense of self and others. Such changes may affect their experiences as students, citizens, consumers, and family and community members. This book addresses the consequences of digital media use on young people's individual and social identities. The contributors explore how young people use digital media to share ideas and creativity and participate in small and large networks, local and global, intimate and anonymous, by considering whether they offer young people entirely new forms of engagement, interaction, and communication.

4 Conclusion

This study explores the conception of literacy in education and its relationship with student engagement based on bibliometric analysis with co-citation analysis. The results of the co-citation analysis in this study have found influential literature in digital literacy, indicating that the conception of literacy and its meaning have evolved due to information technology innovation. Based on the co-citation analysis, it was found that literacy can no longer be seen as the ability to read and write but more than as the skill to understand, sort, and convey information from various media sources, including text, images, audio, and video. In pedagogical practice, digital literacy skills are required as teacher and student competencies to produce meaningful learning sensations by utilizing complex learning media generally mediated by digital technology. Therefore, digital literacy is essential to maintain student engagement in IT-mediated learning.

Acknowledgement.

This research is funded by the fundamental research grant of BLU Unimed contract number 00299/UN33/KPT/2024.

References

- [1] M. Alawamleh, L. M. Al-Twait, and G. R. Al-Saht, "The effect of online learning on communication between instructors and students during Covid-19 pandemic," *Asian Educ. Dev. Stud.*, 2020, doi: 10.1108/AEDS-06-2020-0131.
- [2] R. Christensen and G. Knezek, "Validating a mobile learning readiness survey: Assessing teachers' dispositions toward adoption," *J. Digit. Learn. Teach. Educ.*, vol. 33, no. 4, pp. 148–159, 2017.
- [3] G. H. Sagala, A. F. Hasibuan, and J. Suhariato, "Readiness to Implement Digital Learning: An Issue from Faculty of Economics, Universitas Negeri Medan," 2021.
- [4] G. H. Sagala, A. F. Hasibuan, and T. Sriwedari, "Readiness, acceptance, and social presence in full online learning," *J. Kependidikan Penelit. Inov. Pembelajaran*, vol. 6, no. 1, pp. 68–79, 2022.
- [5] A. Naciri, M. A. Baba, A. Achbani, and A. Kharbach, "Mobile learning in Higher education: Unavoidable alternative during COVID-19," *Aquademia*, vol. 4, no. 1, p. ep20016, 2020.
- [6] Y. Sun, J. Strobel, and T. J. Newby, "The impact of student teaching experience on pre-service teachers' readiness for technology integration: A mixed methods study with growth curve modeling," *Educ. Technol. Res. Dev.*, vol. 65, no. 3, pp. 597–629, 2017.
- [7] M. A. Adarkwah, "'I'm not against online teaching, but what about us?': ICT in Ghana post Covid-19," *Educ. Inf. Technol.*, vol. 26, no. 2, pp. 1665–1685, 2021, doi: 10.1007/s10639-020-10331-z.
- [8] K. Jones and R. S. Sharma, "On Reimagining a Future for Online Learning in the Post-COVID Era," *SSRN Electron. J.*, 2020, doi: 10.2139/ssrn.3578310.
- [9] S. P.-L. Sim, H. P.-K. Sim, and C.-S. Quah, "Online Learning: A Post Covid-19 Alternative Pedagogy For University Students," *Asian J. Univ. Educ.*, vol. 16, no. 4, p. 137, 2021, doi: 10.24191/ajue.v16i4.11963.
- [10] T. Effiyanti and G. H. Sagala, "Technostress among teachers: a confirmation of its stressors and antecedent," *Int. J. Educ. Econ. Dev.*, vol. 9, no. 2, pp. 134–148, 2018.
- [11] M. Oliver, "What is technology," *Wiley Handb. Learn. Technol.*, pp. 35–57, 2016.
- [12] D. Bay and P. Pacharn, "Impact of group exams in a graduate intermediate accounting class," *Account. Educ.*, vol. 26, no. 4, pp. 316–334, 2017, doi: 10.1080/09639284.2017.1292465.
- [13] B. Maiden and B. Perry, "Dealing with free-riders in assessed group work: Results from a study at a UK university," *Assess. Eval. High. Educ.*, vol. 36, no. 4, pp. 451–464, 2011, doi: 10.1080/02602930903429302.
- [14] G. D. Kuh, "What student affairs professionals need to know about student engagement," *J. Coll. Stud. Dev.*, vol. 50, no. 6, pp. 683–706, 2009.
- [15] R. M. Carini, G. D. Kuh, and S. P. Klein, "Student engagement and student learning: Testing the linkages," *Res. High. Educ.*, vol. 47, no. 1, pp. 1–32, 2006.
- [16] H. Small, "Co-citation in the scientific literature: A new measure of the relationship between two documents," *J. Am. Soc. Inf. Sci.*, vol. 24, no. 4, pp. 265–269, 1973.
- [17] K. W. Boyack and R. Klavans, "Co-citation analysis, bibliographic coupling, and direct citation: Which citation approach represents the research front most accurately?," *J. Am. Soc. Inf. Sci. Technol.*, vol. 61, no. 12, pp. 2389–2404, 2010.
- [18] I. V. Marshakova, "Citation networks in information science," *Scientometrics*, vol. 3, no. 1, pp. 13–25, 1981, doi: 10.1007/BF02021861.
- [19] J. Lave, "Situated learning in community of practice," *Perspect. Soc. Shar. Cogn.*, pp. 63–82, 1991, [Online]. Available: http://www.udel.edu/educ/whitson/files/Lave_Situating_learning_in_communities_of_practice.pdf
- [20] J. Rowsell, E. Morrell, and D. E. Alvermann, "Confronting the Digital Divide: Debunking Brave

- New World Discourses,” *Read. Teach.*, vol. 71, no. 2, pp. 157–165, 2017, doi: 10.1002/trtr.1603.
- [21] B. Street, “The implications of the ‘new literacy studies’ for literacy education,” *English Educ.*, vol. 31, no. 3, pp. 45–59, 1997.
 - [22] L. S. Vygotsky, *Mind in society: The development of higher psychological processes*. Harvard university press, 1978.
 - [23] P. Mishra and M. J. Koehler, “Technological pedagogical content knowledge: A framework for teacher knowledge,” *Teach. Coll. Rec.*, vol. 108, no. 6, pp. 1017–1054, 2006.
 - [24] L. S. Shulman, “Those who understand: Knowledge growth in teaching,” *Educ. Res.*, vol. 15, no. 2, pp. 4–14, 1986.
 - [25] G. Kress, “Literacy in the new media age.” Routledge, 2003.
 - [26] J. P. Gee, “The new literacy studies: From ‘socially situated’ to the work,” *Situated literacies Read. Writ. Context*, vol. 2, pp. 177–194, 2005.
 - [27] G. Kress, *Multimodality: A social semiotic approach to contemporary communication*. routledge, 2009.
 - [28] M. K. Bill Cope, *Multiliteracies and*. 2000.
 - [29] J. P. Gee, “What video games have to teach us about learning and literacy,” *Comput. Entertain.*, vol. 1, no. 1, pp. 20–20, 2003, doi: 10.1145/950566.950595.
 - [30] C. Lankshear and M. Knobel, *New literacies: Everyday practices and classroom learning*. Open University Press, 2006.
 - [31] B. Cope and M. Kalantzis, “‘Multiliteracies’: New literacies, new learning,” in *Framing Languages and Literacies*, Routledge, 2013, pp. 115–145.
 - [32] H. Jenkins, “Confronting the Challenges of Participatory Culture – Media Education for the 21st Century (Part Two),” *Nord. J. Digit. Lit.*, vol. 2, no. 2, pp. 97–113, 2007, doi: 10.18261/issn1891-943x-2007-02-04.
 - [33] S. Goodman, *Teaching youth media: A critical guide to literacy, video production & social change*, vol. 36. Teachers College Press, 2003.
 - [34] D. Buckingham, *Youth, identity, and digital media*. the MIT Press, 2007.