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Sense-Making of Digital Literacy for Future Education Era: A Systematic Literature Review

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Abstract: Technological sophistication that continues to develop contributes to and is also integrated into education and learning. Conventional education and learning are shifting towards digital technology-based learning. Digital-based learning must undoubtedly be accompanied by skills and mastery of digital technology. Thus, this paper aims to describe and represent the sense-making elementary school students need regarding digital literacy to realize education in the future era. The method in this writing was a literature review by reviewing the relevant literature with the topic of discussion. The results revealed that the sense-making of education actors is the basic capital in digital-based learning. Therefore, the position of digital technology and digital literacy in education is central to realizing the success of education in the future era. Finally, the recommendations in this paper include (1) the need for regular training or programs related to sense-making of digital literacy so that education in the future era can be carried out optimally, effectively, and efficiently, and (2) further study and analysis are required in mapping the education system related to educational needs as a result of the impact of COVID-19 and education in the industrial revolution 4.0 era in the future.

Keywords: sense-making, digital literacy, elementary school

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Introduction

Technological sophistication that continues to develop contributes to and is also integrated into education and learning, for example, by using the TPACK framework, which can construct teacher knowledge in learning (Lai & Bower, 2019; Ifinedo, Rikala, & Hämäläinen, 2020). Conventional education and learning are shifting towards digital technology-based learning. The current learning process must focus more on a variety of learning media, such as using technology and developing thinking skills so that a monotonous and boring learning process does not occur (Amrita & Kuswanto, 2019; Fitriyadi & Wuryandani, 2021). Furthermore, it said that the use of information and communication technology in learning could increase the effectiveness in implementing the learning process, improve learning outcomes, motivation, interest in learning, learning achievement, and the quality of individual students in terms of utilization (Primamukti & Farozin, 2018; Sulthon, Pujiastuti, & Retnawati, 2021). The application of online-based learning with digital technology provides opportunities for students to generate interest and increase student competence to communicate, entertain, and learn the latest news and obtain a lot of broad information that encourages different perspectives of knowledge (Purnama et al., 2021; Jobirovich, 2021).

It is consistent with the educational transformation that continues to develop throughout the 21st century. This 21st-century education leads to education that can optimally empower technology. The Partnership for 21st Century Learning (www.p21.org) explains that one of the skills and competencies that individuals must have and an essential learning need is Knowledge, Media, and Technology skills, including Information Literacy, Media Literacy, Information Technology Literacy and Communication (ICT) (Gelen, 2018; Tohara, 2021). ICT literacy is unquestionably closely related to digital technology,

an absolute requirement for education actors. With digital literacy, the use of digital technology can be carried out optimally, positively impacting education.

In addition, digital-based learning needs to be accompanied by skills in mastering digital technology, usually known as digital literacy. Digital literacy is one of the basic literacy skills that students need to master in today's era. Digital literacy also refers to a person's understanding and mastery of using information and technology from various sources (Pangrazio, Godhe, & Ledesma, 2020). In this case, the availability of abundant information and technology must undeniably be gone together with good digital literacy. Digital literacy is the foundation for digital users to utilize digital technology more ethically. In Indonesia, the Ministry of Communication and Information (Kominfo) has collaborated with the Digital Literacy Activist Network (Japelidi) and the Siberkreasi National Digital Literacy Movement to launch the National Digital Literacy program to support the realization of digital literacy through four pillars: digital skills, digital safety, digital ethics, and digital culture as a wise reference for digitalization (Raharjo & Winarko, 2021; Pangestu, & Christin, 2022). Moreover, digital literacy is a concern of various parties, both the community in general and stakeholders in the field of education, so they have competent and responsive mastery of digitalization.

Launching the digital literacy program in a module with the title “model of digital media skills” is a form of the government's seriousness in realizing the digital literacy of the Indonesian people. However, it cannot be denied that digital literacy in Indonesia is still in the low category. The public's low interest in reading and writing indicates a technology literacy culture, who tend to prefer watching TV and listening to music and children who are not media literate can see their addiction to watching television shows, playing online games, chatting via social media, internet pornographic content, infotainment, to crime news is one indication of a literate culture is also still low (Asari et al., 2019; Purnawanto, 2021). Furthermore, the results of the digital literacy status survey conducted by the Ministry of Communication and Information Technology in 2020 showed that Indonesia had a digital literacy index value of 3.47, indicating that Indonesia was in the category of medium-level digital literacy and had not yet achieved good literacy status (http://tekno.tempo.co/read/2020). Based on the results, it can be concluded that the achievement of digital literacy has not been optimal and has not achieved a good literacy status.

For this reason, the urgency of digital literacy is a vital need to be considered in education. Digital literacy, or digital media literacy, is also starting to be recognized as one of the essential competency dimensions needed to live in the new media era (Jenson, Dahya, & Fisher, 2014; Sun, Wang, & Liu, 2017). In addition, today's society needs digital literacy (DL) not only to participate in and benefit from digital opportunities in society but also to reduce exposure to risks and threats in everyday digital environments (Hsu, Wenting, & Hughes, 2019).

Therefore, every individual needs various abilities, competencies, and skills to adapt to the technological era, especially the transformation in the education sector, because new technologies, their adoption, and adaptation have changed the entire educational paradigm (Reddy, Sharma, & Chaudhary, 2020). High digital literacy notes that digital literacy is the most important skill in utilizing technology or communication tools to access, organize, coordinate, estimate, and provide information in the community so that students gain benefits from dealing with online risks (Phuapan et al., 2016; Helsper and Smahel, 2020; Purnama et al., 2021). Hence, this paper aims to describe and represent sense-making in digital literacy for future education readiness and needs.

Methods

In reporting the results of this systematic review of the literature, the authors used the 2015 PRISMA statement. A systematic literature review (SLR) is a guide for enhancing reviews and meta-analyses (Rethlefsen et al., 2021). The PRISMA statement template describes the entire research process for selecting and rejecting articles in this SLR. This basic SLR study is limited to published literature on digital technology and digital literacy topics. The database used Google Scholar for literature extraction. The keywords used were "digital literacy" and "digital technology" in the search. The total database results show 68900. To further refine the effect, the internal search option is used. In a core search, the keyword “elementary school”, the database reduced the results to 23300. Results were narrowed after eliminating duplications and irrelevant literature, and the previous four studies were included for review. The authors independently select all articles. The number of related journal articles

is omitted and arranged according to topic and citation frequency. Figure 1 shows the detailed process of selecting data.

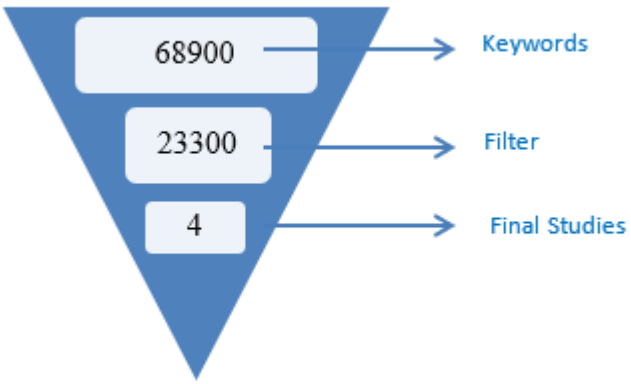

Figure 1. PRISMA Statement 2015

Results and Discussion

The speedy development of the digital technology era has become a key factor in increasing digital literacy. Over the last few decades, digital literacy has been used increasingly and discussed progressively, especially in policy documents related to digital literacy. The term digital literacy was first introduced in Paul Gilster's book *"Digital Literacy"* in 1997. Gilster's important work first defined digital literacy as the skills needed to navigate information critically in an increasingly digital world (Gilster, 1997). In addition, Fu (2013) explained that digital literacy is a set of skills needed by 21st-century individuals to use digital tools to support the achievement of goals in their life situations (Reddy, Sharma, & Chaudhary, 2020). Furthermore, digital media literacy focuses on the ability to access, analyze, or generate media messages in an unwritten mode provided by media communication technologies, such as films, video games, online media, and mobile, which is different from traditional media literacy (Dezuanni, 2003; Sun, Wang, & Liu, 2017).

The digital era also provides a wide and unlimited space for creativity. People can decide for themselves how they use and utilize digital technology. The purpose of digital literacy is to provide opportunities for each individual to develop the ability to use and be creative with digital technology and understand how digitalization affects individuals and society (Spante et al., 2018).

One theory that can explain the formation of digital literacy is the conception of Bawden (2008), which links digital literacy with computer and information literacy. If described in more detail, according to Bawden, the concept of digital literacy is composed of four components: basic literacy skills (reading and writing), background knowledge of information (intellectual level), skills in the field of ICT, and attitudes and perspectives on information (Bawden, 2008; Irhandayaningsih, 2020). Further, the Ministry of Communication and Informatics, *Siberkreasi*, and Deloitte provide a larger framework by offering four competency areas: digital skills, digital culture, digital ethics, and digital safety.

Digital skills are the individual's ability to know, understand, and use ICT hardware, software, and digital operating systems. Digital culture is an individual's ability to read, decipher, familiarize, examine, and build national insight, Pancasila values, and *Bhinneka Tunggal Ika* in everyday life. Then, digital ethics is the ability of individuals to realize, exemplify, adapt, rationalize, consider, and develop digital ethical governance (netiquette). Meanwhile, digital safety is an individual's ability to recognize, pattern, apply, analyze, and increase digital security awareness (Monggilo et al., 2020).

Meanwhile, the indicators of each of these competencies can be seen in the following table:

Table 1. Digital literacy competency areas and indicators by the ministry of communication and informatics, *siberkreasi*, and deloitte

Digital Skills	Digital Culture	Digital Ethics	Digital Safety
Basic knowledge about landscape digital – internet and virtual world.	Basic knowledge of Pancasila values and *Bhinneka Tunggal Ika* as the foundation of digital skills in cultural, national, and state life.	Internet etiquette (Netiquette).	Basic knowledge of hardware protection features.
Basic knowledge about the machine information search, how to use, and data sorting.	Digitization of culture through use of ICT.	Knowledge of information containing hoaxes, hate speech, pornography, bullying, and other negative content.	Basic knowledge of digital identity and personal data protection on digital platforms.
Basic knowledge about the application conversation and social media.	The basic knowledge that encourages behavior to love domestic products and other productive activities.	Basic knowledge of interacting, participating, and collaborating in the digital space under digital ethical rules and applicable regulations.	Basic knowledge of digital fraud.
Basic knowledge about the application digital wallet, market shop (market place), and transactions digital	Digital rights.	Basic knowledge of interacting and transacting electronically in the digital space under applicable regulations	Basic knowledge of digital track record in media (download and upload)).
			Minor safety (catfishing).

Source: Ministry of Communication and Information Technology, *Siberkreasi*, and Deloitte (2020)

Further, digital literacy is a fundamental competency in this digital era. To achieve the goal of digital literacy, an understanding is needed, especially in education and learning closely related to digital technology. In the following, a literature review on the sense-making of digital literacy in elementary schools is presented as a post-pandemic need and future era of education.

This study found "sense-making of digital literacy" results from 2017-2022. More details are displayed in Table 2 below.

1. Digital Literacy and Student Learning Experience

The presence of digital technology in education and learning is a big challenge in achieving today's educational and learning goals. The research of Sun, Wang, & Liu (2017) showed that digital media literacy education strategies could be adopted to instruct students in the knowledge of stop-motion films and further facilitate them to make short films in 100 minutes in primary education classrooms. In this regard, experiential exhibitions can provide opportunities as a new way to develop digital media literacy. This experiential exhibition effectively provides an informal digital media literacy learning experience and can be widely staged in basic education classes. The same was also found in research from Hsu, Wenting, & Hughes (2019), which revealed that learning outcomes were achieved by engaging students in creating multimodal, contextual, and interactive AR artefacts. Here, students were placed in a mixed learning setting, where they were encouraged to learn socially constructively. It is a curriculum design that allows students to engage in multiple AR creation projects of increasing complexity, which helps them practice and consolidate the knowledge and skills learned over time and across multiple projects.

The results of this study uncovered that today, educational institutions are making the necessary changes to teach in diverse ways, one of which is the use of asynchronous learning. Asynchronous learning works best and provides effective results in digital format (Daniel, 2020). The implementation of the learning system is also rapidly shifting. Teaching is ongoing from offline to online, affecting teaching and assessment methodologies. In addition, online teaching methods are adopted by some private schools, which are few taking online classes. In these schools, children take online classes. On the other hand, low-income private and state schools are closed completely and do not have access to e-learning solutions, which disrupts student learning. Also, parents face various problems due to this change in teaching methodology (Tarkar, 2020).

Moreover, many organizations have been forced to adopt new ways to work remotely using new digital communication systems and completely rethink their business and learning models to adapt to the realities of the COVID-19 environment that is still carrying on today (Dwivedi et al., 2020). The COVID-19 online education transformation has enormously impacted online education as almost all schools and universities are required to switch to 100% online modalities. For the IM field, it provides an opportunity to research best practices in IS discipline pedagogy, technology, and assessment to maintain the levels of engagement, personal connection, and attendance expected in a face-to-face classroom environment. These are necessary while maintaining academic integrity (Dwivedi et al., 2020). The current condition also gives students a new color to their learning experience by utilizing digital technology as part of their learning process.

2. Formation of Student Competence

This literature review related to sense-making in digital literacy also focuses on describing the formation of student skill competencies. The findings showed that experiential exhibitions allowed students to collaboratively reflect on and discuss media concepts in groups, which could also train students' communication skills (Sun & Liu, 2017). One of the findings also described a statistically significant increase in five areas of DL practice, comprising information management, collaboration, communication and sharing, creation and evaluation and problem-solving. However, the areas of ethics and responsibility did not develop in this DL learning practice (Hsu & Hughes, 2019).

Furthermore, DL facilitates students for the formation of student independence by providing fewer opportunities for students to search for learning resources from search engines independently and ensuring that students can only access positive content and avoid harmful content. In addition, students independently discuss positive and negative values in classroom learning to protect against harmful content. Another thing from the findings of this study is that in ICT classes, students are directed to learn productivity and creativity. Students' creativity in grades 1-3 is directed at image processing, while in grades 4-5, creativity is aimed at processing words, numbers, and sounds (Suwarto et al., 2022). Digital literacy also has a positive influence on online risk and student self-control. However, these findings confirm that digital literacy can affect online risk in children who behave in cyberspace, which suggests that some children have low self-control, resulting in high online risk. It is crucial, considering that in technological developments that continue to develop, children can freely access the internet anywhere and anytime (Purnama et al., 2021).

Conclusion

Creating sense-making in digital literacy for elementary school children is vital in preparing for future education. The learning experience of students equipped with DL also needs to be monitored and controlled to see the impact on the achievement of student competencies, especially elementary school students. Recommendations in this paper include (1) the need for regular training or programs related to the sense-making of digital literacy so that education in the future can be conducted optimally, effectively, and efficiently. (2) Further studies and analysis are required in mapping the education system related to educational needs because of the impact of COVID-19 and education in the 4.0 industrial revolution era in the future.

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