

Digital Literacy Skills in TVET: A Literature Study

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ARTICLE INFORMATION

Article History:

Received: 05-01-2023

Accepted: 10-04-2023

Keywords:

digital literacy;

TVET;

literature study

ABSTRACT

21st-century learning requires various abilities to adapt to the technological era because the digital information provided in this era is sometimes inaccurate. Therefore, students should be equipped with digital literacy skills. This study aims to determine the digital literacy skills of TVET students and the effects of digital literacy. In this study, we used a systematic literature review (SLR) with the PICOC method on data derived from the article literature. The results of the study show that digital literacy can improve critical thinking skills. IT literacy skills are also essential for adult life. Besides, digital literacy also influences student achievement and career planning. Accordingly, educational institutions must focus on improving digital literacy skills to help students gain successful career development.

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Technical and Vocational Education Training (TVET) equips students with the required professional skills for their future professional careers. The vocational school or training can be attended after someone graduates from the senior high school level for a better future professional career. However, we constantly face disparity between the talents demanded by employers and the skills of graduates or job seekers (N. S. Abdullah et al., 2020). Consequently, the TVET program in every country should be directed toward the expansion of the country's economy by providing professional development assistance for every individual through technology-based training (Studies & Technologies, 2017). TVET aims to assist people to be skilled and semi-skilled workforces. Besides, in the 21st century, people are demanded to have a work and life balance.

In addition, 21st-century skills are defined as a set of required skills for students learning and future professional careers, consisting of innovation, digital literacy, life, and professional career skills (Kateryna et al., 2020). Further, in the recent 21st century, we observed the substantial growth of a digital culture that encourages the usage of digital resources and communication devices, primarily in the field of education. (Perdana et al., 2019). These resources are expected to facilitate students expressing their ideas. Moreover, the transformation of the TVET program also requires skillful human resources capable of identifying 21st-century students and their environment.

In the attempt to meet the requirement of the world of work, we have to equip the workforce with suitable skills and knowledge. Thus, the vocational education system has to constantly adapt to the current need of the professional world and social lifestyle to facilitate students' skills development (Patmanthara & Hidayat, 2018). However, the majority of job seekers are incapable of fulfilling the criteria of the available job vacancies due to the gap between the TVET graduates and the demanded workforce. In the 21st century, most of the works necessitate problem-solving skills. Meanwhile, problem-solving skill is closely correlated with critical thinking, creativity, collaboration, and digital literacy skills. A previous study reported digital literacy as an essential skill to enhance professional and other substantial skills (Odoni et al., 2022).

In the learning process, digital literacy represents the use of technology devices, as well as the accurate management of information, critical thinking, and online behavior (Spante et al., 2018). Digital literacy enables individuals to use information and communication technology in identifying, evaluating, constructing, and communicating information, so it requires cognitive and technical abilities (Hassan & Mirza, 2021). Additionally, digital thinking covers the capacity to identify fake news, inaccurate information, and echo chamber (Sulzer & Sulzer, 2018). It is classified into three categories, namely (1) the use of technology devices; (2) cognitive skills (critical thinking and information management skills); and (c) social skills (communication socialization skills) (Tinmaz et al., 2022).

This study explored the concept, ability, and effects of digital literacy on TVET students globally. It specifically discusses aspects of the adoption and importance of digital literacy in the learning process. Further, we also investigate the level of students' digital literacy, including their condition and preparedness in the application of digital literacy in the learning process, as well as the effects of digital literacy on students' learning results and working preparedness.

METHOD

This study utilized a systematic literature review (SLR) approach to the scientific articles published in indexed journals. SLR is defined as a process of identification, evaluation, and interpretation of the research data to answer a specific research question (Latifah & Ritonga, 2020). It aims to gather evidence and a literature summary for answering a specific question. The data were garnered from scientific articles published in indexed journals and accessed from Internet searching on the Google Scholar platform.

Research Question

To identify the research question in SLR, we used PICOC design, with criteria of population, intervention, comparison, outcomes, and context. The summary of PICOC design for digital literacy is illustrated in Figure 1, while the research question is shown in figure 2.

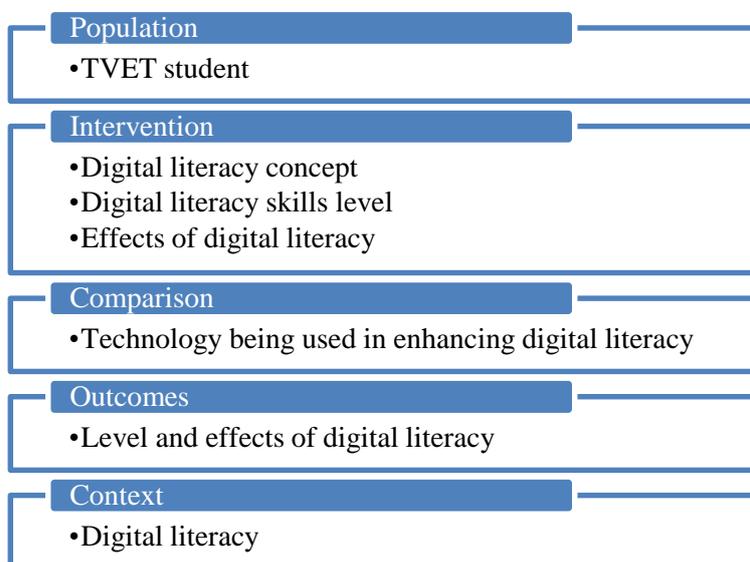


Figure 1. Summary of PICOC Design for Students' Digital Literacy

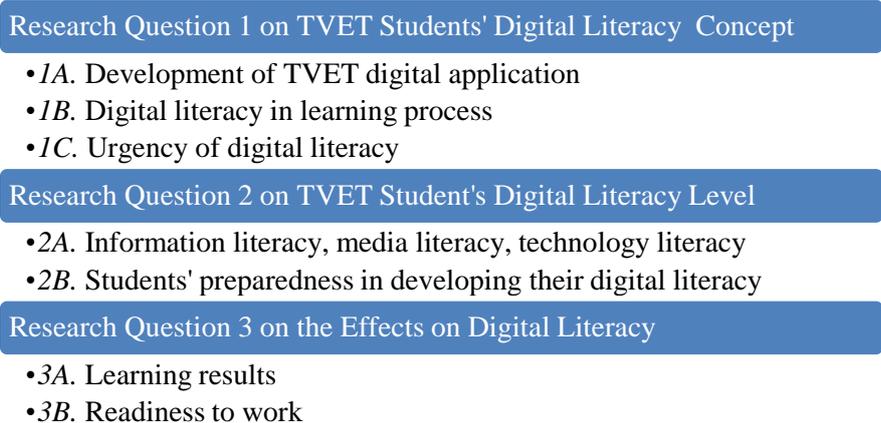


Figure 2. Research Question

Inclusion and Exclusion Criteria

In selecting the primary data sources, we used inclusion and exclusion criteria, as summarized in table 1.

Table 1. Inclusion and Exclusion Criteria

Inclusion Criteria	Studies on the concepts, levels, and effects of digital literacy
Exclusion Criteria	Studies discussing topics other than the concept, level, and effects of digital literacy

Identification Strategy

In finding the data resources, we used a number of stages. First, the initial identification through the Google Scholar database, using keywords of "development of digital application in TVET," "concept of digital literacy," "TVET students' digital literacy level," and "effects of digital literacy." Second, we improved the search results using the primary indexing database. Third, we recorded the results of searching. Fourth, we classified and categorized the scientific articles following the topic and types of publication. The screening results are presented in Table 2.

Table 2. Results of the Screening Process

No	Information Screening	Number of Articles
1	Unaligned title and abstract	21
2	Aligned title and abstract, but they are unaligned with the content	25
3	Selected articles	41
Total		87

RESULTS

In this SLR research, we found a number of articles examining TVET students' digital literacy. Although these articles were not covered in the inclusion criteria, they could be analyzed with several exceptions. The summary of obtained scientific literature discussing the concepts of digital literacy is presented in Table 3, while the summary of studies on the level of digital literacy and the effects of digital literacy are provided in Tables 4 and 5, respectively.

Table 3. Research Discussing the Concept of Digital Literacy

Authors	Purposes	Results
(Patmanthara & Hidayat, 2018)	To identify a significant difference between the control class implementing the conventional model and the experiment class using the blended learning model.	The blended learning model enhances the digital literacy of vocational high school students.
(Maurice & Nairobi, 2020)	To find the integration of digital literacy in the learning processes in the automotive engineering courses in the public and private TVET in Bungome, Kenya	Digital literacy presents substantial effects in automotive engineering courses, especially in students' collaboration and communication since students are big fans of digital media accessed through smartphones and laptops
(Proceedings et al., 2021)	The curriculum development strategies of TVET institutions in following the needs for human resources with great 21 st -century skills	The components of 21 st -century industry are system integration, the Internet of Things, digital literacy, and cyber security, combined with critical thinking, problem-solving, and communication skills
(Naidoo & Dawuwa, 2019)	Examine the practical implementation of Technology-Enhanced Learning (TEL) in the TVET college	TVET can be improved significantly through the integration of technology into the student's environment
(Azmi et al., 2018)	Development, as well as validity and usability of the TVET m-learning model based on the users' needs (device, users, and social)	This study successfully develops and validates the TVET e-learning
(Ismail & Hassan, 2019)	This study identifies the required technical skills in the industrial world to equip TVET graduates to face the future industrial revolution.	The technical knowledge of technology has to be adopted in the new curriculum to improve students' future development following the most recent technology transformation
(Ngware et al., 2022)	Examine the students' skills in a TVET institution in Kenya	In the 21 st century competition, a strategy to enhance the capability of the youth registered with low skills is necessary. However, many institutions have limited facilities, such as the absence of sophisticated laboratory

Authors	Purposes	Results
(Syaharuddin et al., 2021)	Describe the online learning and the suitable learning strategy for the student's learning experience in Banjarmasin, Indonesia	The learning should use media, such as videos, the Internet, and game-based learning like quizzes, to improve students' motivation
(Ana et al., 2021)	Identify the teaching strategies used in Indonesia and Malaysia during the Covid 19 pandemic	The Malaysian lecturers support the use of videos, audio, and real-time activities for asynchronous online courses. Meanwhile, the Indonesian lecturers argued that online learning enhances technology literacy, specifically in the learning evaluation.
(Yeap et al., 2021)	Investigate the demands in TVET programs and their challenges during the Covid-19 pandemic.	The students face issues with a poor internet connection, the usability of the learning platform, and the lengthy amount of time for the video-taking and preparation of online learning
(Ishak & Sukardi, 2020)	Describe the direction of vocational curriculum development, in the 4.0 industry, as the innovative curriculum for the vocational electrical engineering	The curriculum development should integrate the competence and new literacy relevant to the 4.0 industry

As described in Table 1, the digital literacy concepts contain the digital development, implementation of digital literacy in the learning process, and the importance of digital literacy. The integration of digital literacy into the 4.0 professional industry requires the mastery of 21st-century skills (Maurice & Nairobi, 2020; Naidoo & Dawuwa, 2019; Proceedings et al., 2021). The 21st century learning with blended learning improves digital literacy (Patmanthara & Hidayat, 2018). Meanwhile, 21st-century learning also uses technologies, such as videos and the Internet (Ana et al., 2021; Ngware et al., 2022; Syaharuddin et al., 2021). However, during the process of technology-based learning, a number of obstacles are reported, such as poor Internet connection (Yeap et al., 2021). In the TVET, the technology can be implemented through the construction of an e-learning model (Azmi et al., 2018). The inclusion of technical knowledge into the curriculum is necessary to equip students with knowledge related to technology advancement (Ismail & Hassan, 2019). Besides, curriculum development should be integrated with the 4.0 industry revolution (Ishak & Sukardi, 2020). Further, students with limited ability in operating technology mostly do not continue their studies, so they need a digital training program.

Table 4. Results of Digital Literacy Skills Level

Authors	Purposes	Results
(Jones-Jang et al., 2021)	Identify the initial evidence of the most relevant literacy in the context of fake news to improve the viewers' ability to identify fake news	Information literacy significantly improves the ability to detect fake news
(Lombardi et al., 2017)	Explore the psychometric of the IT literacy level through Envision Information Technology Literacy (EITL) scale	The IT literacy skills are relevant to various post-secondary school jobs and regulations, so those skills represent the important life skills
(Papier, 2021)	Examine the level of technology-based learning guided by the lecturers with minimum preparation and their responses to the management system to ensure that no students are left behind	The advancement of blended learning and distance learning develops the literacy skills of TVET students. However, during the pandemic, most of the TVET institutions have not been ready, willing, or capable of replacing interactive face-to-face pedagogy and using the technology-based technology
(Karani & Waiganjo, 2022)	The effects of Covid-19 and opportunities during the pandemic for instructors and students in TVET	Less fortunate students with low digital literacy skills tend to quit school and delay their study
(Mohalik & Sahoo, 2020)	Identify the readiness and digital literacy of teachers and students in online learning	There is an urgent need to provide training for students and teachers to help them prepare the digital knowledge and skills
(Chaka, 2019)	Explore and conceptualize literacy	Literacy can be included in the curriculum, showing students developing characteristics following the advancement of literacy
(Bolaños et al., 2022)	Identify teachers' knowledge in developing the digital skills	Development of digital skills should be enhanced through the classroom management process
(Byungura et al., 2018)	Find the level of familiarity with the technology of the freshman at the University of Rwanda	Students are unfamiliar with technology, and the smartphone is rarely used in the learning process
(Williams, 2020)	Understand the history and social contexts where they have adopted information and communication technology in the teacher education and development	The competencies and indicators of digital literacy have not been generally developed as they face challenges and normative changes during the learning process

Authors	Purposes	Results
(Diao & Yang, 2021)	Establish a guideline for vocational teacher development and increase the quality of communication and information technology learning	Teachers require information technology to fully use the technology potential and prepare their students to face their future
(Bolaños & Salinas, 2021)	Acquire the experience described by students from secondary TVET school in Chili concerning their ability to use and interact with information	Students experience from their interaction with information is the key to developing their digital information skills
(Vokshi et al., 2019)	Understand digital skills and prepare for reflective learning	The dimensions of digital competencies cover information literacy and data, communication, collaboration, creation of digital content, security, and problem-solving
(Utakrit & Saelee, 2017)	Accelerate the information and communication technology skills of the educational staff in the vocational school in Laos	All participants concentrate on integrating their creativity into the tasks throughout the information and communication technology training
(Arfandi et al., 2022)	Investigate the mathematic students' digital literacy profile in relation to their learning motivation	The usage of technology can aid teachers in presenting knowledge in a more efficient means and facilitate students to attain the learning purposes

Table 2 describes research question 2 on digital literacy skills, which covers information literacy, media literacy, and technology literacy. These literacy skills should be integrated into the curriculum to expand students' skills following the advancement of literacy (Chaka, 2019). Information literacy facilitates individuals to identify fake news (Jones-Jang et al., 2021), while digital skills are always relevant to abundant types of jobs (Lombardi et al., 2017). Accordingly, the digital skills of teachers should be continuously sharpened as they help students prepare for their future. Digital literacy skills can be improved through students' experience (Bolaños et al., 2022; Bolaños & Salinas, 2021; Diao & Yang, 2021). However, the blended and distanced learning practiced during the pandemic gave minimum preparation time for teachers and students to carry out technology-based learning (Karani & Waiganjo, 2022; Mohalik & Sahoo, 2020; Papier, 2021). Besides, students have minimum familiarity with technology, so the digital literacy development programs have not been carried out maximumly and encounter numerous issues (Byungura et al., 2018; Williams, 2020). Meanwhile, another study reported that digital competency consists of information literacy, digital content creation, and problem-solving skills (Vokshi et al., 2019). Further, the activities involving the usage of communication and information technology improve students' creativity and help students attain their learning objectives (Arfandi et al., 2022; Utakrit & Saelee, 2017).

Table 5. Research Results on the Effects of Digital Literacy

Authors	Purposes	Results
(Odoni et al., 2022)	Investigate the influencing factors of digital literacy skills for the future professional job	There are four important components for the successful integration of information and communication technology into TVET, namely the pedagogical, strategic, organization, and technical preparedness
(N. S. Abdullah et al., 2020)	Examine differences between the life and career skills of the TVET students in various departments in Malaysia	The higher education institution has to carry out greater attempts to enhance students' 21 st -century skills, including digital literacy skills, to help them successfully attain a job
(Odoni et al., 2020)	Explore the influence of gender in the access to and results of the training program, along with the sustainable development competency in the TVET institutions in Kenya	We observe disparities based on gender in literacy, functional numeracy, and the use of digital or technology devices
(Soeprijanto et al., 2022)	Scrutinize the direct and indirect influence of digital literacy, self-awareness, and career development on the prospective TVET teachers' achievement	Digital literacy carries a significant and direct influence on students' learning achievement, along with an indirect influence on students' career planning

Authors	Purposes	Results
(Choudhary & Bansal, 2022)	Explore the possible challenges that affect the effectiveness of digital literacy training on a different level	Digital literacy training presents no authentic results. Thus, future employers are suggested to conduct digital literacy training to help resolve the relevant challenges and problems
(Comyn, 2018)	Analyze the primary SDG changes that possibly affect the TVET	Technical and vocational skills for the proper professional future career can be placed into the global indicators to measure the proportion of youth and adults with communication and information technology
(Yaakob et al., 2020)	Identify the role of communication and information technology in the future of the Malaysia TVET education program	The TVET education program should follow the demands of the 4.0 industry to ensure that they remain relevant and competitive for the candidates of student
(R. N. Abdullah et al., 2019)	Identify students learning experience using transformative learning that adopts modern learning with the conventional method	Students learning results are affected by the material delivery and the usage of learning media combined with the mixed usage of technologies in the learning process
(Ramadhan et al., 2021)	Investigate the effects of the e-learning model during the COVID-19 pandemic in State Vocational High School 5, Bandung, Indonesia	The quality of e-learning videos affects students' learning results
(Aina & Ogegbo, 2022)	Explore teachers' experience during the transition from traditional to virtual learning	The use of virtual learning enhanced with technology devices improve learning results, knowledge skills, and digital literacy skills
(Raji, 2019)	Explore the effects of the computer-based learning program in facilitating students' vocational learning	Improvement on the TVET program can be carried out using computer-based learning to fill the discrepancy between the recent mastery and the demanded workforce for the private employers
(Syifa et al., 2021)	Predicts the needs of technical facilities and infrastructures, observed from the needs of current technology advancement	The students have to be trained in using software and hardware to ensure that the graduates can compete in the job market
(Mukwawaya et al., 2018)	Explore the preparedness of South Africa to implement the 4.0 industry	Adoption of STEM learning and digital skills development programs, in a comprehensive manner from primary school to college level, equip students with the skills and create work structure based on the 4.0 industry environment
(Winda & Lukito, 2022)	Examine the effects of <i>digital skills</i> , <i>industry 4.0 skills-sets</i> , and instructors' competencies on training participants' readiness to work in BLK Padang in facing the future work field	Through digital skills and the 4.0 industry, the skillsets of the workforce and graduates can help them face every possibility in their future career
(Yoto et al., 2022)	Juxtapose the learning activities with the real work life situation through the internship programs	In the 21 st century, the business and industries tend to need creative workforces with great digital, technology, and humanity literacy
(Phan et al., 2020)	Identify the information technology competencies frameworks to communicate, regulate, and assess the online learning	For the best learning results, the online learning environment should provide features that facilitate students' interaction and collaboration to establish a great learning environment

Table 5 summarizes the results of research question 3 on the effects of digital literacy. The successful integration of communication and information technology in the preparedness of pedagogical, technical, and strategic preparation has been reported in a previous study (Odoni et al., 2022). Technical and vocational skills development with information and communication information skills is necessary to maintain the relevance and competitiveness of the TVET program in gaining prospective students (Comyn, 2018; Yaakob et al., 2020). Digital skills development should be provided for students since the 21st century requires skillful human resources (Raji, 2019), so by equipping students with 21st-century skills (including digital literacy), we help them to successfully get jobs (N. S. Abdullah et al., 2020). Further, digital literacy is reported to influence students' learning results (Soeprijanto et al., 2022). The online learning environment should facilitate students to students interaction to realize an excellent learning environment and results (R. N. Abdullah et al., 2019; Phan et al., 2020; Ramadhan et al., 2021). A gender gap is observed in digital literacy competencies (Odoni et al., 2020). Besides, digital literacy training has not presented real evidence, so a new digital literacy training program is necessary to resolve the issue (Choudhary & Bansal, 2022). The computer-based learning program facilitates the solvency of gaps in the work demand (Raji, 2019).

DISCUSSION

From the analysis focusing on the first to the third research question, we concluded that digital literacy is a component of 21st-century industrial skills that mediates the attainment of critical thinking, problem-solving, and communication skills. Learning with technology, video, and internet connection is also proven to establish students' motivation. Consequently, technology should be adopted into the curriculum to help students adapt to the changes in technology. Besides, the curriculum design should also be integrated with new literacy and competencies relevant to the 4.0 industry. Information technology skills also become essential skills in adult life. The advancement of blended and distanced learning, along with students' learning environment, expands their digital literacy. Thus, students who are unfamiliar with technology will encounter problems during digital literacy learning.

In addition, digital literacy is observed carrying effects on students learning achievement and career planning. In enhancing students' learning results and digital literacy skills, teachers may use virtual learning. Besides, educational institutions have to present greater attempts to expand students' digital literacy skills as it will facilitate students to get jobs in the future. However, digital literacy training has been found giving no significant effect in helping students gain a future job, so a new digital literacy training program is needed. Through digital skills, human resources and graduates are equipped to face any future professional career issues. In the 21st century, businesses and industries need skillful workforces with great digital, technology, and humanity literacy.

In the field of technology, digital literacy is correlated with the technology user's skills, including the capacity to use technology in the most efficient ways to realize positive interaction and communication. Greater technology advancement is followed by a higher chance of information misuse. Thus, we profoundly need digital literacy understanding in this recent technology era. Digital literacy covers the skills in media literacy, which is the ability to understand and identify various forms of online and printed media, as well as the ways to use them. It also includes technology literacy, which represents the skills in comprehending the elements related to technology and the means to use technology, along with technology ethics.

Prior to the digital era, learning is carried out using the conventional approach. In conventional learning approaches, the activities are mainly teacher-centered, so the communication is only from teachers to students. Besides, it focuses merely on conceptual understanding. However, this approach is deemed to be effective in building initial understanding for students. Figure 3 illustrates the stages of conventional learning.

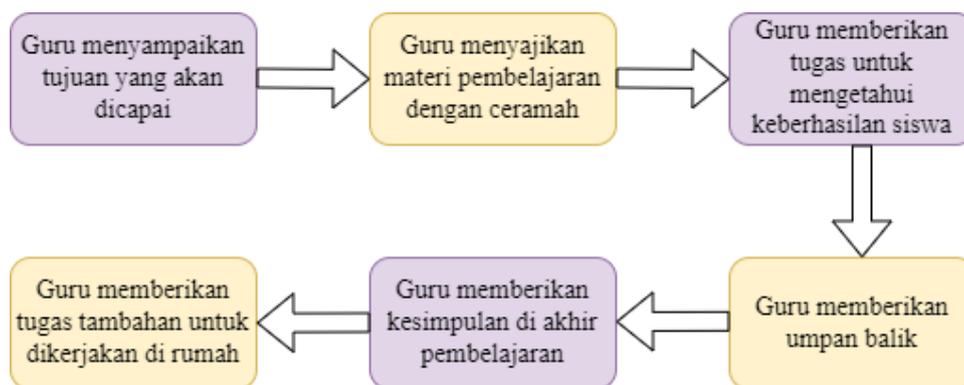


Figure 3. Stages of Conventional Learning

In the recent digital era, information and communication technology have rapidly progressed, even after the Covid-19 pandemic. Consequently, in the field of education, digital learning has been massively carried out, involving the innovative usage of digital technology and devices during the learning process. This learning is commonly known as e-learning. Digital learning using technology devices has been observed to be effective in promoting students' learning experience since it facilitates accessible access to learning content and instructions from anywhere and at any time. The stages of digital learning are presented in Figure 4.

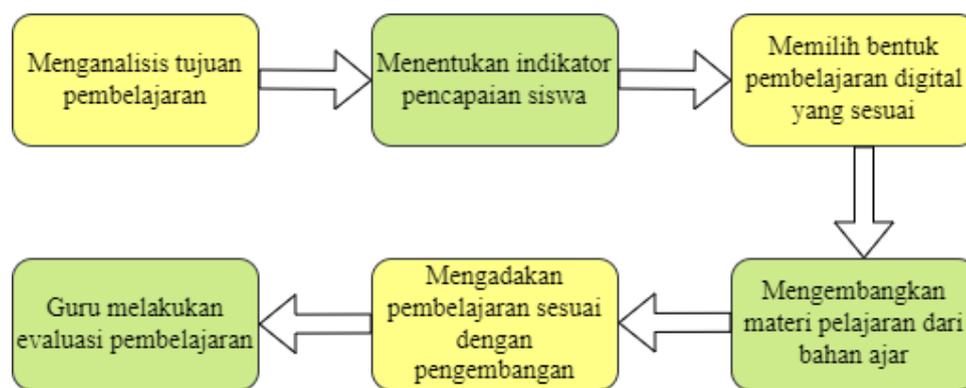


Figure 4. Stages of Digital Learning

CONCLUSION

The results of our systematic literature research on scientific articles published from 2017 to 2020 suggested the influence and increase of digital literacy on the learning process. 21st century learning, which focuses on the development of students' literacy, has been reported to enhance students' critical thinking, creativity, communication, and collaboration skills. Thus, digital literacy should be adopted into the curriculum to aid students and teachers in keeping up with the most recent development. During digital literacy learning, students also may encounter fake information, so the progression of students' digital literacy skills is essential to help them avoid fake information. Besides, media literacy represents someone's capacity to use various types of media in garnering and accessing information. Further, digital literacy also enhances students' 21st-century skills mastery which facilitates their success in learning and preparing for their future jobs. Future studies should focus on the newest digital technology advancement and the results of already implemented digital literacy programs.

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