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An analysis of digital literacy skills of high school students in biology

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ABSTRACT

Digital literacy is a crucial skill for understanding information from various sources, such as the use of the internet and other digital media as a learning resource. Navigating the internet is an important skill to master to keep updated with the development of information and communication technology in the era of Industrial Revolution 4.0 and to master one of the 21st-century skills. Skills that someone should have in digital literacy include internet searching, hypertextual navigation, evaluating information, and synthesizing information. This study aims to determine the digital literacy skills of tenth-grade high school students in biology class. The research method follows the quantitative descriptive method. The population and sample were 62 tenth-grade high school students. The data collection technique is in the form of questionnaires focusing on four aspects of digital literacy. The results indicate that the digital literacy of tenth-grade high school students with an average score of 44% is in the fair category. Meanwhile, the results for each aspect of the digital literacy indicator obtained different scores, namely internet searching at 47% (fair), hypertext navigation at 27% (fair), evaluating information at 40.32% (fair), and synthesizing information at 60.48% (good). This research suggests how stakeholders can issue policies as a basis for improving students' digital literacy to support the learning process focusing more on 21st-century skills.

Keywords: Biology class, digital literacy, high school students

INTRODUCTION

The use of technology in the COVID-19 pandemic has changed the mindset and habits of the Indonesian people, who had been accustomed to being conventional, gradually changed and began to get used to utilizing technology-based platforms, both those provided by the government and the private sector.

This change has a positive impact on the world of education, of course, where educators and students are expected to be able to use technology well. This is in line with a person's ability to manage information and communication technology, which is one of the abilities expected in 21st-century skills.

In realizing 21st-century skills, educators and students have not yet utilized information and communication technology optimally, whereas according to the Minister of National Education Regulation, No. 16 of 2017 concerning public information services within the Ministry of Education and Culture explains that one of the pedagogical competencies of a teacher is being able to utilize Information and Communication Technology (ICT) or digital devices for learning purposes.

Mastering information and communication technology requires a literacy competency. Literacy is needed to improve 21st-century skills, and one of the literacies needed is digital literacy. Digital literacy is a person's ability to help that person understand and use information that develops in various formats originating from various digital sources on the internet (Fauzi & Usmeldi, 2022).

Digital literacy is needed to provide knowledge to students and teach them how to socialize digitally and digital security so that they are expected to be able to have an understanding of navigating the digital world safely and confidently. This digitalized interaction creates a new condition known as cyberspace so that social

interaction can occur anywhere and at any time, making it easier for someone to interact and communicate.

This digital transformation must develop in the world of education, especially for students so that 21st-century competencies can be realized in students. However, in Indonesia, people are not ready to undergo this digital transformation. This problem can be seen from the low level of digital literacy in society, with hoax information, hate speech, ethnicity, religion, race, and intergroup issues. The low digital literacy of the Indonesian people can also be seen from the results of Indonesia's ranking, which is ranked 56th out of 63 countries in the 2019 World Digital Competitiveness ranking (Rochadiani et al., 2020). A similar study was also carried out by observing digital literacy movement patterns in nine large cities such as; Jakarta, Surakarta, Makassar, Yogyakarta, Salatiga, Semarang, Bandung, Banjarmasin, and Bali, and the study revealed digital literate in Indonesian society. This research proves that a person's low digital literacy skills will result in the spread of hoaxes, cyberbullying, hate speech, and terrorism (Rahmawan et al., 2019)

Easy access to many sources in digital form also has an impact on how easy it is for students to learn. However, it is also important to be concerned about accessing information in that a lot of information cannot be verified without including a clear source of information. This can also be seen from the lack of student literacy regarding students' understanding of using the internet as a learning resource. According to a study, it is stated that poor digital skills can cause psychological disorders in adolescents, namely in their attitudes and character (Pratiwi & Pritanova, 2017).

According to Gilster, someone is said to have digital literacy skills if they have mastered four digital competencies and can surf the internet using indicators, namely; 1). Internet searching, which is related to a person's ability to use the internet and carry out various activities using search engines; 2). Hypertext navigation which is the ability to see how far a person knows how a web browser works, the difference between textbooks and the internet, the purpose of hypertext in a web browser, and hypertext knowledge, 3). Evaluate the information content of a person's ability to think critically and provide an assessment of information found online by looking at the validity and completeness of the information source, 4). Synthesizing information is the ability to use various types of media to obtain correct information and review the information found to solve the problem (Hanelahi & Atmaja, 2020).

Considering the importance of digital literacy for students in determining students' understanding for success in facing the 21st-century skills and life skills needed, digital literacy abilities need to be developed in the face of the rapid development of information and communication technology in the era of revolution 4.0. This research needs to be carried out to see the level of digital literacy skills of students, especially high school students, so that they can determine strategies and methods of learning that are of course able to utilize technology and improve the quality of learning in facing the challenges of life in the era of the industrial revolution 4.0. Based on the problems described above, this study aims to determine the digital literacy skills of students.

METHOD

This study follows a descriptive research method, namely a method that does not provide treatment, manipulation, or changes to the samples used (Santoso et al., 2021). The population in this study were the tenth-grade high school students at one of the Bandung City State High Schools with a sample size of 62 students. The data collection technique is a questionnaire in the form of a test. The test instrument is in the form of multiple-choice questions that describe each indicator of digital literacy. The multiple-choice instrument on digital literacy was adapted from previous research which is very relevant to this research

(Riyani & Jumadi, 2019). The test instrument items are arranged based on four indicator components which refer to digital literacy indicators.

Table 1. Digital literacy instrument grid

Aspects of Digital Literacy Skills	Indicators of Digital Literacy Skills	Item
Searching on the internet	Develop procedures for searching for information on the internet	2
	Collect information from the internet effectively and efficiently	2
Hypertext Navigation	Understanding direction (navigation)	2
Evaluating information	Clarify the validity and validity and completeness of the referenced information content	1
	Assess the suitability of the referenced information content	1
Synthesizing information	Building knowledge from referenced information content	2

(Source: adapted from Riyani & Jumadi, 2019)

Analysis is carried out on each component by scoring scores, and data analysis techniques are carried out using the following formulas (Jamil et al., 2022).

$$\text{Percentage} = \frac{\text{Total score}}{\text{The highest score}}$$

The percentage score obtained will be categorized based on the interpretation that corresponds to the percentage score obtained.

Table 2. Students' digital literacy skills.

Percentage (%)	Interpretation
76% - 100%	Very good
51% - 75%	Good
26% - 50 %	Fairly Good
1% - 25%	Bad

(Source: Jamil et al., 2022)

RESULTS AND DISCUSSION

Based on the results of statistical data using Microsoft Excel, descriptive analysis results were obtained regarding the level of students' digital literacy skills.

Table 3. Digital literacy skills of tenth-grade high school students in biology class.

Digital Literacy Indicators	Score	Criteria
Internet Searching	47%	Fair
Hypertext Navigation	27%	Fair
Evaluating Content	40,32%	Fair
Synthesizing Information	60,48%	Good
Mean	44%	Fair

Based on the average percentage of digital literacy of tenth-grade high school students, it can be seen that students' digital literacy has an average score of 44% in the "fair" category. The percentage score for each indicator shows that the ability to synthesize information is in the highest position with a score of 60.48% in the "good" category. Meanwhile, hypertext navigation is in the lowest position with a score of 27% in the "fair" category. Meanwhile, the other two indicators, namely internet search indicators and information content evaluation, are in the middle position with a score of 47% and 40.32% respectively in the same category, namely "fair".

The results of the research show that the digital literacy skills of tenth-grade high school students are still low. Therefore, it is necessary to increase the use of students' digital literacy skills in schools, remembering that digital literacy skills are important for students to master, especially to support 21st-century skills (Wahyuni et al., 2022). Digital literacy is part of 21st-century skills (Nurwahidah et al., 2020).

Digital literacy in the 21st century is not only knowing how to operate technology but also how to manage information and critical thinking skills and of course having good habits in online activities (Perdana et al., 2019). Digital literacy is not only important to support learning, but is also needed in everyday life (Ko et al., 2022).

Having digital literacy skills also provides access to various applications and the ability of human resources to use digital devices (Eguz, 2021). Digital literacy is very necessary to support communication and participation as citizens in contemporary society (Marin & Castaneda, 2023). More digital skills are required

to support learning so that they can be used in the future (Eguz, 2021).

In learning, digital literacy skill has a positive impact, such as helping in the learning process, distinguishing useful and significant learning resources, and making teachers more creative and innovative in creating learning media (Kusumaningrum & Hafida, 2021). Indicators of the use of digital literacy in education are categorized into the scope of the class, school culture, and surrounding community as well as its application in learning activities using digital media and the internet (Hardiyanti & Alwi, 2022).

Students digital literacy in each indicator

Digital literacy has four indicators that can determine a person's digital literacy skills, namely internet searching; hypertext navigation, evaluating information, and synthesizing information. The results show that the four digital literacy indicators have different percentage scores. The following is the percentage of digital literacy scores for tenth-grade high school students in Bandung. Each indicator is presented in the bar chart in Figure 1.

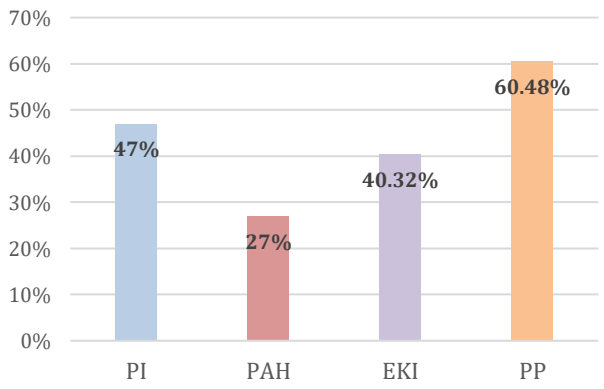

Figure 1. Students' digital literacy skills.

Figure 1 shows that the search indicator on the internet searching obtained a result of 47%. This indicates that the internet searching indicator is at fair criteria, this proves that students in biology learning are still lacking in using the internet as a reference in learning. Internet search ability is an important literacy indicator for students to master because internet searches can affect students' ability to obtain relevant and trustworthy learning material (Kusumaningrum & Hafida, 2021).

These results also prove that the average student is still unable to use search engines such as Yahoo, and Google which are used to search for biological material or biological information related to learning. Research conducted by Nur states that the average student uses and disseminates the information they receive without checking the truth of what they get through the websites they visit (Nur, 2019). Other research shows that the average student knows web browsers and search engines such as Google, and Chrome and is also able to use them to search for information on the internet (Ahsari & Idris, 2019).

This aspect of internet searching ability is also influenced by students' ability factors. According to Bawden in Irhandayaningsih, a person's basic literacy skills also influence the ability to search for information on the Internet, namely the ability to understand the terms and symbols used when searching as well as the ability to use files via digital platforms (Irhandayaningsih, 2020).

Students' skills in searching for information about biological material show good results (Muyasaroh et al., 2021). In line with research conducted by Fauzi, it is stated that students have a good understanding and ability to use the internet and search engines to use it as a positive thing, especially in searching for information in learning (Fauzi & Usmeldi, 2022). Thus, digital literacy skills in aspects of internet search indicators need to be improved so that the expected competencies can be realized.

The ability to navigate hypertext obtained a result of 27%, which shows that hypertext navigation is in the fair category. However, this also proves that the hypertext navigation is in the lowest position of the other three indicators. This illustrates that although the hypertext navigation obtained a score in the fair category, there are still many students who do not understand how to navigate the hypertext.

The main reason why there are still many

students who do not understand this indicator is students' lack of understanding in using the facilities. This indicator is an important indicator in carrying out digital literacy because the skill in navigating hypertext will guide readers in understanding the information. Hypertext guides readers through the hyperlink facilities in the content contained in it so that digital literacy can become more efficient and effective compared to traditional literacy activities (Ahsari & Idris, 2019).

The results of research conducted by Wibowo (2021) show that a person's knowledge of using hypertext (directional links or links to the web) and knowledge of how the web works are at fair criteria which can be caused by the majority of respondents still using smartphones to access the internet, causing limitations. The tools used compared to using laptops and PCs.

The limitations of smartphone devices in displaying hypertext menus can be one of the reasons why the hypertext navigation for tenth-grade students is not very good because the majority of respondents who take tests more often use smartphones for learning information compared to using laptops or PCs which are not flexible.

Other research also shows that student's abilities in the aspect of hypertext direction are still relatively low, this is influenced by factors such as a lack of knowledge about hypertext and hyperlinks, low understanding of HTML, and HTTP, and low knowledge of URLs (Sifa & Winarto, 2022). This statement is supported by Sari who found that the ability to navigate hypertext is in a low category, and the finding also reveals that the average respondent's knowledge of new terms such as hypertext and hyperlinks which are part of accessing the internet is still low (Sari, 2019).

The evaluating information was found to be 40.32% in the fair category. According to Gilster (1997), content evaluation is the ability to think critically to be able to provide an assessment of what is found online so that someone can identify the validity and completeness of the information referenced by a hypertext link (Sari, 2019).

Research shows that students' digital literacy skills are still in the fair category in evaluating the information on the internet so that the information can be used as a resource for studying Biology. Another study also indicates that the overall ability to evaluate information content is categorized in the fair category with an average score of 2.72 (Sifa & Winarto, 2022). However, this result is very far from what was expected because the majority of students are still weak in understanding and evaluating information on the internet.

In Biology learning, information from internet media needs to be confirmed and verified. Confirmation of digital literacy is needed to strengthen the ability to search for and disseminate information responsibly so that the information disseminated does not contain hoaxes, elements of sarcasm, or other digital crimes (Muyasaroh et al., 2021). In general, generation 4.0 still has not fully carried out evaluation activities on the information they obtain on the internet (Sari, 2019). The ability to evaluate information is important to teach to students and it is hoped that familiarity with using internet media will create awareness among students in evaluating the content of information first before using it as a reference. This is comparable to one of the studies which found that the results of the information content evaluation indicator were in the low category and stated that this evaluation ability will increase along with the critical thinking ability of the millennial generation in the area (Raharjo & Winarko, 2021).

The final indicator is synthesizing information which is the ability to organize knowledge and information obtained from various sources based on the ability to evaluate facts and opinions (Shyamsyah & Yuliani, 2022). Based on the findings, the synthesizing information indicator is at a percentage of 60.48% which is in the good category. According to Gilster (1997), synthesizing information is the ability to assemble knowledge and build a

collection of information obtained to form new knowledge (Ahsari & Idris, 2019).

A study carried out in Tasikmalaya on tenth-grade high school students indicates that synthesizing information is classified in the fair criterion. Students can complete assignments by searching for information using search engines, analyzing the background information, and proving the truth of the information (Kusuma & Aprianti, 2020).

Several factors influence a person's digital literacy skill, namely the influence of the intensity of internet use so that they can synthesize the information better. Reading habit also influences a person's digital literacy skills, and this affects the application of digital literacy skills because digital literacy skills include the capacity to navigate digital information (Syah et. al, 2019).

Based on this finding, students are considered to be able to manage information and organize this knowledge into new knowledge. However, the results are categorized as good and compared with the scores obtained by other indicators still require improvement. However, most respondents are still hesitant and unsure whether they can re-examine the information obtained and are doubtful about examining the content of the information they obtain before using it as a learning resource (Fauzi & Usmeldi, 2022).

Good digital literacy skills certainly have a positive impact on a person's learning outcomes, especially in biology learning. When all sources of information are digital, good digital literacy will provide a good and correct understanding of the information search. The ability to utilize technology such as using the Internet in the biology learning process will make students more active because students can search for learning using their efforts and initiative (Amboni et al., 2021).

There will be an increase in student learning outcomes in biology learning if a person has good digital literacy skills. A person can use various learning sources such as scientific articles, online media, and other digital sources to provide knowledge in line with current developments obtain the latest information, and be able to follow technological developments (Yusuf et al., 2022).

CONCLUSION

Based on the findings, it can be concluded that digital literacy skill is an ability that a person must have to understand and use information from various sources on the internet for the benefit of daily life or life skills in facing the surge in the development of information and communication technology in this 4.0 industrial revolution era and become capable of mastering one of the skills of the 21st century.

There are some skills that a person must master in digital literacy, including searching for information, navigating hypertext, evaluating information, and synthesizing information. Based on the results of this study, the digital literacy skills of students can be seen in the fair category. Meanwhile, internet searching skill falls into 47% in the fair category, navigating hypertext with a percentage score of 27% in the fair category, evaluating information with a percentage score of 40.32% in the fair category, and synthesizing information with a percentage score of 60.48% in the good category. These results prove the need for an effort to improve students' digital literacy skills by making efforts in the learning process, especially in biology learning, by implementing learning models or strategies that are integrated with digital literacy so that 21st-century skill competencies can be achieved to meet the rapid development of information technology.

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