

Prospective Mathematics Teachers' Digital Literacy through Web-based Learning

Ratu Mauladaniyati^{1,2*}, Nenden Suciwati Sartika¹, Krisna Satrio Perbowo³,
Wahyudin², Endang Cahya²

¹Universitas Mathla'ul Anwar, Banten, Indonesia

²Universitas Pendidikan Indonesia, Bandung, Indonesia

³Centre of Education Studies Department, University of Warwick, Coventry, United Kingdom

*Corresponding e-mail: ratumaula87@gmail.com

Abstract

This study aims to describe the digital literacy of prospective mathematics teachers who are conducting web-based learning in the new normal era. This research is classified as a qualitative descriptive research, data collected through surveys and interviews. The research subjects were 4th semester students of the mathematics education study program. The results showed that the digital literacy of prospective mathematics teachers in web-based learning in the new normal era was quite good, this was evidenced by the results of student questionnaires which showed positive categories on each indicator. In addition, the cumulative percentage of students on the indicator of basic ability to use the internet (81.08%), on the indicator of the ability to seek and obtain information (75.32%), on the indicator of skills in choosing frequently used information sources (59.49%) and cumulative percentage of ability to use information effectively (81.87%). This is reinforced by the results of interviews with students which showed that the five students were able to achieve these four indicators.

Keywords: Digital literacy, Prospective mathematics teacher, Web-based learning

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INTRODUCTION

The spread of covid-19 in Indonesia was first reported on March 20, 2020, which is only as much as the two cases, until finally, the spread of the virus continues to grow as time goes by (Handayani et al, 2020; Susilo et al, 2020; Yuliana, 2020; Wijayanti et al, 2021). In Indonesia, the impact of the spread of covid-19 has been felt in various sectors of life, especially in the field of education, until finally, the government decided to shut down all activities at the school includes learning activities and changing it to learn at home through distance learning (irfan et al, 2020). The spread of covid-19 continues to increase, making the government extend such policies to the new normal. The New Normal is a change in the behavior of the community to continue to run the activities normally but with a fixed run of the protocol of health to prevent the occurrence of transmission of covid-19 (Anggrasari, 2020). Learning in the era of the new normal can be used to utilize the facilities of the internet and can be done through electronic devices such as laptops, mobile phones, and others.

In modern times, distance education is becoming more popular and accepted in education (Yilmaz, 2015). In addition, to prepare for the resurrection of the golden generation of Indonesia in the year 2045 required the development of education in the perspective of the future so that the necessity of designing and organize education as well as possible with the aim that the creation of quality education, advanced,

independent and modern, as well as enhance the dignity of the nation (Ministry of education, 2017). Education in the 21st century or the era of 4.0 is based on information technology, so it requires teachers to have the ability in information technology good (Suhendri et al, 2020). Almost all elements of education and learning are done by applying ICT. This condition requires educators and learners to have technological literacy. Therefore, the mastery of information technology by both teachers and students is very important in supporting the teaching and learning process.

Digital technology has become an integral part of the world of education (Benson & Kolsaker, 2015). Digital technology here covers a diverse range of hardware and computer software, such as mobile phone, web tools, application software, communications services, and storage (Mohammadyari & Singh, 2015). Students can use digital technology for learning activities such as reading and sending e-mail, access the learning management system, read the journal or e-book, do the quiz online, participate in discussion forums, and so on. Based on online learning (e-learning) can be one of the ways in carrying out distance learning in the era of the new normal is. The presence of learning e-learning is very effective in learning because it makes the learners actively in the learning activities (Rohdiani and Rakhmawati, 2017).

The development of information technology proved to be very rapid and can not be dammed again. The development of information and communication technology has had a great influence on all aspects of life, including the education world (Budiana et al, 2015: 59). The Internet provides convenience for human beings to access digital information and share it through social networks will instead cause the amount of information that cannot be accounted for circulated widely through various electronic media without mentioning the source of the information clear (Nurjanah, Rusmana & Yanto, 2017). In addition, the ease of access to the internet also allows everyone is free to enter information in the virtual world without any restrictions (Kurnianingsih, Rosini, & Ismayati, 2017). Thus, students are required to have the ability of analytical and critical in processing the information obtained from the internet. To cope with the development of technology and information must be balanced with the increased competence of yourself every student. As for the competencies that must be possessed to face the development of science and technology in this century that digital literacy (Yusuf et al, 2019). Because digital literacy is the ability that is related to the activities of accessing and processing information in learning so that it becomes very important in this day and age. This is following the opinion of Adiarsi, Stellarosa & Silaban (2015) that the ease of accessing the internet now makes digital literacy becomes an important thing, access to the news must be educated to be able to use the Internet properly.

Digital literacy is the ability to understand and use information from a variety of digital resources, includes not only the ability to read but also includes the thinking process of the students is critical to evaluate the information found through the medium of digital (Anggrasari, 2020). Meanwhile, according to Sokowati (2014), digital literacy is the ability to use digital technology to understand, evaluate, use and create information. In mathematics learning, digital literacy is a very important ability. Digital literacy involves the action of the digital that is bound with the teaching and learning of mathematics. In addition, digital literacy also involves the ability to use knowledge, attitude, technique, and personal qualities to solve problems in the learning of mathematics. As for the previous research related to the literacy of teachers of mathematics in the study conducted by Suhendri, et al in the year 2020, the

results reveal that the level of literacy of information technology mathematics teachers of private vocational high schools in Jakarta is still relatively low, one of the factors that cause the low literacy is the lack of training on the utilization of information technology.

Regarding the current global era, mathematics education students are one of the components related to literacy. Students of Mathematics Education after graduating will serve as mathematics subject teachers. Of course, they must be equipped with various literacy skills, one of which is digital literacy. The literacy is not only for their needs while attending lectures, but to be applied when they are on duty in the field. This situation is very important considering that students both at the junior high and high school levels must acquire knowledge formally, so that the good or bad knowledge they have will greatly affect their abilities in everyday life and when continuing their studies to a higher level of education.

Various studies have been carried out related to digital literacy, such as what has been done by Rizal et al (2019) which measured the digital literacy of elementary school teacher candidates at a University in Sumedang, other research was also conducted by Nelson et al (2011) which measured perceptions of digital literacy needed by students at various universities. Therefore, as an effort to build student digital literacy, research was conducted on mathematics education students at Mathla'ul Anwar University Banten to determine the digital literacy skills of prospective mathematics teachers in the new normal era.

Based on the exposure which has been described above, the research problem is focused on analyzing the digital literacy of prospective mathematics teachers in the implementation of web-based learning. The purpose of this study was to describe the digital literacy of prospective mathematics teachers in web-based learning in the era of the new normal.

RESEARCH METHOD

This research is classified as descriptive qualitative research. This study aims to describe the digital literacy of prospective mathematics teachers who are doing web-based learning in the era of the new normal. Learning is done because of the pandemic COVID-19 that has spread in Indonesia for one year. This research is more directed at the role of the skills of digital literacy of prospective mathematics teachers in the use of important technologies for the development of education in Universitas Mathla'ul Anwar Banten. The subject of this research is the students of the 4th semester of the study program of mathematics education. The subject is taken with purposive sampling technique, taking the subject with this technique is based on the choice of the researcher about the aspects of what and who to be the focus at the time of a particular situation during the process of research, because the sampling is purposive, i.e. depending on the purpose of the focus in a moment. In addition, the scope of research used is on the course *Capita Selecta Math High School* conducted in the even semester of the academic year 2020/2021.

Data were collected through surveys and interviews. The research instrument used is a sheet of questionnaires and interview guidelines following the indicators of digital literacy that have been declared valid and reliable based on the results of the test instrument. Performance indicators in this research are all students have basic skills in using the internet, being able to find and retrieve information from the internet, have the skills in selecting the source of information that is often used, and can use information effectively. The results of the questionnaire that has been filled by

the students through a google form and then analyzed and interviewed the five students related to digital literacy are selected at random so that it will get more accurate information about how the ability of digital literacy of prospective mathematics teachers in the implementation of web-based learning in the era of the new normal.

RESULTS AND DISCUSSION

Digital literacy is an attitude, awareness, and the ability of individuals to utilize the facilities and digital tools appropriately to access, identify, integrate, manage, analyze, evaluate and synthesize digital resources, construct new knowledge make the expression of the media, and communicate with other people in the context of a particular life situation (Sa'adah et al, 2020). The implementation of learning began to be observed on April 19, 2021. Data collection was done through questionnaires with a google form to the students of the 4th semester of the study program of mathematics education. Furthermore, interviews were conducted with the 5 students selected to be analyzed more deeply, and data was used as reinforcement in this study. In this study, the authors conducted a survey about the digital literacy of students based on four indicators of digital literacy, i.e. the ability of the base using the internet, the ability to find and obtain information, the skill of choosing the source of information used as well as the ability to use information effectively. Here is described the results of the acquisition of data in research related to the four indicators.

The analysis of the questionnaire data digital literacy students

We measure the digital literacy of prospective mathematics teachers through a questionnaire following the four indicators are used. The division of the questionnaire was conducted online through a google form that can be filled in through the link: bit.ly/LiterasiDigitalCalonGuruMatematika. The questionnaire consists of 14 statements for indicators of basic skills in using the internet, 18 statement for indicators of ability to find and obtain information, 16 statements for the indicator of the skill of choosing the sources of information used, and 16 statements for indicators of ability to use information effectively, each of which consists of the statement positive and negative. Based on the results of the response of the students can be seen in the table below, that the data obtained from the score of the average number of students who give a response to a specific category on each indicator.

Table 1. The results of the questionnaire of attitude scale

Indicator	Average Score	Category
Basic ability to use the internet	3,18	Positive
The ability to find and obtain information	2,84	Positive
The skill of choosing the sources of information used	2,61	Positive
The ability to use information effectively	2,94	Positive

Based on Table 1, the score is the average score of the questionnaire students each indicator is in a positive category. This is following the opinion of Lestari and Yudhanegara (2018) that the category of attitude scale on the questionnaire is in the category positive if it is in the neutral category if and only be negative if. This means that students of the study program of mathematics education as teacher candidates meet the four indicators of digital literacy. The results of the response of students on each of the indicators can be detailed as follows.

Basic ability to use the Internet

For indicators of basic skills using the internet, the results obtained based on the survey are presented in the Table 2.

Table 2. The results of the questionnaire basic ability to use the Internet

Basic Ability to Use the Internet	Percentage		Level
	Yes	No	
Able to open various sites by entering a Uniform Resource Locator on the Browser bar	84,62%	15,38%	Good
Able to use the search tools on the web to find as well as get information	88,46%	11,54%	Good
Able to identify search results that are obtained	80,77%	19,23%	Good
Able to create and use email (Electronic Mail)	98,08%	1,92%	Good
Able to understand the basic concepts of the Internet.	96,15%	3,85%	Good
Able to understand and make a web page with post text or images as well as hyperlinks	38,46%	61,54%	Less

The results of the survey in Table 2 show that most of the students managed to take advantage of the internet and apply it in learning activities. Quick and easy access to be one of the factors in the success of the use of the internet and technology in the learning process. Most of the respondents were able to unlock a variety of websites by entering the URL in the browser bar that is as much as 84,62%, as much as 88,46% of the students stated able to use the search tools on the web to find as well as get information, as much as 80,77% students can identify search results that are obtained, as much as 98,08% of the students stated can create and use your e-mail (letters established electronic flow meter) and as much as 96,15% of the students stated that they understand the basic concepts of the internet. However, only a small fraction of students who declare able to understand and make a web page by posting text or image as a hyperlink, that is as much as 38,46%. Furthermore, from the percentage of student responses on each sub-indicator performed the categorization of the level of competence of digital literacy, which shows that at the sub-indicators of the first to the fifth on a basic ability to use the internet is in a good category, while in the understanding and creates a web page with post text or images as well as the hyperlink is in the category of less well. The percentage level of digital literacy is said to be good if it is greater than 75%, is said to be sufficient if it is in the 60% to 75%, and is said to be less if smaller than 60% (Arikunto, 2006).

The ability to find and obtain information

For indicators of ability to find and obtain information, the results obtained based on the survey are presented in the Table 3.

The results of the questionnaire on indicators of ability to find and obtain information through the website show that most of the respondents were able to choose the way or method the right to access and find the information needed, as much as 65,38% of respondents were able to choose, store and manage any materials obtained accompanied a source of information and most of the respondents were also able to identify various types of sources, as well as identify the concepts and keywords to be an overview of the information needed. But, just as much as 53.85% of respondents can identify the various sources in the online library for identifying

information, which is in the category of less well, this is because most of the other respondents only use the e-book and website.

Table 3. The results of the questionnaire the ability to find and obtain information

Basic Ability to Use the Internet	Percentage		Level
	Yes	No	
Able to choose the way/the right method of accessing the information required	80,77%	19,23%	Good
Able to choose the way of/the appropriate method to search for the information needed	94,23%	5,77%	Good
Able to choose, store and manage any materials obtained accompanied by the source of the information	65,38%	34,62%	Enough
Able to identify different types of sources that could potentially provide information	76,92%	23,08%	Good
Able to identify the concepts and keywords that can describe the information needed.	80,77%	19,23%	Good
Able to identify the various sources in the online library	53,85%	46,15%	Less

The skill of choosing the source of information that is often used

For the indicator of the skill of choosing the sources of information used, the results obtained based on the survey can be seen in the Table 4.

Table 4. The skill of choosing the sources of information used

Basic Ability to Use the Internet	Percentage		Level
	Yes	No	
The use of Print Media (newspaper, books, magazines)	51,28%	48,72%	Less
The use of Audio Media and Audio Visual (Radio, TV)	42,31%	57,69	Less
The use of electronic Media (e-book, etc.)	69,23%	30,77%	Enough
The use of the site that provides online video	57,69%	42,31%	Less
The use of application-based learning support virtual classroom (zoom meetings, google meet, etc.)	76,92%	23,08%	Good

A list of the next statement to be filled in by the respondents related to the skills of each of the respondents in choosing the sources of information used for online learning done. The results of the study showed that as many as 50.28% of respondents revealed that they often use print media (Newspaper, books, magazines, etc.), while the other part that is as much as 48.72% revealed that they rarely read newspapers and magazines, only often seek information through printed books. To help the learning activities, just as much as 42.31% of respondents frequently use the media audio and audiovisual. In addition, there is as much as 69.23% of which depend on electronic media in learning activities, 57.69% of respondents often search for information through the website which provides video-online video. Furthermore, all students are always using virtual classrooms in the learning, although some respondents go through difficulties or obstacles.

The ability to use information effectively

For the indicator to four, which is related to the ability to use the information effectively, the results obtained based on the survey are as Table 5.

Table 5. The results of the Questionnaire the Ability to use Information Effectively

The ability to use information effectively	Percentage		Level
	Yes	No	
Able to analyze the information obtained	80,77%	19,23	Good
Able to compare information obtained from different sources	88,46%	11,54	Good
Able to present information that is obtained	88,46%	11,54	Good
Able to check and assess the information obtained with its source based on certain criteria	80,77%	19,23	Good
Able to check the authenticity of the data obtained	76,92%	23,08	Good
Understanding of copyright and its use is ethically	73,08%	26,92	Enough
Able to follow the regulations of the law and ethics of access to and use of information resources	84,62%	15,38	Good

This skill is related to the attitude of critical and reflexive against a variety of information from print media and online media are presented on a variety of websites and the use of new technology. The results of this study show that most students can analyze the information obtained as many as 80,77%, can compare the information obtained from a variety of sources as much as 88,46%, and know-how to present the information obtained by the 88,46%. Furthermore, most of the respondents were also able to inspect and assess the information obtained with its source based on certain criteria (80,77%), able to check the authenticity of the data obtained (of 76.92%), understanding of copyright and their use (73,08%), and can follow the rules of the law and ethics of access to and use of information resources (84,62%).

Based on the description of the data the results of the research above, it can be seen that most of the respondents i.e. student teachers of mathematics can use the internet for various activities, including helping with their learning process. It is as disclosed by Jayawardana (2017) that in addition to facilitating students to understand the material, it also increases the activity of student learning and providing a positive contribution to the learning outcomes. In addition, the internet has also become the need of students every day which can be accessed via laptop, computer, mobile, or other tools.

Analysis of Interview Data Digital Literacy Students

The implementation of an interview is intended to seek more information about the digital literacy of the student teachers of mathematics. The interview guide consisted of 2 questions for indicators of basic skills in using the internet, 4 questions for indicators of ability to find and obtain information, question 4 for the indicator of the skill of choosing the sources of information used, and 2 questions to indicators of ability to use information effectively. Interviews were conducted with 5 student teachers of mathematics directly in Mathla'ul Anwar Banten University with the following protocol health. Table 6 presents the result of interviews with the researcher's students.

Table 6. Analysis of the Results of the Interview in Each Indicator

Student	Indicator			
	Basic ability to use the internet	The ability to find and obtain information	The skill of choosing the sources of information used	The ability to use information effectively
M1	Basic skills of students in using the internet quite well, students can apply the internet both in learning activities through a variety of web sites or in the task.	Students looking for information on the web in the form of an e-book following what will be studied, but often feel difficulty in understanding the material.	Students can search the information on the website which is the source of the writing is clear.	Students are always trying to understand the material they can get, and if the difficulties, the students handle it by asking friends, lecturers and find an explanation through the youtube website.
M2	Basic skills of students in using the internet quite well, students can apply the internet in the learning activities through a variety of web sites and in the task, and be able to sort out the right information.	Students can search for information through the web because it feels easier and more complete, in addition, in online learning, the students feel happy because you can save time and material, it's just often difficult in finding a network on the internet.	Students can search the information on the website which is the source of the writing is clear and usually in the form of an e-book following the material to be studied.	Students always re-read the material they get to be able to understand the material, and if you feel difficulty, students continue to search for the answer with a lot more searching to obtain information that makes it okay.
M3	Basic skills of students in using the internet quite well, students can apply the internet in the learning activities through a variety of web sites and in the task, and love to seek a variety of information on the web.	Students can seek, read, and always trying to understand the material on the website, it's just often constrained by the network the internet because living in locations that are difficult to obtain access to the internet.	Students can find the right information on the web that the source of the writing is clear, usually in the form of an e-book or pdf format that is following the material to be studied.	Students read the information on the web but can be applied in the activities of the subjects, if you feel difficulty, students continue to search until late at night to obtain information that makes it okay.
M4	Basic skills of students in using the internet quite well, students can apply the internet in the learning activities through a variety of web sites and in the task, as well as students in reading and searching for information.	Students looking for information on the web in the form of an e-book by what will be learned just often feel difficulty in understanding the material.	Students can find the right information on the web that the source of the writing is clear, starting from the definition, example problems along with the explanation to exercises.	Students are always trying to understand the information they got, if there is trouble, they overcome it with more looking for the source of the information to visit the youtube site.
M5	Basic skills of students in using the internet quite well, students can apply the internet both in learning activities through a range of websites, as well as in the task.	Students can search for information through the web, because it is easy to find and more complete, in addition, because in web-based learning is a lot of time in the house so that it can more freely to take the time for more looking for information.	Students can search the information on the website which is the source of the writing is clear.	Students are always trying to understand the material they can get, and if the difficulties, the students cope with continually searching and finding the explanation through the youtube website.

Discussion

The ability of digital literacy of the student teachers of mathematics is divided into four indicators, namely a basic ability to use the internet, the ability to find and obtain information, the skill of choosing the sources of information used, and the ability to use information effectively. This is in line with the opinion of Nahdi & Jatisunda (2020), which states that in digital literacy, students' skills in using information technology are something important to do. The percentage of the cumulative digital literacy of prospective teachers in mathematics in each indicator can be seen in the Table 7.

Table 7. Percentage of digital literacy skills of prospective teachers

Digital literacy skills	Percentage
Basic ability to use internet	81.08
The ability to find and obtain information	75.32
The ability to choose the source of information to be used	59.49
The ability to use information effectively	81.87

Based on the results of the research presented in the figure above, it can be seen that the percentage of the cumulative student on indicators of basic ability to use the internet (81,08%) are in a good category, the percentage of cumulative on indicators of the ability to find and obtain information (75,32%) are in a good category, the percentage of cumulative on the indicator of the skill of choosing the source of information that is often used (59,49%) are in the category of less and the percentage of the cumulative ability to use information effectively (81,87%) are in a good category. The grouping of the category of the level of digital literacy here is based on the opinion of Arikunto (2006).

Furthermore, based on the results of interviews with 5 students prospective mathematics teachers about digital literacy in web-based learning, on the first indicator digital literacy can be concluded that the basic ability to use the internet students well enough, students can apply the internet both in learning activities through a variety of web sites or in the task. On the second indicator, the ability to find and obtain information from the students well enough, students can search for information through the web, because it is easy to find and more complete. On the third indicator, the skills of students in choosing a source of information that is often used quite well, students can search for and select information on the website following the material to be studied, and the source of the writing is clear. On the indicator fourth, the ability to use information secure effective student teachers of mathematics can be said to be good, the students are always trying to understand the material he can get, and if the difficulties, the students cope with the ask and continue to seek additional information on the website or your provider of online videos to get the information which is considered sufficient, in addition, students were able to apply it in the lecture with each other to share information to friends through the faqs and presentation.

From the results of these studies were summed up that in the era of the new normal this needs to be the use of the internet in accessing all the information about news national and international, to information education has become a primary need, what is more, faster access sought to save time and matter become one of the reasons why the use of the internet is increasingly in demand. However, in the use of the information media students and the wider community can use it wisely, students and the community should be able to analyze and evaluate a variety of information on the

content which is good to use and which are less good. In addition, the selection of information on the source of the clear is also important, because not all of the content that is spread on the web has the clarity of the source so it must be able to account for the information obtained. This is in line with the results of the research Bahrul & Amelia (2019) stating that the student as a user of digital media is expected to be able to fortify them from the applied information provided by various sources.

CONCLUSION

Based on the results of the analysis of data and discussion in this study, it can be concluded that the digital literacy of prospective teachers of mathematics in web-based learning in the era of the new normal is quite good; it is proved by the results of the questionnaire of students who show the positive category in each indicator. In addition, it can be seen that the percentage of the cumulative student on indicators of basic ability to use the internet (81.08%), on the indicators of ability to find and obtain information (75.32%), on the indicator of the skill of choosing the source of information that is often used (59.49%) and the percentage of the cumulative ability to use information effectively (81.87%). This is reinforced by the results of interviews with students who show that in the five students were able to achieve the fourth indicator, the students can apply the internet both in learning activities through a variety of websites or in the task, students can search for information through the website and feel the source of information on the web is easy to find and more complete, students can search for and select information on the website following the material to be studied and the source of the writing is clear, as well as students can use information obtained effectively and can apply it in learning.

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