

## THE INFORMATION AND DATA LITERACY OF PROSPECTIVE PRE-SERVICE ELEMENTARY EDUCATION TEACHERS: A SURVEY

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**Abstract:** Digital literacy is a fundamental ability that must be possessed by teachers in the era of the Industrial Revolution 4.0 and Society 5.0. Teachers who have good digital skills will be able to present realistic, actual, and interesting learning. This study argues if digital literacy has been internalized in the learning process of pre-service teachers, students they will also be familiar with digital literacy activities. Thus, they can improve the digital literacy skills of their students when they later teach in primary schools. This study aims to analyze the literacy skills of primary school pre-service teachers in information and data literacy. The method used is a survey method, with a single data tabulation data analysis technique. The data collection was carried out by providing an online questionnaire via a google form to pre-service teachers who were in their 6th semester of the *Madrasah Ibtidaiyah* (Islamic primary schools) Teacher Education Study Program, at one Islamic state university in East Java, Indonesia. The results of this study indicate that the pre-service teachers' digital literacy skills in the index of data and information literacy are at a good level. Implications and limitations of the study as well as suggestions will also be discussed in the presentation.

**Keywords:** digital literacy, prospective pre-service teachers, information, data literacy

### INTRODUCTION

Digital literacy is an ability that must be possessed by teachers in the era of the Industrial revolution 4.0 and the era of society 5.0. Digital literacy is a fundamental skill that must be possessed in the current era of bid fata (Pu and Yang, 2021). As a prospective teacher who will be responsible for developing the literacy skills of students, of course, they must be supported by their ability to carry out digital literacy. It is undeniable that technological developments in the era of the industrial revolution 4.0 allow automation in almost all fields (Ghufroon, 2018). For example, in conducting a study of research results, one can access it from various countries and languages in an instant. Even with the internet of things (IoT) combined with artificial intelligence, it will be able to process big data into a conclusion (Sabri, 2019). These changes can occur in all sectors, the economic sector, culture or education sector. Changes in the world of education can be seen in the arrangement of classrooms, virtual learning, assignments that accommodate many learning preferences and the use of a number of platforms in learning (Rahman and Nuryana, 2019).

Teachers today must be digitally literate. Being a professional teacher, it is not enough just to rely on knowledge from one source only. It is important for prospective teachers to use digital literacy in finding various learning resources, so that the material can be delivered contextually (Rolón-dow *et al.*, 2021), actually in an interesting and interactive way (Rusydiyah, Purwati and Prabowo, 2020). Actual knowledge will help students understand scientific concepts that continue to develop (Rosenthal *et al.*, 2017) and make student have critical thinking skills (Beneke, 2020; Derby, Macfarlane and Gillon, 2020). Learning that uses a digital literacy approach is also able to improve students' digital literacy skills (Hikida *et al.*, 2019; Cem, 2020). The Examples include using video (Greenwood *et al.*, 2017), platform (Schroeder and Curcio, 2022) and many interactive media in learning. Moreover, students in the 21st century

are the alpha generation who are very close to technology, so their adaptability to technology is very fast (Tootell, Freeman and Freeman, 2014).

Digital literacy is an individual's awareness, attitude and ability to use digital tools and facilities appropriately to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, build new knowledge, create media expressions, and communicate with others, in the context of certain life situations, to enable constructive social action; and to reflect on this process (Martin, 2006). The term of digital literacy itself was introduced by Paul Gilster in 1997 in his book *Digital Literacy* (Shopova, 2014).

Several literatures show different digital literacy indexes. Based on Wan Ng's opinion, digital literacy consists of technical, cognitive, and socio-emotional dimensions. Technical aspects of digital literacy can include the use of information and communication technology and the ability to connect to devices. Aspects of critical thinking include the ability to access information/data, select, copy and select the required information. Meanwhile the socio-emotional aspect includes the ability to establish social interactions digitally (Cem, 2020). In another reference, it was found that digital literacy consists of various indices, including the ability to find and select information, communicate effectively, digital security, functional skills, creative, critical thinking and evaluation, understanding socio-cultural and ability to collaborate. Digital literacy consists of several indices, namely information and data literacy index, communication and collaboration index, security, and technology capability (Themes, 2013).

Even though they are different, there are points of commonality in categorizing digital literacy. Where in general, digital literacy consists of aspects of the ability to operate technology, the ability to find information/data as well as the ability to think critically, and interact socially in the digital world. Of the several digital literacy indexes, the researcher focuses on the information and data literacy index. This is based on the results of a survey by the Indonesian Ministry of Communication and Informatics which shows that of the four digital literacy indices measured, the data and information literacy index has the lowest score (KOMINFO, 2020). So, referring to the survey results, the researcher is interested in measuring the data and information literacy skills of prospective elementary education teachers. Moreover, being a prospective teacher needs to have the ability to find information/data well in order to be able to represent actual, contextual, interesting and fun learning (Sural and Dedejali, 2018).

Digital literacy research has actually been done by many previous researchers such as by Önger (2018); Anisimova, (2020); Cem, (2020); and Erol and Aydin, (2021). They examine the digital literacy skills of prospective teachers. However, the research has not specifically measured digital literacy skills from the information and data literacy index. Therefore, the researcher considers it important to conduct research on the analysis of digital literacy skills of prospective basic education teachers as reference data in the formulation of relevant teacher professional competency development education programs.

## **METHOD**

This study used a quantitative method using a survey design. The purpose of the survey design in this study is to provide a quantitative description of trends (Turgut and Yakar, 2020), attitudes, and opinions of a population (Creswell and Creswell, 2018). The types of questions used were descriptive questions to determine the level of digital literacy skills of prospective elementary education teachers. The object of this research was a prospective primary education teacher, who is currently pursuing a strata 1 study. Currently, the object of research was in the 6th semester of the 2021/2022 academic year. The determination of the object of research was based on several considerations. First, the semester 6 students have received the

basic theories of education and learning. Second, the 6th semester students were in the process of participating in an internship program so that they have already known the practical implementation of education in the field/school where they do the internship. The number of samples in this study was 100 students with details of 5 male participants and 95 female participants.

### Data Collection

The data were collected by distributing questionnaires via a google form. The questionnaire contains statements derived from information index indicators and data literacy. It refers to “A Global Framework of Reference on Digital Literacy Skills”, which contains 5 competency areas (UNESCO, 2018). The five competency areas include information and data literacy, communication and collaboration, digital content creation, safety, and problem solving. From several digital literacy indices, the researcher focuses on analyzing data and information literacy skills with several competencies that are used as references for researchers in developing indicators, as shown in Table 1.

**Table 1. Digital Literacy Competency Areas(UNESCO, 2018)**

Competence area	Competences
1. Information and data literacy	1.1 Browsing, searching and filtering data, information and digital content 1.2 Evaluating data, information and digital content 1.3 Managing data, information and digital content

In addition to being guided by the digital literacy framework issued by UNESCO, the researcher also analyzed and used the data and information literacy sub-index from the results of a survey conducted by KOMINFO Indonesia in 2020. The digital literacy ability of the data and information literacy sub-index includes, the ability to search and access data, information and content in digital media as needed, the ability to filter data, information and content as needed, the ability to direct/regulate data searches, as well as the ability to store data, information and content in digital media(KOMINFO, 2020), as contained in Table 2.

**Table 2. Information and Data Literacy Sub-Index(KOMINFO, 2020)**

Sub-Index	Indicator
Information and data literacy	Able to search and access data, information and content in digital media as needed
	Able to filter data, information and content as needed in digital media
	Able to direct/manage the search for data, information and content as needed
	Have the ability to store data, information and content in digital media

### Data Analysis

The data collected were analyzed descriptively. The descriptive analysis was carried out in several steps, namely explaining the data systematically and clearly according to the research focus, interpreting and searching for causal relationships, criticizing and drawing a conclusion. The data analysis was carried out by calculating respondents' answers from a scale of 1 to 5,

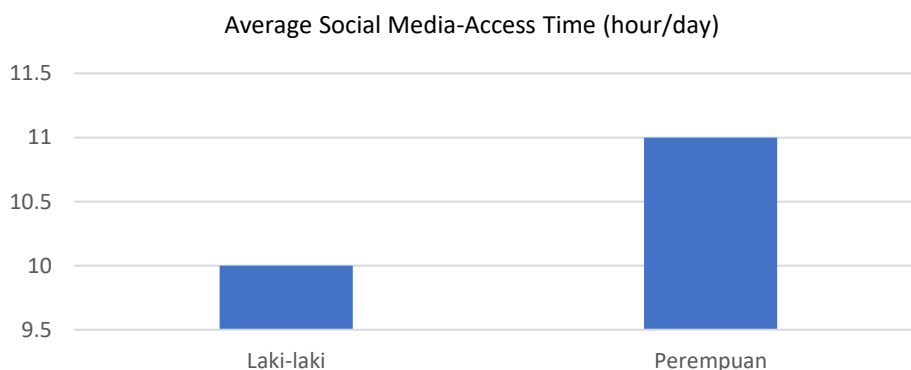
adopting a Likert scale: a score of 1 = Strongly Disagree, 2 = Disagree, 3 = Disagree, 4 = Agree, 5 = Strongly Agree. From the results of the arithmetic mean of each statement, the researcher grouped the indicators tested, and looked at the mean of each indicator.

To increase the validity in generalizing the results, the researcher presented information about how the research was conducted, how the data was collected and what methods were used when analyzing the data. To improve the external reliability, the researcher asked for the help of an expert to examine the data collection instruments and research findings. Categories were formed from the teacher's answers and the frequency of answers collected. The answers were classified into 5 categories, including strongly agree for the very capable category, agree for the able category, less agree for the less able category, disagree for the incapable category, and strongly disagree for the very poor category. To clarify the distribution of the existing data, the researcher tabulated it in a tabular form.

## FINDINGS

Based on the results of filling out questionnaires by 100 prospective teachers, it was found that respondents based on gender were 95 women and 5 men, or 95% female respondents and 5% male respondents. The number of female respondents is more than male respondents because there are more candidates for primary education teachers in the Madrasah Ibtidaiyah Teacher Education study program, Sayyid Ali Rahmatullah State Islamic University Tulungagung, there are more female teacher candidates than male teacher candidates.

Furthermore, related to the average duration of social media between men and women, the results showed that female teacher candidates used social media for an average of 11 hours per day, while male teacher candidates for 10 hours per day.



**Figure 1. Average Duration of Social Media (hours/day)**

Data on the average duration of social media between male and female teacher candidates are only as additional information that prospective education teachers in everyday life are close to aspects of digital literacy for both male and female teacher candidates. So, this should have a positive impact on the ability of prospective teachers in data and information literacy. For this reason, in assessing the digital literacy skills of prospective teachers, the researcher draws conclusions that are not based on gender.

As explained in the previous section, digital literacy skills from the data and information literacy index consist of several competency areas. The first competency relates to the ability to operate digital devices. The second competency relates to the ability to access, manage the search for data, information and content in digital media as needed. The third competence

relates to the ability to filter data, information and content as needed. The fourth Competence relates to the ability to store data, information and content in digital media.

The data presentation starts from the ability of prospective teachers to operate digital devices which are tabulated in Table 5.

**Table 3. Operational Skills**

No	Indicators of Operational Skills (operational skills)	SS	S	KS	TS	STS
1	Ability to operate a computer or laptop	5%	60%	3%	0%	2%
2	Ability to use the internet	17%	69%	13%	1%	0%
3	Able to download the required information or data	24%	67%	8%	1%	0%
<b>mean</b>		<b>15%</b>	<b>65%</b>	<b>18%</b>	<b>1%</b>	<b>1%</b>

Based on the data in the table, it can be seen that the majority of prospective teachers, as many as 65% have the ability to operate digital devices properly. The ability to operate digital devices is measured by their ability to operate a computer or laptop, their ability to use the internet and download the required information or data. These three indicators are the basic abilities of prospective teachers in digital literacy, in order to support their competence as prospective teachers, and information is capable of operating digital devices. Even as much as 15% have the ability to operate digital devices very well. However, there are still 1% of prospective teachers who have not been able to operate digital devices properly.

Next, the second presentation about abilities access, is related to managing searches and filtering data, information and content in digital media as needed, which are tabulated in Table 6.

**Table 4. Ability to Find and Filter Information and Data**

No	Indicator in access, manage the search for data, information and content on digital media as needed	SS	S	KS	TS	STS
1	No difficulty in finding information/data	11%	38%	45%	5%	1%
2	Able to get as many references as needed via the internet	21%	45%	30%	4%	0%
3	Can you access research articles, e-books, or other learning resources digitally?	8%	75%	17%	0%	0%
4	Able to set search to get specific file types	9%	9%	40%	40%	45%
5	Able to organize searches to get information or data within a certain time	16%	16%	48%	48%	33%
<b>mean</b>		<b>13.00%</b>	<b>36.60%</b>	<b>36.00%</b>	<b>19.40%</b>	<b>15.80%</b>
<b>Indicators in filtering information and data</b>						
6	Able to filter the required data/information properly	21%	55%	22%	2%	0%

7	Able to filter valid and invalid data/information sources	14%	41%	41%	4%	0%
8	Able to determine the appropriate keywords to find the information/data needed	18%	55%	26%	1%	0%
9	Get used to finding out whether the information found on websites is true or false	24%	67%	8%	1%	0%
10	Get used to finding out who the author of the information is to find out his track record/credibility	26%	58%	16%	0%	0%
11	Accustomed to comparing various sources of information to decide whether information is correct	6%	44%	47%	3%	0%
<b>mean</b>		<b>18%</b>	<b>53%</b>	<b>27%</b>	<b>2%</b>	<b>0%</b>

The data show that in terms of seeking and finding the required information/data, only 13% said they were very capable and 36% said they were able. Meanwhile the other 36% answered neutral, meaning that they doubted their ability to search and find the data/information needed. A total of 19.4% said they were unable and 15.8% said they were very incapable. The data are not directly proportional to the ability of prospective teachers to operate digital devices. This means that the technical capabilities of prospective teachers in operating digital devices need to be strengthened in order to be able to support other digital literacy competencies.

Although the majority of prospective teachers find it difficult to organize searches to find certain types of files, information/data, the majority of prospective teachers have good abilities in filtering data/information. Namely, as many as 18% of prospective teachers have the ability to filter data/information very well and 53% have good abilities while those who cannot afford only 2%. The third area of competence is needed by teachers to be able to present valid, credible, true sources or teaching materials and not hoaxes.

For this reason, competence in filtering data/information is measured from several indicators. These indicators include the ability to determine the right keywords for the information/data sought, the ability to identify whether an information/data is valid, identify whether the data/information is a hoax, and identify the author's biography and the credibility of a source of information/data.

The next presentation is about ability to store data, information and content in digital media as needed, as tabulated in Table 7.

**Table 5. Ability to store data, information or content with digital media**

No	Indicators in Storing data, information or content with digital media	SS	S	KS	TS	STS
1	I am able to store information/data in digital media	15%	60%	25%	0%	0%
2	I am able to backup data via digital platform	12%	62%	25%	1%	0%
<b>Mean</b>		<b>13.5%</b>	<b>61%</b>	<b>25%</b>	<b>0.5%</b>	<b>0%</b>

Based on the data exposure of the survey results, it shows that in the competence of storing data, information/content with digital media, the majority of prospective teachers (61%) have good abilities. This competence is measured by indicators of the ability of prospective teachers to store information/data and their ability to back up data. From the first indicator, 60% of teacher candidates answered that they were able to store information/data in digital media and 0% said they were unable. Then to backup data through digital platforms, as many as 62% of respondents said they were able and 1% said they were unable.

Based on the exposure to data from each of these competency areas, it can be seen that prospective basic education teachers have good digital literacy skills in the data and information literacy index. The percentage of each competency is tabulated in Table 8.

**Table 6. Conclusion on the digital literacy ability of prospective basic education teachers in the data and information literacy index**

No	Areas of Competence	SS	S	KS	TS	STS
1	Ability in operational skills	15%	65%	18%	1%	1%
2	Ability to access, manage search data, information and content on digital media as needed	13%	36.6%	36%	19.4%	15.8%
3	Ability to filter data, information and content as needed in digital media	18%	53%	27%	2%	0%
4	Have the ability to store data, information and content in digital media	13.5%	61%	25%	0.5%	0%
	<b>mean</b>	<b>14.88%</b>	<b>53.9%</b>	<b>26.5%</b>	<b>5.73%</b>	<b>4.2%</b>

The data show that in the first competency area, the ability of prospective teachers in operational skills is at a good level with a percentage of 65%. In the second area of competence, about ability access, manage the search for data, information and content on digital media according to needs are also at a good level with a percentage of 36.6%. In the third competency area, regarding the ability to filter data, information and content as needed in digital media, it is at a good level with a percentage of 53%. In the fourth competency area, regarding the ability to direct/regulate the search for data, information and content as needed, it is also at a good level with a percentage of 61%. Thus, from the average result of each indicator shows that the digital literacy ability of prospective basic education teachers in the data and information literacy index is at a good level.

## DISCUSSION

Digital literacy is a very complex ability containing cognitive, psychomotor and affective elements, to work efficiently in a digital context (Eshet-Alkalai, 2004). Digital literacy is also interpreted as a multifaceted competency consisting of several levels, ranging from low levels to digital literacy skills at a higher level (Martin, 2006). A high or low ability in digital literacy, one of which is influenced by the duration of a person in accessing the digital world. As research conducted by (Çam and Kiyici, 2017), shows that there is a significant difference in terms of digital literacy skills seen from the context of the duration of accessing technology. The same thing was found in this study, that prospective teachers have good digital literacy skills because they are intense in accessing digital devices.

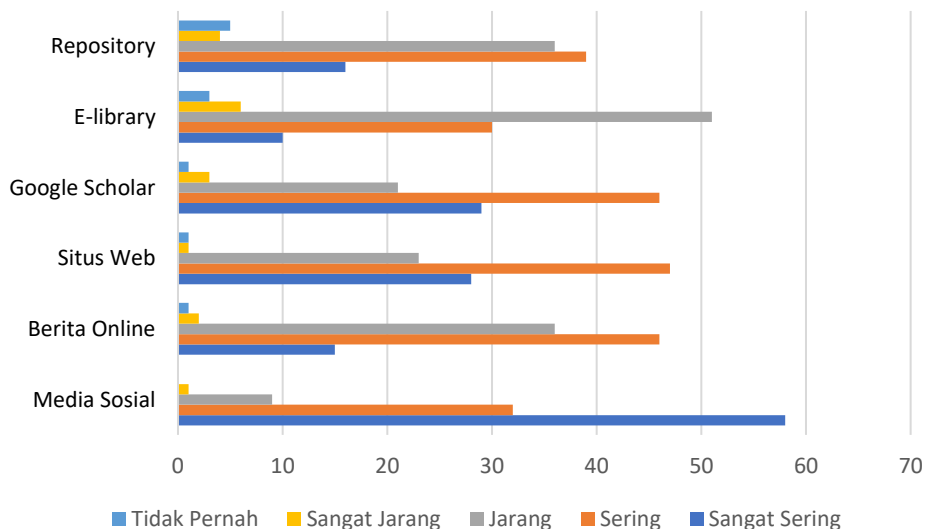
The measured digital literacy ability is the data and information literacy index. This index refers to the KOMINFO Indonesia digital literacy index (KOMINFO, 2020), which in this index

consists of 4 sub-competencies, namely 1) the ability to operate digital devices, 2) the ability to access, manage the search for data, information and content in digital media as needed, 3) the ability to filter information and data, and 4) the ability to store data, information or content with digital media.

Based on the five indicators measured, it shows that the digital literacy ability of prospective teachers from the aspect of the data and information literacy index shows that 14.88% have very good digital literacy skills and 53.9% are at a good level, 26.5% are at a good level. Sufficient, 5.73% are at the poor level and 4.2% are at the very poor level. Although the majority of digital literacy skills from the data and information literacy index are at a good stage, there are still as many as 36.43% of basic education teacher candidates who do not have good data and information literacy skills.

For this reason, there is a need for institutional efforts to strengthen the digital literacy skills of prospective teachers. This is because digital literacy is not an ability that appears suddenly but grows and develops through habituation. As the research conducted by Schroeder and Curcio, the use of digital-based learning platforms greatly affects the digital literacy skills of prospective teachers (Schroeder and Curcio, 2022). Learning programs that carry the principles of digital literacy will certainly provide intense opportunities to access digital facilities.

Accessing digital facilities is certainly not only used for entertainment, but is also used to enrich insight and strengthen the skills of prospective teachers in designing and implementing learning. Therefore, the sources in searching for information and data also need to be considered. Because not all sources support the strengthening of the digital literacy of prospective teachers. Based on a survey of digital data and information sources that are widely accessed by teachers, it is illustrated in the following chart:



**Figure 2. Digital Source of Information and Data**

The results of this survey indicate that most of the sources accessed by prospective teachers are social media, followed by sources from Google Scholar, websites, repositories, online news and e-libraries. The data provide a recommendation that further research is needed to find out what factors are the attractiveness of prospective teachers in determining

sources in searching for data/information. It is hoped that more credible sources can be more accessible.

## CONCLUSION

Digital literacy ability in the data and information literacy index, prospective basic education teachers at Islamic higher education UIN Sayyid Ali Rahmatullah Tulungagung seen from four competency areas include 1) the ability to operate digital devices, 2) the ability to access, manage the search for data, information and content in digital media as needed, 3) the ability to filter information and data and 4) the ability to store data, information or content with digital media. From the four competency area measurements, 68.88% of prospective teachers have good digital literacy skills, and the rest have not reached a good level. For this reason, it is necessary to strengthen the digital literacy of prospective basic education teachers carried out by institutions.

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