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DIGITAL LITERACY: STUDENT PERCEPTION IN MATHEMATICS LEARNING

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Abstract

Technological developments are increasingly sophisticated. Digital literacy skills are something that will be needed in the future, including in learning mathematics. The urgency of digital literacy skills can increase understanding if used appropriately. This study aims to examine student perceptions of digital literacy in learning mathematics. This study aims to discuss students' perceptions of digital literacy skills in learning mathematics. The type of research conducted is survey research. The population in this study were all students at the Universitas Islam Riau who had studied mathematics. The sample of this study was 152 people from several study programs at the Universitas Islam Riau. The sampling technique is the purposive sampling technique. The instruments used were a Digital Literacy Skills Questionnaire in Mathematics Learning and interviews. Data collection techniques using questionnaires and interviews. The questionnaire was distributed via Google Forms and consists of five aspects of digital literacy with 20 statements. The data analysis technique used is a descriptive quantitative analysis of students' perceptions of digital literacy in learning mathematics. Overall, students' digital literacy skills in learning mathematics are good; students can access the internet to learn mathematics, find and obtain information needed to learn mathematics, but they need to be improved in media literacy skills in learning mathematics. The use of digital literacy is highly recommended in the current mathematics learning process because students who live in the digital era can keep up with the times.

Keywords: Digital Literacy, Mathematics Learning, Perception.

Abstrak

Perkembangan teknologi semakin canggih. Keterampilan literasi digital menjadi sesuatu yang dibutuhkan di masa yang akan datang termasuk dalam pembelajaran matematika. Urgensi keterampilan literasi digital dapat meningkatkan pemahaman apabila dipergunakan secara tepat. Penelitian ini bertujuan untuk mengkaji persepsi mahasiswa terhadap literasi digital dalam pembelajaran matematika. Jenis penelitian yang dilakukan adalah penelitian survei. Populasi dalam penelitian ini adalah seluruh mahasiswa Universitas Islam Riau yang pernah belajar matematika. Sampel penelitian ini adalah 152 orang dari beberapa program studi di Universitas Islam Riau. Teknik pengambilan sampel adalah teknik purposive sampling. Instrumen yang digunakan adalah kuesioner literasi digital dalam pembelajaran matematika dan wawancara. Teknik pengumpulan data dengan kuesioner dan wawancara. Kuesioner dibagikan melalui google form yang terdiri dari lima aspek literasi digital dengan 20 pernyataan. Teknik analisis data yang digunakan adalah analisis kuantitatif deskriptif persepsi siswa terhadap literasi digital dalam pembelajaran matematika. Secara keseluruhan literasi digital siswa dalam pembelajaran matematika tergolong baik; siswa dapat mengakses internet untuk belajar matematika, mencari dan memperoleh informasi yang dibutuhkan untuk belajar matematika, namun mereka perlu meningkatkan literasi media dalam pembelajaran matematika. Penggunaan literasi digital sangat dianjurkan dalam proses pembelajaran matematika saat ini karena siswa yang hidup di era digital dapat mengikuti perkembangan zaman.

***Kata kunci**: literasi digital, pembelajaran matematika, persepsi.*

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INTRODUCTION

Rapid technological growth demands a change in skills that both students and teachers must possess. There are challenges in the teaching and learning process with technology, including developing information, digital, and visual literacy to ensure students are equipped with the skills needed for their future success (Nelson, Courier, and Joseph 2011; Lagrange et al., 2003). In the era of society 5.0, which the Japanese government introduced in 2019, it was created to anticipate the turmoil caused by the industrial revolution 4.0 (Ellitan, 2020; Al Faruqi, 2019; Heriyanto et al., 2019;), so that we are now entering the VUCA (Volatility, Uncertainty, Complexity, and Ambiguity) era (Ariwibowo & Wirapraja, 2018; Potsangbam, 2018; Guo et al., 2019). Volatility is a condition of uncertainty that can change rapidly. Uncertainty is a state full of uncertainty. Complexity is a state of being very complex or full of complexity. Ambiguity is a state of complete ambiguity or confusion or floating direction of life (Potsangbam, 2018). This situation can be seen during the current covid-19 pandemic; everything I changing big. All groups have to adjust how they work with the conditions currently engulfing the world very quickly. This is also inseparable from the world of education. The learning system, which is usually done face-to-face, must be replaced with online learning (Kusumaningrum & Wijayanto, 2020; Mustakim, 2020). Conditions like it or not, all parties must be ready to implement these changes. The impact of these changes resulted in changes in the education system. The world of education has a significant role in improving the quality of students. A mathematics educator must think about how students have many choices in learning, and the use of technology must be involved in the teaching and learning process (Lagrange et al., 2003; Mustakim, 2020; Drijvers et al., 2010).

The change towards the era of society 5.0 wants humans to coexist with technology comfortably (Al Faruqi, 2019). Of course, teachers cannot be separated from using Information and Communication Technology (ICT). ICT has a vital role in all social aspects because ICT has become commonly used in everyday life. ICT can significantly influence the learning process, encourage teachers to get many benefits and improve their abilities, access various educational resources, and use technology to motivate students to learn. The presence of ICT has changed not only as a tool for learning but has become a space in education; this has become an inseparable part of the current pedagogical process (Lucena; 2020; Thomas & Hong, 2013).

Changes in views also occur in terms of learning mathematics. Literacy Digital Technology is an important thing to be mastered by students because almost all learning processes turn to the digitalization process. Digital literacy is a crucial skill for education today(Koltay, 2011; Muliawanti & Kusuma, 2019). The use of digital literacy can also support Education Sustainable Development (ESD) in education, namely improving the quality of education. This digital literacy helps the younger generation benefit from information sources connected to digital technology and prepare themselves to face the current challenges of Futurelab (Muliawanti & Kusuma, 2019; Maulana, 2015). According to [17] have ten benefits can

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be obtained using digital literacy, namely: 1) it can affect the world; 2) make happy; 3) help with work; 4) Can make good decisions; 5) Always connected; 6) obtain the latest information; 7) make it safer; 8) save money; 9) learn faster; 10) save time. In addition, digital literacy makes a person have skills in accessing knowledge and can also hone critical thinking skills in digital literacy(Brian Wright, 2012).

There are many innovations in digital literacy technology today; this also happens in mathematics learning, such as e-books/digital modules (Istikomah & Herlina, 2020), interactive learning videos (Wachtler et al., 2016), Youtube, Virtual Reality (VR)(Kaufmann et al., 2000; Fabris et al., 2019), Augmented Reality (AR) (Estapa & Nadolny, 2015; Guntur et al., 2019), Internet of Things (IoT), Geogebra Software (Saha et al., 2010; Ljajko & Ibro, 2013), learning using Zoom, google meet, whereby, google classroom, learning media using the latest software, etc. The use of digital technology is a must; students are also generally smartphones; the results of a survey conducted in 2018 of 50 students, only two people do not use smartphones (Istikomah & Herlina, 2020). Especially in the current pandemic conditions, all learning activities have shifted from face-to-face to online. This, of course, requires every individual to quickly adapt to understanding and using the technologies that are now developing.

In learning mathematics, have students utilized digital literacy to their fullest to understand mathematical concepts? How are digital literacy skills in learning mathematics? Many exciting things can be studied with the development of digital literacy today. So, in this study, we focus on examining how students perceptions digital literacy skills in mathematics learning?

METHOD

Methods used in this research are survey methods (C.A. Moser, 2016). The subjects in this study were students in several study programs at Universitas Islam Riau. The number of research subjects reached 152 students. The stages of this research can be seen from the following chart in Figure 1.

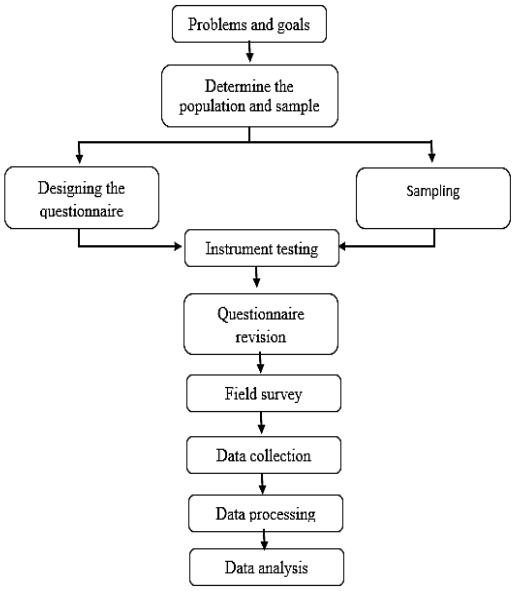

Figure 1. The stages of this research

The research instrument used was a Digital Literacy Mathematics questionnaire. Koltay (2011) & Covello (2010) aspects of digital literacy studied in this study are presented in Table 1.

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Table 1. Aspects of Digital Literacy and Statement

Aspects of Digital Literacy	Statement	Number of Statement
Information Literacy	Able to perform online searches by entering a URL into the browser to search for mathematical information	1
	Can use search applications/tools to obtain and obtain information in learning mathematics	2
	Able to select/identify mathematics reading books on the internet	3
	Able to detect valid and invalid information in finding information in learning mathematics	4
Computer Literacy	Able to operate computer/laptop digital technology equipment in mathematics learning	5
	Able to deal with problems of computer/laptop digital technology interference in learning mathematics	6
	Able to display presentations with PowerPoint or the like in Mathematics Learning	7
	Able to use equations to write mathematical symbols via Computer/Laptop	8
Media Literacy	Have the skills to use digital learning media in learning mathematics	9
	Able to create digital learning media for Mathematics Learning	10
	Able to display presentations with PowerPoint or the like	11
	Able to use math software to learn mathematics	12
Visual and Communicatio n Literacy	Able to communicate on digital media	13
	Able to access math learning videos	14
	Able to interpret and present mathematical material information obtained through digital media	15
	Able to make digital media to share mathematical information	16
Technology Literacy	Able to determine technology effectively for learning mathematics	17
	Able to make Electronic Mail (*Email*)	18
	Able to use email and send by attaching files	19
	Able to create web and display text (text), images, videos, and more	20

The data collection technique was carried out using a questionnaire via google-form to reach many research samples and interviews. The instrument given uses a Likert scale, the questionnaire uses very advanced, proficient, skilled, less skilled, and unskilled. The questionnaire consists of positive and negative statements. For positive statements, scores are very Proficient (5), Proficient (4), Skilled (3), Less Skilled (2), and Unskilled (1), and vice versa for negative statements.

Test the validity and reliability of the instrument using the smart pls application on 99 respondents. In the validity test with Average Variance Extracted (AVE), the AVE value is greater than 0,5, meaning that each indicator is valid, while the reliability results seen from Cronbach Alpha obtained a reliability value of 0,8 meaning reliable.

Data analysis was carried out descriptively, quantitatively, and qualitatively based on the results of questionnaire data. An analysis was carried out for each digital literacy component by finding the average of each component. Next, to obtain a score in the range of 1–100%, convert the average of each digital literacy

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component (score) using the following formula:

$$\text{Value (x)} = \frac{\text{score}}{\text{ideal score}} \times 100\% \quad (1)$$

The assessment category for each digital literacy component is determined using the criteria as in Table 2.

Table 2. Literacy Digital Category

Interval (%)	Category
$80 \leq x \leq 100$	High
$70 \leq x < 80$	Medium
$0 \leq x < 70$	Low

RESULT AND DISCUSSION

The survey results were conducted to see students' perceptions of digital literacy in learning mathematics. The digital literacy aspects used in the questionnaire include five things, namely: 1) Information Literacy; 2) Computer Literacy; 3) Media Literacy; 4) Visual and Communication Literacy; 5) Technology Literacy.

The results of research on Digital Literacy skills in mathematics learning can be seen from the Table 2.

Table 3. Effects of Digital Literacy in Each Aspect

Aspects of Digital Literacy	Mean	Deviation Standard (SD)	Percentage (%)	Category
Information Literacy	3,33	0,87	83,30	High
Computer Literacy	3,08	0,98	77,09	Medium
Media Literacy	2,71	0,89	67,82	Low
Visual and Communication Literacy	3,20	0,82	79,93	Medium
Technology Literacy	3,07	0,84	76,73	Medium
Total			**76,97**	**Medium**

Based on Table 3, it can be seen that Information literacy skills are in the high category. In contrast, the medium category includes computer literacy, visual and communication literacy, and technological literacy. However, in the aspect of using media in learning mathematics, it is still low, with a percentage of 67,82%. This shows that it still needs to be improved, especially in media literacy in learning mathematics.

Furthermore, the description of students' perceptions of each indicator is described. The results of data processing can be seen in the Table 4.

Table 4. Aspects of Information Literacy Skills

Statement	Score	Percentage (%)	Category
Able to perform online searches by entering a URL into the browser to search for mathematical information	3,55	88,75	High
Can use search applications/tools to obtain and obtain information in learning mathematics	3,40	85,00	High
Able to select/identify math reading books on the internet	3,26	81,50	Medium
Able to detect valid and invalid information in finding information in learning mathematics	3,12	78,00	Medium

From Table 4, students can search in learning mathematics. However, in terms of detection, valid and invalid information in finding information about mathematics is still the lowest among the other three statements. The

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table shows that, in general, students in information literacy skills are proficient and skilled in finding information.

Next, the resenerallys of skills in the aspect of computer literacy are presented in the Table 5.

Table 5. Aspects of computer literacy skills

Statement	Score	Percentage (%)	Category
Able to operate computer/laptop digital technology equipment in mathematics learning	3,25	81,25	High
Able to deal with problems of computer/laptop digital technology interference in learning mathematics	2,79	69,73	Medium
Able to display presentations with PowerPoint or the like in Mathematics Learning	3,22	80,59	High
Able to use equations to write mathematical symbols via Computer/Laptop	3,07	76,80	Medium

In the indicator of computer literacy skills, there are two in the high category and two in the medium category. However, when viewed from the percentage, the highest student ability is to operate computer/laptop digital technology equipment in learning mathematics. But it is not in line with the ability to face obstacles in using digital technology in learning mathematics. Result in Aspects Media Literacy Skills can show in Table 6.

Table 6. Aspects media literasi skills

Statement	Score	Percentage (%)	Category
Able to use digital learning media in learning mathematics	3,06	76,48	Medium
Able to create digital learning media for Mathematics Learning	2,52	62,99	Low
Able to use math software to learn math	2,56	63,98	Low

In this aspect of media literacy skills, students can generally use digital media to learn mathematics. But low in making and using the software as a support for learning mathematics. Table 7 show the result of aspects of visual and communication literacy skills.

Table 7. Aspects visual and communication literacy skills

Statement	Score	Percentage (%)	Category
Able to communicate on digital media	3,42	85,52	High
Able to access math learning videos	3,38	84,37	High
Able to interpret and present mathematical material information obtained through digital media	2,94	73,52	Medium
Able to make digital media to share mathematical information	3,05	76,32	Medium

Furthermore, the literacy aspect of Visual and communication skills, two statements in the high category and two in the medium category. The highest ability is to communicate with digital media and access mathematics learning videos.

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However, the lowest percentage is interpreting and presenting mathematical material information obtained through digital media. Then, for the laspeaspectdigital literliteracyiteracy Technology skills, the result showed in the Table 8.

Table 8. Aspects of literacy technology skills

Statement	Score	Percentage (%)	Category
Able to communicate on digital media Able to determine technology effectively for learning mathematics	3,05	76,15	Medium
Able to make Electronic Mail (email)	3,40	85,03	High
Able to use email and send by attaching files	3,64	91,12	High
Able to create web and display text (text), images, videos, and others in learning mathematics	2,18	54,50	Low

The last aspect, namely the literacy aspect of technology skills, is the highest ability to create emails, use, send, and att files. However, it is still shallow in developing web and display text, images, videos, and others in learning mathematics.

Discussion

The initial finding in this study is that there is one aspect in the high category, three in the medium category, and one in the low category. Students' digital literacy skills in the high category are information literacy; in this category, students can search for digital information through their smartphones or laptops/computers. Medium literacy skills are Computer Literacy skills; Visual Literacy and Communication, and Technological Literacy. This means that students are skilled in using computers and take advantage of the currently developing technology. Furthermore, the skills that are in the spotlight due to the low level of these skills are media literacy skills. In this aspect, generally, students still have difficulty using media and software for learning mathematics in the teaching and learning process. One of the causes of the low ability to use mathematical media and software is that the learning process is not facilitated. Whereas the use of software in learning can improve students' understanding. In line with the opinion Tamur et al (2020) & M. Tamur et al (2021) that using mathematics software has a positive effect on understanding mathematics. In addition, the role of the media in learning is important and supports their success in learning (Mor, 2015)

Digital literacy skills in learning mathematics play a very supportive role in learning. Exploring digital literacy skills in learning mathematics is needed to motivate students to succeed. After considering the existing literature related to digital literacy, this study has five aspects (Covello, 2010; Çam & Kiyici, 2017). This study is expected to examine how students can use digital literacy in learning mathematics to overcome obstacles in using digital literacy.

Based on the interviews with several students, the obstacle they face in finding learning resources through digital literacy in mathematics learning is the difficulty finding valid information. Students are sometimes confused in understanding various mathematical concepts on the internet. So for this information literacy skill, the teacher's role is needed to clarify the

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information they get. This is in line with studies (Tohara et al., 2021), revealing that teachers need to provide insight or assessment of information and ensure students can read, select, interpret and evaluate the information required for learning.

In the digital era, teachers must be able to use pedagogical methods that are integrated with ICT (Yusuf et al., 2019; Alazam et al., 2012), so that the pedagogical foundation can develop their competencies to skillfully use ICT appropriately (Tang & Chaw, 2015). The development of technology in the mathematics learning process by using learning models and technology can provide opportunities for students to be involved in problem-solving and critical thinking skills in learning (Novitasari et al., 2020). This is according to what Ting said that digital literacy can solve problems faced by students by exploring using the internet (Ting, 2015). This is in line with the findings of the research which revealed that students who have high digital literacy, these students also have high problem solving abilities (Agustin & Winarso, 2021).

Based on the results of surveys and interviews, in general students' digital literacy are good, but they need to be improved in the use of media literacy in learning mathematics. The role of the pedagogical environment and learning environment is needed to be able to improve digital literacy in learning mathematics because literacy digital is essential for mathematics education today (Anderson, 2021; Khan et al., 2021; Drijvers, 2019). The results of this research are in line with the findings of research Zulkarnain, Z et al., (2020), that the results of the research found that students' digital literacy was still in the low category. However, in contrast to the research results presented in Fadillah, A et al (2021), the research results reveal that digital literacy abilities are relatively high, but more detailed and in-depth studies are still needed.

The findings of the present research hold the potential to augment digital literacy in the context of mathematical education. Educators can enhance their digital literacy competencies to design suitable and efficacious pedagogical approaches, thereby facilitating students' mastery of mathematical concepts. So, that digital literacy can be an effective supporting tool in developing their mathematical thinking process.

Limitations the scope of this research study is restricted to a questionnaire survey and an interview, which are founded on the arbitrary perspectives or opinions of students. To attain more robust and cogent conclusions, it is imperative to undertake in-depth interviews and direct observations of the respondents to determine the alignment between their proficiency in digital literacy and their responses to the questionnaire. Finally, the contribution of this research is to enhance students' digital literacy by means of incorporating of technology in the pedagogical process of the classroom.

CONCLUSION

This research study discusses digital literacy. It can be viewed from four aspects, namely 1) Information Literacy; 2) Computer Literacy; 3) Media Literacy; 4) Visual and Communication Literacy; 5) Technology Literacy. The results showed that from the four aspects, two aspects were obtained in the high category, two in the medium category,

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and one in the low category. In general, students can access the internet to learn mathematics, but they are still common in creating and using several media in learning mathematics.

Based on the findings and research results, students have mastery and understanding of digital literacy and seek the information they need through digital technology and consistently use it in everyday life. However, teacher assistance is needed in providing information to further improve students' abilities so that knowledge in the use of digital literacy can foster a good understanding of learning mathematics.

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