Digital Literacy Profile of Early Childhood Education Students

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Abstract. The objective of this study is to obtain a mapping regarding digital literacy competencies in early childhood education students and provide an overview of which indicators need to be developed in the form of policies in the early childhood education study program as well as in further research. The type of research used was quantitative descriptive research with a population of all early childhood education students at Universitas Negeri Medan and used a random sampling method as the sample in this research. Data collection technique is distributing questionnaires to samples and analyzing using descriptive percentages. The findings and conclusions are that the digital literacy competencies of early childhood education students in Universitas Negeri Medan are in the High category, female students have higher digital literacy skills than male students, the class of 2021 students have the highest digital literacy skills compared to classes of 2020, 2022, and 2023. Based on indicator of digital literacy, students' digital ethics and digital culture are higher than digital skills and digital safety indicators.

Keywords: Digital Literacy, Early Childhood Education Students

1 Introduction

Indonesia is preparing to enter a new era, driven by the pandemic that occurred several years ago. The educational approach and process has changed from conventional to online-based learning such that it is no more confined by place and time. This pandemic seems to accelerate the transition of revolution 4.0 towards the era of Society 5.0. The Society 5.0 era is one in which technology has become an integral component of human life. The existence of collaboration between humans and technology as the basis (Technology Based) means that the competencies connected to the usage and development of technology-based technologies become a requirement for future humanity.

According to the findings of a study performed by Kominfo and KIC, Indonesia's digital literacy index was 3.49, with index 5 being the greatest literacy and index 1 being the lowest literacy (Kominfo & KIC, 2021). Kinsey (2019) explains that by 2030, around 23 million jobs will be displaced by automation, meaning that Indonesia is faced with preparing human resources for national digital transformation in various aspects of life.

When individuals interact face-to-face, they are constantly learning from the social conditions and events that surround them. This learning process always alters due of technology equipment and evolves into a multi-structure. During this process, digital literacy is seen as effective literacy. Digitalization was founded on digitization, multimedia, interactivity, and ubiquitous presence. The 1970s saw the development of digital technology

ICONSEIR 2023, November 30, Medan, Indonesia

DOI 10.4108/eai.30-11-2023.2346948

and integrated systems, which paved the way for the digital world. Digital technology, speech, picture, data, or packaging, and the coding of all sorts of communications arose with the advent of computer technologies and communication devices.

One of the adaptations to the 5.0 era in the world of education is to prepare students who are prospective teachers to have key and supporting competencies and have a friendly attitude towards technology. As Agents of Change, teachers have a strategic role and have many challenges in preparing themselves for future needs. Digital 'literacy' is one example of a 21st century life skill that is pushed as a form of required ability. Based on a poll performed by KIC and Kominfo, the digital literacy index for the Gen Z category (aged 13-22 years), namely 40% of respondents, is still at a low level.

Digital literacy entails far more than just expertise with certain computer skills. While core abilities are important, digital literacy involves recognizing their significance in various settings and using them effectively. It is worth noting that digital literacy is a multifaceted concept that includes several abilities. Lankshear and Knobel (2008) proposed that effective use of digital media necessitates a range of competencies, including text literacy, technical skills, cognitive abilities, and sociocultural strengths.

Bawden (Nasrullah et al., 2017) interprets digital literacy as the computer and information literacy. This literacy has progressed during the 1980s. Microcomputers and information have evolved through networked information technology from the 1990s to the present day. Digital literacy is currently defined as a set of knowledge and abilities for using digital media, communication technologies, or networks to search, assess, use, generate, and utilize information in a healthy, smart, intelligent, conscientious, precise, and law-abiding manner in order to encourage communication and interaction in daily life. Digital literacy is described as the ability to use information and communication technology (ICT) to transfer content/information while displaying cognitive and technical abilities. Digital literacy emphasizes on cognitive and social-emotional components of the digital world and environment, rather than just technical abilities.

In early childhood education, students as prospective teachers not only master pedagogical knowledge as a basis for teaching, but also complete the ability to master technological tools and can use digital data to support learning in early childhood education classes. Early childhood education institutions must adapt to all changes and prepare competent teacher candidates according to the needs of the society 5.0 era.

Digital mastery, one of which gives teachers breadth in enriching knowledge and teaching materials as well as presenting various varied methods for teaching in the classroom. This is connected to pedagogical competence, using communication and information technology to increase the quality of educational development activities, and professional competence, specifically using communication and information technology for self-development. (Permendiknas, 2007).

The importance of digital mastery in the new era for teachers in professional development means that it is necessary to carry out initial studies/research regarding digital literacy skills in order to map the conditions and digital literacy abilities of early childhood education students as prospective early childhood teachers.

Digital literacy consists of two words, literacy and digital. Literacy is the capacity to access, comprehend, and apply something intelligently through diverse actions (Nasrullah, et al., 2017). Meanwhile, digital is a form of change/modernization of mechanical technology so that it can make human life easier. So digital literacy refers to the capacity to identify and use digital means and technology instruments to carry out diverse activities successfully and efficiently.

Deakin University defines digital literacy as the use of technology to find the information needed, using information as a basis for thinking and disseminating information through technological tools/technological devices in the digital world (University, 2022). Steve Wheeler, in his writing, formulated the important components of digital literacy (Wheeler, 2012) that is; social networking (utilization of social media that supports life), transliteracy (utilization of various platforms for socializing), maintaining privacy (maintaining personal security), managing identity (using identity appropriately on various social media), creating content (skills in creating activities and information using various applications), organizing and distributing material (organizing and sharing data information, photos, and videos with others); reusing and repurposing content, sifting and choosing content (the behavior of processing and reusing data that has already been found, storing data for use repeatedly and filtering information according to needs through the network), as well as self-broadcasting (participating as a digital citizen through digital forums and the use of social media)

In line with Wheller, a framework for digital literacy refers to "a Global Framework of Reference on Digital Literacy Skills" (Unesco, 2018) refers to several groups and competencies:

a. Information and data literacy, Ability to look for and access data and material in digital media as needed, filter required information, organize data searches, information in digital media, have the ability to store data in digital media
b. Communication and Collaboration, interacting through various communication devices, sharing data/information via appropriate and appropriate digital technology, considering how to communicate, being aware of diversity when sharing information, ethics in technology (writing opinions in polite language, being ready for the consequences of writing on the internet, include the creator of the work, whether writing, drawing or photo, do not spread hate speech, hoaxes and slander)
c. Digital Content Creator, developing digital content, understanding licenses and copyright, designing information and programs that are presented digitally
d. Safety, related to personal security (file security, misuse, disabling GPS, not uploading personal data on social media) and device security (using applications to find and delete viruses on cellphones/computers, being able to secure devices with passwords, backing up data)
e. Problem Solving, related to the ability to operate technological tools, the capacity to download and upload files/applications, as well as install programs, the ability to manage digital learning resources, the skills to use learning tools, the skills to use social media for learning, mastery of learning software and applications and critical thinking (finding out origin of data, checking and comparing data or information).

Digital literacy based on Wheeler and the UNESCO framework, can be broadly summarized in three domains of ability, namely knowledge, attitudes and skills in using digital technology products.

The framework used in Indonesia in 2021 refers to "A Global Framework of Reference on Digital Literacy Skills" (Unesco, 2018) and several other references. In this framework, digital literacy is divided into four pillars, such as Digital Skills, Digital Ethics, Digital Safety, and Digital Culture(Kominfo & KIC, 2021).

a. Digital Skills are person's capacity to comprehend, understand, and use ICT hardware, software, and digital operating systems in daily life.
b. Digital Ethics are an individual's capacity to recognize, demonstrate, adapt, justify, consider, and build digital ethical governance (netiquette) in daily life.

c. Digital Safety or digital security is the user's capacity to notice, pattern, apply, evaluate, examine, and raise awareness about personal data protection and digital security in daily situations.
d. Digital Culture is an individual's capacity to read, describe, acquaint, investigate and construct national insight, the values of Pancasila and Bhinneka Tunggal Ika in daily life, and the digitization of culture via the use of ICT.

Referring to the competency section of the national framework and UNESCO, the relationship between the two can be described in the following table:

Table 1. Digital Literacy Competency Chart

UNESCO	National Digital Literacy	Information
Information and Data Literacy Digital Content Creator Solution to problem	Digital skills	1. Digital skills are person's capacity to comprehend, understand, and use ICT hardware, software, and digital operating systems in daily life.
Communication and Collaboration	Digital Ethics Digital Culture	1. Digital ethics are an an individual's capacity to recognize, demonstrate, adapt, justify, consider, and build digital ethical governance (netiquette) in daily life 2. Digital culture is person's capacity to read, describe, acquaint, investigate and construct national insight, the values of Pancasila and Bhinneka Tunggal Ika in everyday life, and the digitization of culture via the use of ICT.
Safety	Digital Safety	Digital safety is the user's capacity to notice, pattern, apply, evaluate, examine, and raise awareness about personal data protection and digital security in daily situations.

Based on the competency formulation above, it can be concluded that the competencies that must be possessed in relation to digital literacy are the ability to include knowledge, attitudes and skills in using information and communication technologies to enhance the quality of development/learning and self-development activities (Permendiknas, 2007).

The ability of students as prospective early childhood teachers to utilize technology can support the learning process (Arigiyati, Kusumaningrum, & Kuncoro, 2021) and prepare students adequately to live and work in a digital society (digcomptest, 2017). Technology may also be used as an educational resource, digital media, a form of teacher supervision, as fast access to information, school promotion and publication of teacher work (Rohmah, 2019).

Some time ago, learning at early childhood education was carried out online due to the pandemic conditions and related to the independent learning policy. The process that takes place online allows teachers to have skills that make learning easier in "virtual" classes. The ability to master technological tools, such as cellphones, tablets, laptops as a means of communication, is explored through learning activities. Technological breakthroughs have developed a type of "smartphone" that can make it simpler for individuals to carry out their everyday tasks, including learning activities, on the network. In addition, teaching materials, materials and creative content can be used directly by teachers and enrich children's learning experiences inside or outside the classroom (Hasbi, et al., 2020). Teachers can adapt and choose material that suits children's needs and interests. Teachers can read story books, tell stories through technology by utilizing digital products. Smooth and creative motif activities in coloring activities using applications and others. In the article Transforming Early Childhood Experience with Digital Technologies as a basis for the world of education (Hatzigianni, 2018). Digital technology can also be used in assessing children's processes and development by utilizing various digital worksheets and reports (Hasbi, et al., 2020).

2 Research Methods

This research is a quantitative descriptive study by taking sample data from the population of early childhood education students at Universitas Negeri Medan, using a random sampling method so that each student has the opportunity to become a research sample. The data collection technique used was literature study, distributing questionnaires to samples and accompanied by interviews with parties deemed to have information. Data analysis was carried out using descriptive percentage data analysis with data processing carried out through stages (1) Data collection, carried out with a focus on aspects of the research topic; (2) Data entry; (3) Data Analysis; (4) Tabulation according to observation needs; and (5) Descriptive interpretation.

3 Results and Discussion

3.1 Instrument Test Results

This research uses a measurement method in the form of a scale. Scale is a data gathering approach that involves offering respondents a set of written statements or questions to answer. This scale was designed to measure digital literacy competency through four aspects, namely digital skills, digital ethics, digital safety and digital culture. The scale is sorted based on the smallest score, namely 1, to the largest score, namely 4.

Table 2. Digital Literacy Instrument Grid

Rated aspect	Indicator	Number of Items
a. Digital Skills	Person's capacity to comprehend, understand, and use ICT hardware, software, and digital operating systems in daily life.	10
. Digital Ethics (Digital Ethics)	Person's capacity to recognize, demonstrate, adapt, justify, consider, and build digital	10

	ethical governance (netiquette) in daily life	
c. Digital Safety (Digital Security)	Person's capacity to notice, pattern, apply, evaluate, examine, and raise awareness about personal data protection and digital security in daily situations	10
d. Digital Culture (Digital Culture)	The an individual's capacity to read, describe, acquaint, investigate and construct national insight, the values of Pancasila and Bhinneka Tunggal Ika in daily life, and the digitization of culture via the use of ICT.	10

In this research, the validity used is content validity. Suryabrata (1998) states that content validity is enforced by reviewing and revising questions/statements. In line with this statement, Azwar (2004) stated that content validity aims to reveal the extent to which the questions in the measuring instrument cover the entire content area being measured, based on professional opinion (professional judgment).

The reliability of measuring instruments can be seen from the reliability coefficient which is an indicator of the consistency of questionnaire items in carrying out their measuring function together. The reliability of this measuring instrument actually refers to the consistency or trustworthiness of the measuring results which contain measurement accuracy (Azwar, 2004). Reliability tests are used on valid items. The level of reliability is indicated by a reliability coefficient number. Based on the results of the Pearson product moment correlation test, there were 28 items out of 40 items that were declared valid and reliable for use in this research. The results of instrument testing can be seen in the table below:

Table 3. Digital Literacy Instrument Trial Results

Item No	Correlation coefficient	Information
1	0.988	Valid
2	0.017	Invalid
3	0.858	Valid
4	0.879	Valid
5	0.120	Invalid
6	0.926	Valid
7	0.117	Invalid
8	0.888	Valid
9	0.897	Valid
10	0.298	Invalid
11	0.137	Invalid
12	0.948	Valid
13	0.323	Invalid
14	0.945	Valid
15	0.346	Invalid
16	0.988	Valid
17	0.095	Invalid
18	0.869	Valid
19	0.907	Valid
20	0.901	Valid
21	0.968	Valid
22	0.964	Valid
23	0.913	Valid

24	0.947	Valid
25	0.921	Valid
26	0.905	Valid
27	0.934	Valid
28	0.871	Valid
29	0.938	Valid
30	0.864	Valid
31	0.964	Valid
32	0.322	Invalid
33	0.988	Valid
34	0.988	Valid
35	0.103	Invalid
36	0.929	Valid
37	0.988	Valid
38	0.959	Valid
39	0.060	Invalid
40	0.298	Invalid

3.2 Description of Research Data

Analysis of research data can be carried out by grouping referring to categorization criteria. This categorization is based on the assumption that population scores are normally distributed. The categorization criteria used in this research are divided into four categories, namely very high, high, medium and low.

A. Overview of Digital Literacy Scores

Based on empirical categorization of research subjects, data is grouped into levels and then arranged according to certain norms. The categorization criteria for digital literacy in early childhood education students can be seen in table below.

Table 4. Categorization of Empirical Data on Digital Literacy

Variable	Value Range	Category	Frequency	Percentage
Digital Literacy	$91 < X \leq 112$	Very high	90	39.3%
	$70 < X \leq 91$	High	134	58.51%
	$49 < X \leq 70$	Medium	5	2.18%
	$28 < X \leq 49$	Low	-	-

Based on the categorization criteria in table 5.3, it shows that the digital literacy abilities of early childhood education study program students in Unimed generally get a score of 89.01 and are in the High category. It can be seen from the data above that there are no students in the low category. From the total sample of 229 students, 90 students (39.3%) were in the Very High category, 134 students (58.51%) were in the High category, and 5 students (2.18%) were in the Medium category.

B. Digital Literacy Scores in Terms of Gender

The digital literacy profile of early childhood education study program students in Unimed based on gender can be seen in the following chart.

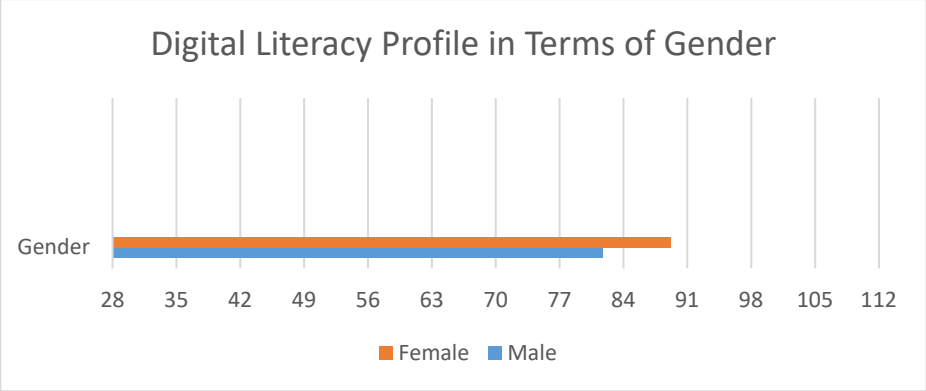

Fig. 1. Digital Literacy Profile in Terms of Gender

The graphic above illustrates that female students in the early childhood education studies program have stronger digital literacy abilities than male students. However, both are in the High group, with scores ranging from 71 to 91. Male students had an average score of 81.75. Meanwhile, female students had an average score of 89.15.

C. Digital Literacy Scores Based on Student Academic Year

The digital literacy profile of early childhood education study program students, if viewed based on student academic year, can be seen in the following chart.

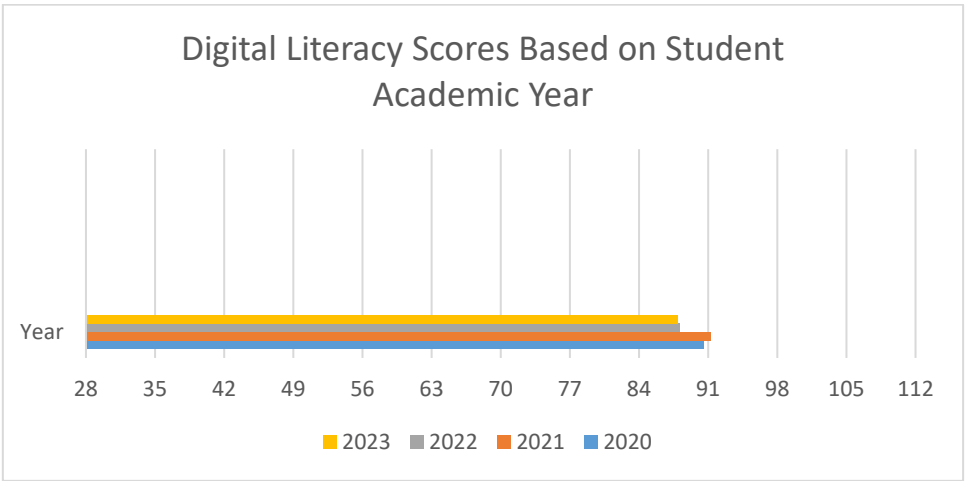

Fig. 2. Digital Literacy Scores Based on Student Academic Year

The chart above shows that the class of 2021 of early childhood education study program students have the highest digital literacy skills among the three other classes. With an average score of 91.2, students from the class of 2021 are in the Very High category. The classes of 2020, 2022 and 2023 are in the same score range, namely in the High category. The class of 2020 got an average score of 90.5, the class of 2022 got an average score of 88.13, and the class of 2023 got the lowest average score compared to the other three classes, namely 87.85.

D. Digital Literacy Scores Viewed from Digital Literacy Ability Indicators

Digital literacy skills have four indicators, namely digital skills, digital ethics, digital safety and digital culture. The digital literacy profile of early childhood education study program students, if viewed based on these four indicators, can be seen in the following chart.

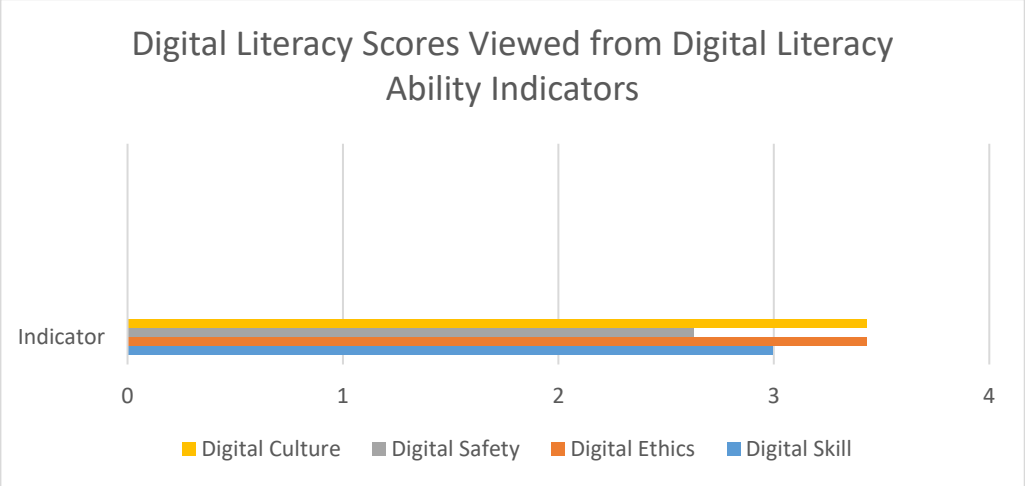

Fig. 3. Digital Literacy Scores Viewed from Digital Literacy Ability Indicators

If viewed based on indicators of digital literacy skills, the chart above shows that in general students of early childhood education study program have the highest average score on digital ethics and digital culture, namely 3.43. The lowest indicator is digital safety with an average score of 2.62. Meanwhile, digital skills have an average score of 2.99.

3.3 Discussion

Digital literacy refers to the capacity to identify and use digital methods and technology instruments to do various activities successfully and efficiently (Nasrullah et al, 2017). Digital literacy is divided into four pillars, such as Digital Skills, Digital Ethics, Digital Safety, and Digital Culture (Kominfo & KIC, 2021). In general, the digital literacy competencies of early childhood education study program students in Unimed are in the High category, in fact 39.3% of students have very high digital literacy skills, and there are no students in the Low category. This shows that the average student in the early childhood education study program is able to use digital means and technological tools to carry out various activities, including learning activities.

If viewed based on gender, the digital literacy skills of early childhood education female students are higher than male students. However, Both are in the High group, with scores ranging from 71 to 91. Male students had an average score of 81.75. Meanwhile, female students had an average score of 89.15. From the data above, it can be analyzed that so far female students have used digital facilities and technological tools with higher frequency, duration and intensity than male students so that their abilities have become more developed.

The results of the analysis based on the student academic year from the early childhood education study program show that the class of 2021 has the highest digital literacy skills among the three other classes. Meanwhile, the class with the lowest score is the class of 2023. This condition can also be caused by the frequency, duration and intensity of using digital facilities and technological tools. The class of 2023 is the youngest class to have gone through the learning process at the early childhood education study program in less than 6 months. They are not yet accustomed to using digital means and technological tools, especially in the learning process.

If analyzed based on indicators of digital literacy skills, in general students of the early childhood education study program in Unimed have the highest average score on digital ethics and digital culture, namely 3.43. Students have strong capabilities in knowing, comprehending, and using ICT hardware and software, as well as digital operating systems in daily life. Students have also recognized, modeled, adapted, reasoned, examined, and built digital ethical governance (netiquette) in daily situations. The lowest indication is digital safety, with an average score of 2.62. This demonstrates that pupils were not able to notice, pattern, apply, evaluate, consider, and raise awareness of personal data protection and digital security in daily life. Meanwhile, digital skills have an average score of 2.99 which is in the Medium category, which shows that students are capable of knowing, understanding, and using ICT hardware, software, and digital operating systems in daily life..

4 Conclusion

a. The digital literacy competencies of early childhood education study program students are in the High category
b. Female students have higher digital literacy skills than male students
c. Students from the class of 2021 have the highest digital literacy skills compared to students from the classes of 2020, 2022 and 2023
d. Students' digital literacy abilities on digital ethics and digital culture indicators are higher than on digital skills and digital safety indicators.

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