Journal of Educational Research and Evaluation
Volume 7, Issue 4, 2023, pp. 703-712
P-ISSN: 2597-422x E-ISSN: 2549-2675
Open Access: https://doi.org/10.23887/jere.v7i4.58388

The Relationship Between Digital Literacy and Students' Science Process Skills in Junior High Schools

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ARTICLE INFO

Article history:
Received February 07, 2023
Revised February 13, 2023
Accepted July 27, 2023
Available online November 25, 2023

Kata Kunci :
Hubungan, Keterampilan Proses Sains, Literasi Digital

Keywords:
Digital Literacy Ability, Relationship, Science Process Skills

ABSTRAK

Keterampilan proses sains merupakan salah satu keterampilan yang dapat mengembangkan potensi pada diri siswa. Keterampilan proses sains mengacu pada aspek kognitif dan psikomotorik, sehingga mampu menciptakan pembelajaran bermakna berdasarkan pengalaman siswa. Kemampuan literasi digital dan keterampilan proses sains siswa jarang diperhatikan dalam proses pembelajaran, sehingga diperlukan suatu analisis untuk mengetahui kemampuan literasi digital dan keterampilan proses sains siswa. Penelitian ini bertujuan untuk menganalisis hubungan keterampilan literasi digital dengan keterampilan proses sains pada materi bidang sederhana. Metode penelitian yang digunakan adalah metode campuran dengan desain eksplanatori. Subjek penelitian yang digunakan berjumlah 24 siswa. Instrumen penelitian yang digunakan adalah angket literasi digital, lembar observasi keterampilan proses sains, dan lembar wawancara. Teknik analisis data menggunakan analisis data kuantitatif dan analisis data kualitatif. Hasil uji korelasi Pearson menunjukkan terdapat hubungan yang signifikan antara keterampilan literasi digital dengan keterampilan proses sains siswa pada materi bidang sederhana. Peneliti berharap penelitian selanjutnya dapat mengetahui hubungan tersebut berdasarkan gender.

ABSTRACT

Science process skills are one of the skills that can develop potential in students. Science process skills refer to cognitive and psychomotor aspects, so as to create a meaningful learning based on student experience. Digital literacy abilities and students' science process skills are rarely considered in the learning process, so an analysis is needed to determine students' digital literacy skills and science process skills. This study aims to analyze the relationship between digital literacy skills and science process skills in simple plane materials. The research method used is a mixed method with an explanatory design. The research subjects used were 24 students. The research instruments were digital literacy questionnaires, science process skills observation sheets, and interview sheets. Data analysis techniques used quantitative data analysis and qualitative data analysis. The results of the Pearson correlation test showed that there was a significant relationship between digital literacy skills and students' science process skills in simple plane material. The researcher hopes that further research can determine the relationship based on gender.

1. INTRODUCTION

Natural science is one of the most important sciences to learn at every level of education. Most natural sciences are built on the basis of curiosity in a researcher towards an object to be studied during the investigation process (Arafat et al., 2022; Astalini et al., 2021; Jannah et al., 2023). Science learning is not only aimed at requiring students to master skills, knowledge in the form of facts, concepts or principles, but also the discovery process through experimentation in the learning process (Astalini et al., 2022; Husna, Siahaan, et al., 2021; Utami et al., 2022). Whether or not science learning objectives are achieved in the form of knowledge, attitude, and psychomotor assessment can be determined by conducting an assessment (Fajarini et al., 2021; Megawati, 2022; Nawangsari & Suryanti, 2021). One of the psychomotor domains that need to be measured in science learning is science process skills. Science process skills are one of the skills that can develop potential in students. Science process skills refer to cognitive and psychomotor aspects, so as to create a meaningful learning based on student experience (Ermawati et al., 2019; Ginting et al., 2022; Sumaeni et al., 2022). Science process skills are very important for students to master, because they can grow students' thinking broadly, cognitively, critically, and can solve a problem (Darmaji et al., 2021; Minasari et al., 2020). Therefore, science process skills need to be

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trained in students. One way to train and develop students' science process skills is by doing practicum activities (Mahjatia et al., 2020; Nurfahzuni & Budiyanto, 2023). Practicum plays an important role in training students' abilities and skills to understand a learning material. Through practicum students can train cognitive, affective, and psychomotor levels (Darmaji et al., 2019; Koo et al., 2022; Tambak et al., 2022). The practicum method can help improve students' analytical skills as well as students' science process skills in using laboratory equipment (Hamidy et al., 2022; Jannah et al., 2023; Putri et al., 2022). In addition, along with the development of technology and information as it is today, students can carry out learning activities wherever and whenever. However, in utilizing various existing digital media, digital literacy skills are also needed. Digital literacy skills help students understand various information obtained from various digital media sources carefully and precisely. Digital literacy is the ability and understanding in using digital media, the internet, creating information, evaluating, finding and using it effectively in everyday life (Dinata, 2021; Prabowo et al., 2023; Sormin et al., 2017). Therefore, digital literacy skills play an important role in dealing with rapid technological advances, in order to avoid various negative impacts. In addition, digital literacy is also very important in the world of education, with digital literacy, it will be easy for students to interact, enrich knowledge from various sources, use information in a fast way, and be able to give birth to various innovations (Ahsani et al., 2021; Fitriani et al., 2022; Ningsih et al., 2021). To find out the digital literacy skills of each student, it is necessary to assess students' digital literacy abilities in the learning process.

This research is relevant to previous research on digital literacy. However, there are differences in the focus of research, including research by previous study that focusing on analyzing digital literacy skills (Khan & Vuopala, 2019). Furthermore, there is also research that focuses on developing a digital literacy assessment model that is equipped with self-learning tools (Baker, 2004). In addition, there are also differences in research subjects, including research by other study with high school students as research subjects (Cohen et al., 2020). Then research with research subjects were students for SMA/SMK (Anggraini et al., 2020). Likewise, research conducted that focuses on the effect of self-directed learning on students' digital literacy levels (Kim et al., 2022). There are also several studies that are relevant to research related to science process skills. However, there are differences in the focus of the research, one of which is research conducted that focusing on test instruments to measure students' KPS (Ulfah et al., 2020). Research by other study focuses on improving science process skills (Supriyadi et al., 2020). There is also research that focuses on describing students' science process skills (Wulandari et al., 2020). Then there are differences in the material studied, namely research that analyzing science process skills in Heat Transfer material (Bystrova, 2020; Hadianto et al., 2021). From these studies it is known that there is no research that analyzes the relationship of digital literacy with science process skills. The novelty of this research is the analysis of the relationship between two variables, namely digital literacy and science process skills. This study analyzes the relationship between digital literacy and science process skills only for simple plane materials. This is because there is no research that has analyzed the relationship between the two variables, namely digital literacy and science process skills on simple machine material. Students who have good digital literacy will find it easier to find important information as learning material and support the emergence of positive ideas and creative ideas related to the knowledge learned during the learning process, so that digital literacy skills can be a determinant of student learning success. Therefore, this study aims to determine the relationship between digital literacy and science process skills in simple machine materials.

2. METHODS

The type of research used in this research is mixed methods. Mixed methods are methods that combine quantitative and qualitative approaches (Mahirullah et al., 2023; Nadila et al., 2021; Rattray et al., 2023). The research design used is explanatory mixed methods designs, namely research methods that combine quantitative and qualitative research methods in a systematic way. In the first phase of this design, the researcher collects quantitative data and is followed by a second phase of collecting qualitative data. The population in this study was all students of class VIII SMPN 7 Muaro Jambi. Samples are some part of the number and characteristics possessed by a population (Husna, Maison, et al., 2021; Nasution & Fitriani, 2019). The sample in this study was 24 class VIII C students of SMPN 7 Muaro Jambi. However, the sample used to be interviewed was only 3 students. This sample was taken using a purposive sampling technique. Purposive sampling technique is a sampling technique based on several considerations or certain criteria that aim to obtain a sample that is in accordance with the research objectives. The criteria for taking this sample were class VIII students who had studied simple machine material. The research instrument is a tool used in collecting data from a study. The instruments used in this study were a digital literacy questionnaire with 22 statements, an observation sheet for science process skills with 20

statements, and an interview sheet consisting of 6 questions divided into 3 questions about digital literacy and 3 questions about science process skills. The type of questionnaire used is a closed questionnaire using a Likert scale. The digital literacy questionnaire consists of four alternative answers, namely strongly agree, agree, disagree and strongly disagree. While the observation sheet uses a Likert scale with four alternative answers, namely very good, good, not good, and very bad. The interviews in this study were conducted in a semi-structured manner, namely combining structured and unstructured interviews. Semi-structured interviews can get informants' answers to each question in depth, researchers can add questions and can make changes to questions that have been made (Andina, 2019; Low, 2019). The lattice of digital literacy instruments and science process skills can be seen in Table 1 and Table 2.

Table 1. Digital Literacy Grid and Science Process Skills

Science Process Skills	Digital Literacy
Indicator	**Indicator**
Observation	Ability to search the internet
Classification	Ability to use hypertext direction guides

Table 2. Digital Literacy and Science Process Skills Interview Questions Grid

Science Process Skills	Digital Literacy
Indicator	**Indicator**
Observation	Ability to search the internet
Classification	Ability to use hypertext direction guides

Then a category for digital literacy variables is show in Table 3 and Table 4.

Table 3. Categories for Digital Literacy Variables

Category	The interval for each digital literacy indicator	
	Ability to search the Internet	**Ability to use Hypertext Direction Guides**
Very Not Agree	11.00 – 19.25	11.00 – 19.25
Not Agree	19.26 – 27.50	19.26 – 27.50
Agree	27.60 – 35.75	27.60 – 35.75
Very Agree	35.76 – 44.00	35.76 – 44.00

Table 4. Categories for Science Process Skills Variables

Category	Interval for each indicator of science process skills	
	Observation	**Classification**
Very Not Good	10.0 – 17.5	10.0 – 17.5
Not Good	17.6 – 25.0	17.6 – 25.0
Good	25.1 – 32.5	25.1 – 32.5
Very Good	32.6 – 40.0	32.6 – 40.0

The data analysis technique used in this research is quantitative data analysis and qualitative analysis. This descriptive statistical test aims to obtain the mean, median, frequency, percentage, minimum value, and maximum value of the data being analyzed. Inferential statistics consist of an assumption test in the form of a normality test and homogeneity test, and a hypothesis test in the form of a correlation test. While the qualitative data analysis technique uses the Miles and Huberman technique by analyzing the results of the interviews that have been conducted (Astalini et al., 2018). The steps in the Miles and Huberman model are data collection, data reduction, data presentation, and making conclusions/verification. According to previous study the data collection stage is an integral part in analyzing data, where the researcher collects the necessary data (Effendi et al., 2021). At the data reduction stage, researchers discard things that are considered unnecessary in research. The data presentation stage is a limitation of a presentation as a collection of structured information which gives the possibility of drawing conclusions and taking action, the data presented is really valid and can be accounted for. The conclusion drawing stage is part of an activity from a complete configuration, where the conclusions presented are the results of research that has been verified previously. The process flow of qualitative data analysis using Miles and Huberman can be seen in Figure 1.

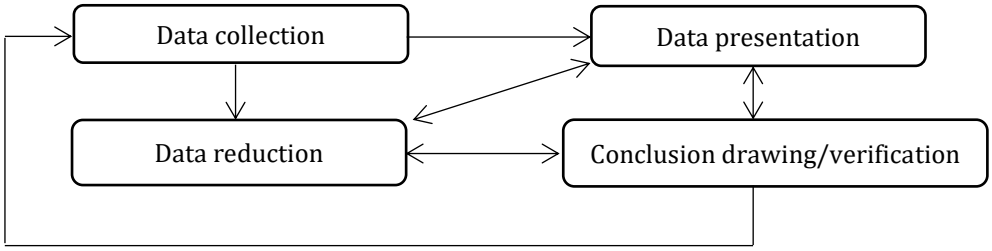

Figure 1. Qualitative Research Data Analysis Process

3. RESULT AND DISCUSSION

Results

The results of the descriptive statistical test for the digital literacy variable on indicators of the ability to search the internet and the ability to use hypertext guides can be seen in Table 5.

Table 5. Descriptive Statistical Test for Digital Literacy Variables

Indicator	Category	Range	F	%	Mean	Median	Min	Max
Ability to search the internet	Very Not Agree	11.00 – 19.25	0	0%	36.2917	37.5	29	40
	Not Agree	19.26 – 27.50	0	0%				
	Agree	27.60 – 35.75	9	37.5%				
	Very Agree	35.76 – 44.00	15	62.5%				
Ability to use hypertext directions	Very Not Agree	11.00 – 19.25	0	0%	35.25	35	26	42
	Not Agree	19.26 – 27.50	0	0%				
	Agree	27.60 – 35.75	13	54.17%				
	Very Agree	35.76 – 44.00	11	45.83%				

From the description of Table 5 above, it can be seen that the percentage value for the ability indicator to search the internet was 62.5% in the strongly agree category, while for the ability indicator to use hypertext guides, a percentage value was 54.17% in the agree category. From these two indicators it is known that the percentage value on the ability to search the internet indicator is higher than the ability to use hypertext guides in the strongly agree category. Then a descriptive statistical test was carried out for the science process skills variable on the observation and classification indicators, the results obtained can be seen in Table 6.

Table 6. Descriptive Statistical Test for Science Process Skills Variable

Indicator	Category	Range	F	%	Mean	Median	Min	Max
Observation	Very Not Good	10.0 – 17.5	0	0%	33.6250	33	29	39
	Not Good	17.6 – 25.0	0	0%				
	Good	25.1 – 32.5	9	37.5%				
	Very Good	32.6 – 40.0	15	62.5%				
Classification	Very Not Good	10.0 – 17.5	0	0%	33.8333	34	28	39
	Not Good	17.6 – 25.0	0	0%				
	Good	25.1 – 32.5	7	29.17%				
	Very Good	32.6 – 40.0	17	70.83%				

Table 7. Digital Literacy Variable Normality Test and Science Process Skills Variable

Variable	Indicator	Kolmogorov-Smirnov		
		Statistic	df	Sig.
Digital Literacy	Ability to search the internet	0.217	24	0.200*
	Ability to use hypertext directions	0.124	24	0.200*
Science Process Skills	Observation	0.187	24	0.200*
	Classification	0.101	24	0.200*

From the description of Table 6 above, it can be seen that the percentage value for the observation indicator is 62.5% in the very good category, while for the classification indicator the percentage value is 70.83% in the very good category. From these two indicators it is known that the percentage value on the classification indicator is higher than the observation indicator in the very good category. Then a normality test was carried out for the digital literacy variable and the science process skills variable, the results obtained can be seen in Table 7. From the description of Table 7 above it can be seen that the normality test was carried out using the Kolmogorov-Smirnov test, the result was that the data was normally distributed, with a significance value of 0.200 > 0.05. Then a homogeneity test was carried out for the digital literacy variable and the science process skills variable which can be seen in Table 8.

Table 8. Test the Homogeneity of Digital Literacy Variables and Science Process Skills Variables

Variable	Levene Statistic	df1	df2	Sig.
Digital Literacy	0.957	1	46	0.333
Science Process Skills	0.428	1	46	0.516

Based on Table 8 the result is that the data is declared homogeneous, with a sig. > 0.05, where the significance values for the two variables respectively are 0.333 and 0.516. Next, a correlation test was carried out for the digital literacy variables and science process skills variables which can be seen in Table 9.

Table 9. Pearson Correlation Test for Digital Literacy Variables and Science Process Skills Variables

Variable		Digital Literacy	Science Process Skills
Digital Literacy	Pearson Correlation	1	0.625
	Sig. (2-tailed)		0.000
	N	24	24
Science Process Skills	Pearson Correlation	0.625	1
	Sig. (2-tailed)	0.000	
	N	24	24

Based on Table 9 the result is that the sig. < 0.05, where the significance value for both variables is 0.000, so it can be stated that there is a relationship between digital literacy variables and science process skills variables. In addition, a Pearson correlation value of 0.625 was obtained, meaning that the two variables had a strong correlation. After analyzing the quantitative data from the results of the distribution of observation sheets for science process skills and the digital literacy questionnaire, quantitative data from the questionnaire results were obtained as described above. Furthermore, researchers analyzed qualitative data in the form of interviews with students. This interview serves as supporting data from the questionnaire data that has been obtained. Transcripts of data from interviews with three class VIII C students of SMPN 7 Muaro Jambi can be seen in Table 10.

Table 10. Interview Transcripts about Digital Literacy Skills and Science Process Skills

No.	Question	Answer
1.	Do you always use internet access as a learning resource to understand natural science lessons on simple planes?	"Of course yes." "Yes, because it really helped me understand the material." "Yes"
2.	Do you use search engines like google, yahoo, ask in finding information related to natural science lessons on simple planes?	"Yes, I often use google." "Yes." "Yes, I use Google and YouTube."
3.	Through hypertext and hyperlinks can you quickly find information related to science lessons on simple planes?	"Yes, of course." "Yes, I can easily search for various information." "Yes."
4.	Before conducting the experiment, did you observe the tools and materials to be used?	"Of course yes, I will observe the tools and materials one by one." "Yes."

No.	Question	Answer
		"Yes, but not all of them can be observed due to limited time."
5.	Did you observe the results obtained from the measurements taken?	"Yes, so that later it can be presented properly." "Yes." "Yes."
6.	Do you classify the tools and materials used according to their use?	"Yes, but only a few." "Yes, so I don't use the wrong tool." "Yes."

From the student's answers it can be seen that students always take advantage of internet access as a learning resource to understand simple airplane material, utilize search engines such as Google and YouTube and use hypertext and hyperlinks to find information related to simple airplane material quickly. In addition, students also observe tools and materials, as well as the results obtained from measurements taken, and students can group tools and materials used according to their use. So from these results it is known that for students' digital literacy skills the indicators of ability to search the internet and the ability to use hypertext guides are very good, and for students' science process skills the indicators of observation and classification are also very good.

Discussion

Based on the results of descriptive statistical tests for the digital literacy variable on the indicators of internet search ability and the ability to use hypertext guides, it shows that the percentage value of internet search ability is higher than the ability to use hypertext guides in the strongly agree category. Meanwhile, the results of descriptive statistical tests for the science process skills variable on the observation and classification indicators show that the percentage value of the classification indicator is higher than the observation indicator with the very good category. The assumption test used consists of the normality test and homogeneity test. The normality test aims to find out whether the data is normally distributed or not, the data is said to be normal if the sig. > 0.05 (Kamid et al., 2021; Maison et al., 2021). Based on the results of the normality test, it shows that the data is normally distributed, with a significance value of 0.200 > 0.05. While the homogeneity test aims to determine whether the variance of the data population is the same or not, the data is declared homogeneous if the sig. > 0.05 (Astalini, Darmaji, et al., 2021). Based on the results of the h test that the data was declared homogeneous, with significant values for the digital literacy and science process skills variables of 0.333 and 0.516 respectively, where sig. > 0.05. The hypothesis test used is the Pearson correlation test. This correlation test aims to determine the relationship between two variables. Based on the results of the Pearson correlation test, it shows that the significance value obtained is 0.000 <0.05, meaning that there is a relationship between the digital literacy variable and the science process skills variable.

In addition, it is also supported by the results of interviews with three students in class VIII C which show that for students' digital literacy skills the indicators of the ability to search the internet and the ability to use hypertext guides are very good, and for students' KPS on the indicators of observation and classification are also very good. There are several previous studies that are relevant to the research that will be conducted regarding digital literacy variables. However, there are differences in research focus, such as research conducted which focuses on determining the effect on digital literacy skill variables (Sukarno & Widdah, 2020). Research of previous study focuses on measuring the digital literacy level of schools, teachers and students (Birhan et al., 2021). Further research conducted which focused on the influence of digital literacy skills and learning styles on students' metacognitive listening strategies (Potter & Thai, 2019). Meanwhile, research conducted focuses on measuring the accuracy and feasibility of digital literacy instruments for teachers (Guess et al., 2020). Follow-up research conducted focuses on developing and testing the effectiveness of digital literacy instruments on student learning outcomes (Cohen et al., 2020). In addition, the research subjects used are also different, such as research conducted which took high school students as research subjects (Qodr et al., 2021). Digital literacy skills and science process skills play an important role in supporting student learning activities. This is because by having digital literacy skills, each individual can save time, can study anywhere and anytime, always gets the latest information, and can make good decisions (Kuncoro et al., 2022; Sujana & Rachmatin, 2019; Sumiati & Wijonarko, 2020). Besides having digital literacy skills, it is also important for students to have science process skills. With the science process skills, students can develop their creativity in learning so that students can actively develop and apply their abilities (Aldi et al., 2022; Mahmudah, 2016; Santiawati et al., 2022). The novelty of this research lies in the material and the number of variables used. Where the

material used is a simple machine, and the variables used are two variables namely digital literacy and science process skills. From this study it can be seen that there is a significant relationship between digital literacy skills and students' science process skills in simple plane material. The success of digital literacy in the classroom depends on educators as facilitators in the teaching and learning process, and digital literacy can affect learning outcomes and student academic achievement (Sanova, A., Bakar, A., Afrida, A., Kurniawan, D. A., & Aldila, 2022; Sanova et al., 2022). Likewise, the science process skills possessed by students can support scientific thinking to support further abilities. In addition, process skills can improve students' critical thinking (Basyoni et al., 2020; Rodriguez & Lieber, 2020). The implication of this research is digital literacy skills and science process skills that can be trained in a lesson and can have an impact on students. Digital literacy skills can have an impact on students, where students can add insight by searching for various information, and students can improve individual abilities to be more critical in thinking and understanding information obtained from various digital media (Dewi et al., 2021; Fitriyani & Nugroho, 2022). By having digital literacy skills, students can also develop science process skills. These science process skills also have an impact on students in learning. Where process skills can make students participate actively, form habits to be able to solve problems, and make students learn how to apply science rather than just learning concepts and laws (Mahmudah et al., 2019; Subeki et al., 2022). The limitations of this study are only analyzing the relationship of two variables for one class. However, no correlation test was performed based on gender between male and female students. Therefore, the researcher suggests that for further research, research can be carried out on digital literacy variables and science process skills based on gender.

4. CONCLUSION

Based on the research that has been done, it can be concluded that there is a significant relationship between digital literacy skills and students' science process skills in simple plane material. The significance of this study lies in the potential to develop digital literacy and science process skills through targeted lessons, thereby influencing students positively. The acquisition of digital literacy skills can enhance students' capacity to broaden their knowledge through information searches. Additionally, it empowers students to enhance their individual capabilities, fostering a more critical approach to thinking and better understanding of information sourced from diverse digital media.

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