

THE ROLE OF DIGITAL LITERACY AND LEARNING MOTIVATION ON STUDENTS' CRITICAL THINKING

Uum Sri Utami¹, Nurrohmatul Amaliyah*²

^{1,2}Pendidikan Dasar Sekolah Pascasarjana Universitas Muhammadiyah Prof.Dr.Hamka, Jakarta, Indonesia

* Corresponding Author: nurramaliyah@uhamka.ac.id

ARTICLE INFO

Article history:

Received : Oct 06, 2025

Revised : Oct 29, 2025

Accepted : Nov 28, 2025

Available online : Nov 30, 2025

Keywords:

Digital Literacy, Motivation, Critical Thinking Skills, Science Subjects.

ABSTRACT

This study aims to examine the role of digital literacy and learning motivation in students' critical thinking skills. This study employed a quantitative approach using a correlational design. The fourth-grade students at several public elementary schools in the Pegadungan subdistrict were selected as the sample of this research. The research sample consisted of 128 students. Data were obtained through tests measuring critical thinking skills and questionnaires assessing digital literacy and learning motivation. Data analysis was performed using multiple linear regression tests. The results showed a significant relationship between digital literacy ($r = 0.331$; $p < 0.05$) and learning motivation ($r = 0.223$; $p < 0.05$) with students' critical thinking skills. Simultaneously, both variables had a positive and significant effect on students' critical thinking skills ($R = 0.438$; $\text{Sig.} = 0.000$). These findings indicate that students with higher levels of digital literacy and stronger learning motivation tend to demonstrate better critical thinking abilities. In conclusion, improving students' access to digital resources and fostering intrinsic learning motivation can contribute significantly to the development of critical thinking skills. The findings of this study suggest that educators should integrate technology-based learning activities and motivational teaching strategies into classroom instruction to support the enhancement of critical thinking skills in elementary education.

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INTRODUCTION

Critical thinking is widely recognized as a core 21st-century competency and is especially vital in integrated natural and social sciences (IPAS) subject in primary school, where students must analyze, evaluate, and solve real-world problems. However, research consistently finds that primary students' critical thinking skills in IPAS are generally low to moderate, highlighting a need for more effective instructional approaches. However, in practice, IPAS learning in elementary schools remains dominated by conventional, teacher-centered methods that emphasize memorization,

resulting in suboptimal development of students' critical thinking abilities (Dadang Supardan, 2015).

Based on observations conducted at SDN Pegadungan on the topic of plants, students tended to receive information passively from the teacher without engaging in activities that encouraged deeper analysis. As a result, their academic performance was low, with an average score of 55.45. In addition, students mostly used digital devices for entertainment, such as playing games and watching videos, rather than for learning purposes (Amaliyah, 2023). Therefore, innovative learning approaches are needed to enhance students' motivation and critical thinking skills (Marwah Sholihah & Nurrohmatul Amaliyah, 2022). The achievement of critical thinking indicators among primary school students is only 32.5%, which is considered low. According to (Adiputra & Heryadi, 2021) explains that critical thinking accustoms students to analyze, review, and seek new ideas. (Umar, 2022) shows that digital literacy has a positive effect on critical thinking skills, even though the level of digital literacy among elementary school students is still quite low (39.40%).

As a result, students have limited opportunities to actively engage in inquiry, discussion, and problem-solving activities that foster higher-order thinking. Learning activities rarely encourage students to question information, analyze data, or relate concepts to real-life contexts. In addition, the integration of digital resources in IPAS learning has not been maximized, even though technology can support exploration, visualization, and critical analysis of scientific and social phenomena. This condition underscores the importance of adopting innovative learning strategies that integrate digital literacy and actively promote students' motivation to learn. By providing learning experiences that are interactive, contextual, and supported by digital media, teachers can create learning environments that encourage students to think critically. Therefore, examining the role of digital literacy and learning motivation in developing students' critical thinking skills in IPAS learning at the elementary school level is essential to address existing gaps and improve learning outcomes.

These conditions suggest that students have not yet been optimally trained to think critically through meaningful learning activities. The lack of learning strategies that integrate digital literacy with classroom instruction limits students' opportunities to explore information, evaluate sources, and express ideas independently. When digital tools are not used as learning resources, students miss valuable opportunities to develop higher-order thinking skills. Therefore, teachers play a crucial role in designing learning

experiences that actively involve students in problem-solving, discussion, and inquiry-based activities supported by digital media. By integrating digital literacy into the learning process, students can be encouraged to use technology more productively, which in turn may increase their learning motivation and critical thinking skills. Consequently, examining the relationship between digital literacy, learning motivation, and critical thinking skills is important to provide empirical evidence that can support the development of effective learning strategies in elementary schools.

On the other hand, research (Dudung, 2018) emphasizes that learning motivation plays an important role in encouraging students to be active, persistent, and capable of solving problems. Although there have been many studies on digital literacy, motivation, and critical thinking, most of them focus on junior high school or high school levels. Studies that specifically link digital literacy and learning motivation with critical thinking skills in elementary school students, particularly in science subjects, are still rare. This gap indicates the need for further investigation at the elementary school level, where foundational thinking skills begin to develop. Early exposure to digital literacy and strong learning motivation is essential to help students build critical thinking skills from a young age. In science learning, in particular, students are required to observe, analyze, and draw conclusions based on evidence, making critical thinking a key competency. Therefore, this study seeks to examine the role of digital literacy and learning motivation in enhancing elementary school students' critical thinking skills in science subjects. The findings of this study are expected to contribute both theoretically and practically by providing empirical evidence and pedagogical insights for teachers in designing effective and engaging learning strategies at the primary education level.

Therefore, this study is novel in testing the relationship between these variables in the context of elementary schools. Based on the above description, this study aims to: (1) determine the relationship between digital literacy and students' critical thinking skills, (2) determine the relationship between learning motivation and students' critical thinking skills, and (3) determine the relationship between digital literacy and learning motivation together with students' critical thinking skills. (Rahman, 2021). The hypothesis proposed is that there is a positive relationship, both partially and simultaneously, between digital literacy and motivation with the critical thinking skills of fourth-grade students.

This study used a correlational quantitative approach involving fourth-grade students from public elementary schools in the Pegadungan subdistrict as samples. Data were collected through questionnaires designed to measure digital literacy, learning

motivation, and critical thinking skills (Syafi'i, 2021). Data analysis was conducted using correlation and regression tests to determine the relationship between variables. This study uses the abbreviation IPAS (Natural and Social Sciences), which is an integrative subject that combines science and social concepts in elementary schools. (Puspitasari, 2016). Thus, the research results are expected to provide theoretical contributions in the development of digital literacy and learning motivation as well as practical implications for teachers in improving the quality of science learning.

RESEARCH METHOD

This research was conducted at three primary school located in Pegadungan, west Jakarta. They are SDN Pegadungan 07, SDN Pegadungan 11, SDN Pegadungan 02, and SDN Pegadungan 05 Pagi, Kalideres District. This research took 189 students as a population, while the sample consisted of 128 students after determined using a random sampling technique based on the Slovin formula. The approach used was quantitative with a survey design, while data analysis was conducted through correlation and multiple regression to test the relationship between variables. (Hardani & others, 2020). The dependent variable in this study is critical thinking skills (Y), while the independent variables include digital literacy (X1) and learning motivation (X2). The research instrument consisted of a 10-item essay test to measure critical thinking skills and a 30-item Likert-scale questionnaire to measure digital literacy and learning motivation. (Sugiyono, 2023). The research procedure included instrument development, validity and reliability testing, data collection through tests and questionnaires, and data analysis using SPSS 26.0 software. Instrument validity was tested using Pearson product-moment correlation, while reliability was measured using Cronbach's Alpha. (Fadli, 2021). The statistical tests used included the Kolmogorov-Smirnov normality test, linearity test with one-way ANOVA, Pearson correlation, and multiple regression analysis. The scope of the study was limited to fourth-grade students of Elementary School Cluster III, Pegadungan Village, so the results of this study have limitations in generalizing to different levels or regions.

RESULT AND DISCUSSION

Result

The measurement of critical thinking skills was conducted with 128 students using nine (9) essay questions based on science material. The results showed that students'

scores varied considerably, with the lowest score being 9 and the highest score reaching 36. This range of scores indicates differences in students' ability to analyze, evaluate, and apply scientific concepts. The following subsections describe the distribution of students' critical thinking skills and discuss the findings in relation to relevant theories and previous studies. The frequency distribution is presented in the table below.:

Table 1. Distribution of Critical Thinking Skills Scores

Interval	Frequency	Percentage
9-11	5	3.91
12-14	10	7.81
15-17	9	7.03
18-20	9	7.03
21-23	11	8.59
24-26	20	15.63
27-29	17	13.28
30-32	20	15.63

Most students were in the score range of 24–26 and 30–32 (15.63%), while the fewest were in the range of 9–11 (3.91%). Data visualization is shown in the diagram below:

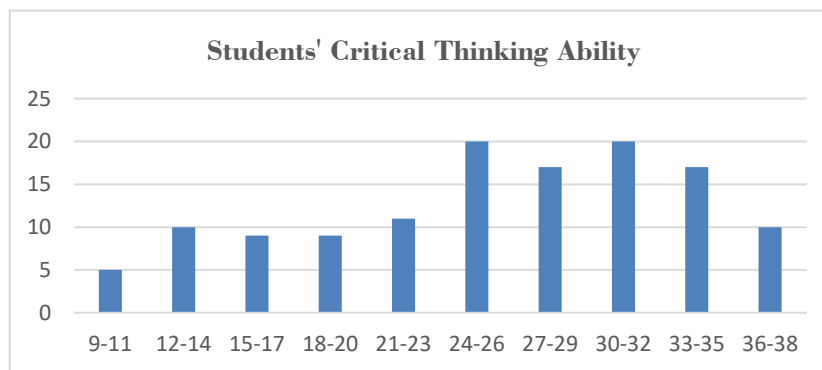


Figure 1. Bar Chart of Critical Thinking Ability Categories of critical thinking levels.

The diagram shows that 36.72% are in the high category, 22.66% are low, 21.09% are very low, and 19.53% are very high (Table 2). Table 2. Distribution of Critical Thinking Ability Levels 2. Learning Motivation The motivation instrument consists of 27 statement items. The lowest score is 58 and the highest is 111. Meanwhile, the distribution of critical thinking ability levels with low, medium, and high categories can be seen in the table below:

Table 2. Distribution of Critical Thinking Ability Levels

Category	Interval	f	%
Sangat Tinggi	>33.212	25	19.53
Tinggi	25.645 - 33.212	47	36.72
Rendah	18.077 - 25.645	29	22.66
Sangat Rendah	<18.077	27	21.09
Total		128	100

The table above shows that, of the 128 students, 25 had very high critical thinking skills (19.53%), 47 had high critical thinking skills (36.72%), 29 had low critical thinking skills (22.66%), and 27 had low critical thinking skills (21.09%). Motivation Score Distribution: Most students were in the 106–111 range (25.78%), while the lowest score was in the 64–69 range (0.78%). The visualization of the data can be seen in the image below:

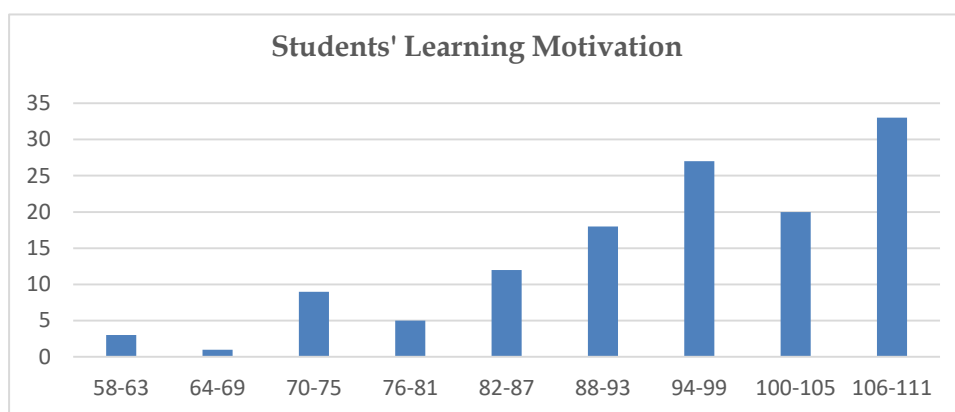


Figure 2. Students' Learning Motivation

The motivation category shows 44.53% of students in the high category, 24.22% in the low category, 15.63% in the very high category, and 15.63% in the very low category. There are 5 indicators measured in the motivation instrument, namely the existence of encouragement and need in learning, the existence of hopes or ideals for the future, the existence of awards to be achieved in learning, the existence of interesting activities/things in learning, the existence of a conducive and comfortable learning environment.

Digital Literacy: Digital literacy was measured using 23 items. The lowest score was 48 and the highest was 92. The distribution of scores is presented in the table below:

Table 3. Distribution of Digital Literacy Scores

Interval	Frekuensi	Presentase
48-52	1	0.78125
53-57	8	6.25
58-62	6	4.69
63-67	11	8.59
68-72	10	7.81
73-77	29	22.66
78-82	28	21.88
83-87	33	25.78
88-92	2	1.56
Jumlah		100.00

From the results of the calculation of the research data from the Digital Literacy questionnaire instrument, a frequency distribution table was obtained as above. The majority of students were in the 83–87 range (25.78%), while the fewest were in the 48–52 range (0.78%). The visualization is shown in Figures 4 and 5 below:

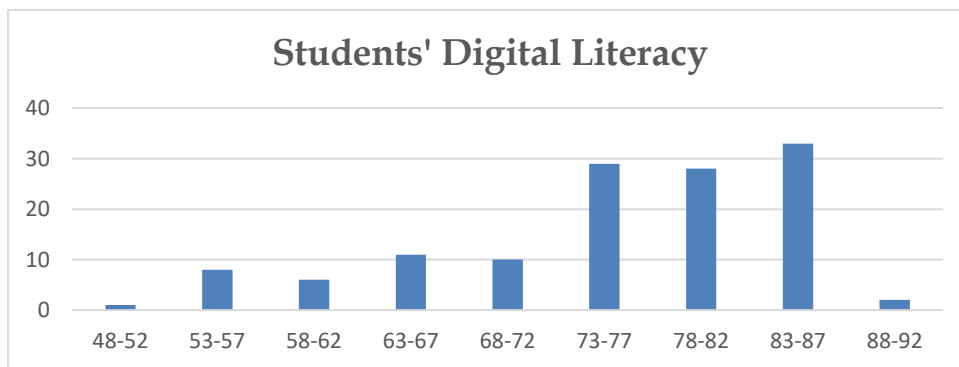


Figure 3. Digital Literacy Bar Chart

The diagram above presents the results of the digital literacy questionnaire administered in this study. It shows that one student scored within the 48–52 range, eight students within 53–57, six students within 58–62, eleven students within 63–67, ten students within 68–72, twenty-nine students within 73–77, twenty-eight students within 78–82, thirty-three students within 83–87, and two students within 88–92. From the bar chart, it can be observed that the majority of students fall within the moderate to high score range, indicating relatively good levels of digital literacy among the respondents.

The figure above shows that the majority of students fall into the high category (49.22%), followed by very high (14.84%), low (17.97%), and very low (17.97%) categories. The assumption testing results indicated that the Kolmogorov–Smirnov normality test yielded a significance value of $0.188 > 0.05$, meaning that the data were normally distributed. Furthermore, the linearity test produced a significance value of $0.00 < 0.05$, which demonstrates that the relationship between the variables is linear.

Table 4. Conclusion of Hypothesis Test Results

No.	Correlation	α	Significance	R count	Conclusion	Note
1	Digital Literacy eith critical thinking		0.000	0,333	Correlated	Weak
2	Motivation with critical thinking	0,05	0,006	0,224	Correlated	weak
3	Digital literacy and learning motivation with critical thinking		0.001	0,336	Correlated	weak

Hypothesis Testing: Correlation results show: Digital literacy is related to critical thinking skills ($r = 0.333$; $p < 0.05$). Motivation is related to critical thinking skills ($r =$

0.224; $p < 0.05$). Simultaneously, digital literacy and motivation are related to critical thinking skills ($r = 0.336$; $p < 0.05$). Discussion of Digital Literacy and Critical Thinking Skills: The results show a positive relationship between digital literacy and critical thinking skills, although with a weak correlation. Students with high digital literacy tend to be better able to interpret, analyze, evaluate, and draw conclusions from information.

This is in line with research (Supriani et al., 2020) and (Chairulhaq et al., 2021) which confirms that digital literacy contributes to strengthening critical thinking skills. Learning Motivation and Critical Thinking Skills There is a positive relationship between learning motivation and critical thinking skills. Students with high motivation are more persistent in solving problems, analyzing issues, and drawing conclusions. This is in line with the opinion of (Yasin et al., 2023) that motivation is the primary driving force determining learning success. Digital Literacy, Motivation, and Critical Thinking Skills Simultaneously, digital literacy and motivation are positively related to critical thinking skills, although their respective contributions are only 9.8%. This means that other factors such as physical condition, self-efficacy, anxiety, and the learning environment also play a role. This finding is consistent with research (Nur Aedi, 2016) which states that digital literacy, motivation, and self-control together influence students' academic achievement.

The main discussion of this study indicates a positive relationship between digital literacy, learning motivation, and students' critical thinking skills. Data analysis shows that students with high levels of digital literacy tend to have better critical thinking skills, characterized by skills in using technology, evaluating information, and being able to solve problems independently (Arif et al., 2021). Similarly, learning motivation has been shown to contribute to improved critical thinking skills, with highly motivated students being more persistent in understanding problems, analyzing information, and drawing sound conclusions. Although the strength of the relationship between the two on critical thinking skills is relatively low, the results of this study still indicate the important role of digital literacy and motivation in supporting the development of critical thinking skills. (Putra et al., 2020).

This finding is important because it supports the view that the development of digital literacy not only influences students' technological skills but also has implications for the critical thinking patterns needed to face the challenges of the digital era. The results of this study are consistent with Simanjuntak's study in (Adiputra & Heryadi, 2021), which shows a significant relationship between digital literacy and critical thinking

skills, as well as research (Putri & Amaliyah, 2022) which emphasizes the close relationship between learning motivation and critical thinking skills.

Thus, these findings align with previous literature and strengthen the argument that the combination of digital literacy and learning motivation can be a major supporting factor in improving students' critical thinking skills. However, other factors contribute 90.2% to critical thinking skills, such as the learning environment, physical conditions, self-confidence, and teacher and parental support. This indicates an alternative explanation: critical thinking skills are influenced not only by digital literacy and learning motivation but also by other external variables that need to be considered. The implications of this research emphasize the importance of teachers integrating digital literacy into learning and encouraging learning motivation through a variety of strategies, so that students can become accustomed to using technology productively while developing critical thinking patterns. (Salim Salabi, 2022).

Discussion

The results of this study demonstrate that digital literacy and learning motivation are positively associated with students' critical thinking skills in IPAS learning, although the magnitude of these relationships is relatively weak. This finding indicates that students with higher levels of digital literacy tend to show better abilities in interpreting information, evaluating evidence, and drawing reasoned conclusions. This result is consistent with prior research reporting that digital literacy supports higher-order cognitive processes by enabling learners to critically access and evaluate digital information (Supriani et al., 2020; Chairulhaq et al., 2021). Similarly, Umar (2022) emphasized that digital competence facilitates critical engagement with learning materials rather than passive information consumption.

The positive relationship between learning motivation and critical thinking skills further suggests that motivated students are more likely to engage actively in problem-solving and sustained cognitive effort. This finding aligns with Dudung (2018) and Yasin et al. (2023), who identified motivation as a central factor influencing students' learning engagement and academic outcomes. However, the relatively weak correlation observed in this study contrasts with findings from studies conducted at the secondary education level, which reported stronger associations between motivation and critical thinking. This discrepancy may be attributed to developmental differences, as elementary school

students are still in the early stages of developing metacognitive awareness and self-regulated learning abilities.

Moreover, the combined contribution of digital literacy and learning motivation explains only a limited proportion of variance in students' critical thinking skills. This suggests that critical thinking development is a multidimensional process influenced by additional factors, including instructional design, classroom interaction, teacher facilitation, and learning environment (Nur Aedi, 2016; Putra et al., 2020). Consequently, while digital literacy and motivation are necessary components, they are not sufficient in isolation to substantially enhance critical thinking skills.

These findings imply that efforts to improve students' critical thinking in IPAS learning should not focus solely on enhancing digital access or motivational aspects, but also on implementing student-centered pedagogical approaches that promote inquiry, reflection, and contextual problem-solving. Integrating digital literacy within structured learning activities may therefore maximize its potential impact on the development of critical thinking skills in elementary education.

This findings, therefore highlight to foster critical thinking not only access to digital tools and motivated learners but also well-designed instructional practices that actively engage students in higher-order cognitive processes. Therefore, future instructional efforts should emphasize the integration of digital literacy within inquiry-based and student-centered learning environments to enhance its effectiveness. Additionally, further research is recommended to explore other contributing factors and instructional variables that may more strongly influence critical thinking development at the primary education level.

CONCLUSION AND SUGGESTION

Based on the results of this study conducted with fourth-grade students at several public elementary schools in the Pegadungan Subdistrict, the following conclusions can be drawn.

First, there is a significant relationship between digital literacy and students' critical thinking skills in the Natural Sciences subject on the topic of plants at Pegadungan Elementary Schools, although the strength of the relationship is weak. Based on the statistical results, the significance value of 0.000 (< 0.05) indicates that H_0 is rejected and H_1 is accepted, meaning that there is a significant relationship between digital literacy and students' critical thinking skills in the Natural Sciences subject. The Pearson correlation

coefficient obtained was 0.333, indicating a weak relationship. In addition, there is a significant relationship between learning motivation and students' critical thinking skills in the Natural Sciences subject on the topic of plants at Pegadungan Elementary Schools, although the strength of the relationship is very weak.

Second, based on the statistical results, the significance value of 0.006 (< 0.05) indicates that H_0 is rejected and H_1 is accepted, meaning that learning motivation is significantly related to students' critical thinking skills in the Natural Sciences subject. Second, the correlation value obtained is 0.224 indicating that the relationship is weak. Based on the analysis data obtained on fourth grade students, there is a significant relationship between Digital Literacy and Learning Motivation with Students' Critical Thinking Skills in the Natural Sciences Subject on the Topic of Plants at SDN Kelurahan Pegadungan with a very weak level of closeness. The results obtained are the coefficient of the degree of relationship between Digital Literacy and Learning Motivation with critical thinking skills is 0.336 where the level of closeness of the relationship is weak, so H_0 is rejected and H_1 is accepted, which means there is a significant relationship between learning motivation and digital literacy with students' critical thinking skills in the Natural Sciences Subject on the topic of plants.

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