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Digital Literacy, Self-Efficacy, and Learning Motivation as Predictors of Critical Thinking Skills in Elementary School Students

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ABSTRACT

Critical thinking is an essential competence in 21st-century learning, yet its development among elementary school students remains challenged by conventional rote-oriented instructional practices. This study aimed to examine the individual and simultaneous predictive effects of digital literacy, self-efficacy, and learning motivation on elementary school students' critical thinking skills. A quantitative survey design with a causal-associative approach was employed. The sample consisted of 120 elementary school students in Banggai Kepulauan. Data were collected using closed-ended questionnaires based on a five-point Likert scale. Data analysis included descriptive statistics, a residual normality test, multiple linear regression, partial tests, simultaneous testing, and coefficient of determination analysis. The findings showed that digital literacy (B = 0.312; t = 3.421; p = 0.001), self-efficacy (B = 0.285; t = 3.114; p = 0.002), and learning motivation (B = 0.354; t = 3.987; p < 0.001) positively and significantly predicted students' critical thinking skills. Simultaneously, the three variables significantly predicted critical thinking skills (F = 34.251; p < 0.001), with an R2 value of 0.471. These results indicate that 47.1% of the variance in students' critical thinking skills was explained by the three predictors, while 52.9% was associated with other factors outside the model. The study concludes that the development of critical thinking in elementary schools requires an integrative learning approach that strengthens students' technological competence, academic confidence, and learning motivation.

Keywords: Digital Literacy, self-efficacy, learning motivation, critical thinking, elementary school

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INTRODUCTION

The rapid development of digital technology in the 21st century has transformed the landscape of elementary education. Digital technology is no longer merely a tool for expanding access to information; it also requires learners to develop higher-order thinking skills, including the ability to analyze, evaluate, and use information responsibly (Falloon, 2020; Ng, 2021; Voogt & Roblin, 2021). In this context, critical thinking has become a fundamental competence that enables students to filter information, solve problems, and make logical, analytical, and reflective decisions (Ennis, 2018; Facione, 2020).

Despite the growing importance of critical thinking, classroom practices in elementary schools are still frequently dominated by rote learning and one-way knowledge transmission. Such practices provide limited opportunities for students to question information, construct arguments, evaluate evidence, and draw independent conclusions (Abrami et al., 2021; Sardiman, 2020). The increasing use of digital devices in learning also does not automatically improve students' ability to assess the validity and reliability of information. Technical access to digital tools must be accompanied by critical thinking skills and responsible information evaluation (Hidayat & Khotimah, 2022; Kemendikbud, 2021).

Critical thinking does not develop in isolation. It is shaped by the interaction of technological, psychological, and motivational factors. The technological dimension is represented by digital literacy, which refers not only to the operational ability to use digital devices but also to the capacity to access, understand, evaluate, and use digital information ethically and effectively (UNESCO, 2021; Falloon, 2020). Students with better digital literacy are expected to be more capable of selecting relevant information, comparing sources, and making reasoned judgments in digital learning environments.

The psychological dimension is represented by self-efficacy. Based on social cognitive theory, self-efficacy refers to individuals' beliefs in their capability to organize and perform actions required to achieve specific goals (Bandura, 1997; Schunk & DiBenedetto, 2020). In learning contexts, students with stronger self-efficacy tend to show greater persistence, confidence, and willingness to engage with cognitively demanding tasks. Such psychological readiness is essential for critical thinking because students must be willing to question, analyze, and defend their reasoning.

The motivational dimension is represented by learning motivation. Motivation is a driving force that influences students' engagement, persistence, interest, and depth of attention during learning activities (Ryan & Deci, 2020; Sardiman, 2020). Students with strong motivation are more likely to explore information, ask questions, complete analytical tasks, and sustain effort when facing difficult problems (Prasetyo & Wulandari, 2023). Therefore, learning motivation may become an important predictor of critical thinking skills in elementary school students.

Previous studies have examined the relationship between digital literacy, self-efficacy, motivation, and higher-order thinking skills. However, many studies have focused on secondary school students, university students, or partial relationships among variables (van Laar et al., 2021; Chen et al., 2020). Studies that simultaneously examine digital literacy, self-efficacy, and learning motivation as predictors of critical thinking skills in elementary school students remain limited. This gap is important because elementary school is a foundational stage for building critical thinking habits.

The novelty of this study lies in the integrative model that combines technological, psychological, and motivational dimensions to explain critical thinking skills among elementary school students. Rather than examining each factor separately, this study tests the simultaneous contribution of digital literacy, self-efficacy, and learning motivation. Accordingly, this study aims to analyze the partial and simultaneous predictive effects of digital literacy, self-efficacy, and learning motivation on elementary school students' critical thinking skills.

METHOD

This study used a quantitative approach with a causal-associative survey design. This design was selected to examine the predictive relationship between digital literacy, self-efficacy, learning motivation, and students' critical thinking skills through inferential statistical analysis (Sugiyono, 2022).

The study was conducted among elementary school students in Banggai Kepulauan. The sample consisted of 120 students. The sampling technique used was probability sampling, allowing members of the population to have a proportional opportunity to be involved in the study. The independent variables were digital literacy (X1), self-efficacy (X2), and learning motivation (X3), while the dependent variable was critical thinking skills (Y).

Primary data were collected using a closed-ended questionnaire with a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire was developed based on theoretical indicators of each variable. Before being distributed, the instrument was tested for validity and reliability. All items were declared valid because the calculated r-values were greater than the r-table value, and the reliability coefficients met the minimum Cronbach's Alpha criterion of 0.70 (Sugiyono, 2022).

Table 1. Operationalization of Research Variables

Variable	Dimensions / Indicators	Theoretical Basis
Digital literacy (X1)	Accessing, understanding, evaluating, and utilizing digital information.	UNESCO (2021); Falloon (2020)

Self-efficacy (X2)	Self-confidence, persistence in dealing with tasks, and belief in problem-solving ability.	Bandura (1997); Schunk & DiBenedetto (2020)
Learning motivation (X3)	Learning persistence, interest in learning, and engagement in learning activities.	Ryan & Deci (2020); Sardiman (2020)
Critical thinking skills (Y)	Analysis, evaluation, reasoning, and drawing conclusions.	Ennis (2018); Facione (2020)

Table 1 presents the operationalization of the variables used in the study. Each variable was developed from established theoretical constructs and translated into measurable indicators for questionnaire items.

The collected data were analyzed using descriptive statistics and inferential statistics. The analysis included a residual normality test using Kolmogorov-Smirnov, multiple linear regression analysis, partial testing using the t-test, simultaneous testing using the F-test, and coefficient of determination analysis. The regression model used in this study was $Y = a + b1X1 + b2X2 + b3X3 + e$, where Y represents critical thinking skills, X1 represents digital literacy, X2 represents self-efficacy, X3 represents learning motivation, and e represents the error term.

Ethically, the study was conducted by maintaining the confidentiality of student data and using the collected responses only for academic research purposes

FINDING AND DISCUSSION

Descriptive Overview and Normality Test

The descriptive analysis showed that students' digital literacy, self-efficacy, learning motivation, and critical thinking skills were generally in the moderate-to-good category. Students demonstrated adequate ability in accessing digital information, but their ability to evaluate the validity of information still required improvement. In terms of psychological and motivational dimensions, students showed relatively positive self-efficacy and learning motivation, as reflected in their confidence and participation in the learning process. However, in the critical thinking variable, students still needed further support in evaluation and logical conclusion-drawing skills.

Table 2. Descriptive Summary of Research Variables

Variable	General Descriptive Finding	Aspect Requiring Improvement
Digital literacy	Students were relatively able to access and understand digital information.	Evaluating the validity and credibility of digital information.
Self-efficacy	Students showed confidence in completing learning tasks.	Maintaining confidence when facing complex analytical tasks.
Learning motivation	Students showed interest and engagement in learning activities.	Sustaining motivation in tasks requiring deep reasoning.
Critical thinking skills	Students were able to understand and analyze information.	Evaluation, inference, and logical conclusion drawing.

Table 2 summarizes the descriptive tendency of each variable. The findings indicate that students had positive basic tendencies in digital access, confidence, and motivation, but still needed strengthening in higher-level critical thinking processes, especially evaluation and inference.

Table 3. Normality Test Result

Test	Significance Value	Criterion	Conclusion
Kolmogorov-Smirnov residual normality test	0.200	$p > 0.05$	Normal

Table 3 shows that the residual data were normally distributed because the significance value was 0.200, which was greater than 0.05. Therefore, the data met the normality assumption and were considered appropriate for multiple linear regression analysis.

Multiple Linear Regression Analysis

The multiple linear regression analysis produced a constant value of 4.215. The regression coefficient for digital literacy was 0.312, the coefficient for self-efficacy was 0.285, and the coefficient for learning motivation was 0.354. The empirical regression equation was: $Y = 4.215 + 0.312X1 + 0.285X2 + 0.354X3$.

Table 4. Multiple Linear Regression Coefficients

Predictor	B	t-value	Sig.	Interpretation
Constant	4.215	-	-	Baseline value of the model
Digital literacy (X1)	0.312	3.421	0.001	Positive and significant
Self-efficacy (X2)	0.285	3.114	0.002	Positive and significant
Learning motivation (X3)	0.354	3.987	0.000	Positive and significant

Table 4 indicates that all independent variables positively and significantly predicted students' critical thinking skills. Digital literacy had a significant positive effect with $t = 3.421$ and $p = 0.001$. Self-efficacy also had a significant positive effect with $t = 3.114$ and $p = 0.002$. Learning motivation had a significant positive effect with $t = 3.987$ and $p < 0.001$. These results show that increases in digital literacy, self-efficacy, and learning motivation were associated with higher critical thinking skills.

Table 5. Simultaneous Test and Coefficient of Determination

Indicator	Value	Interpretation
F-value	34.251	The regression model was significant
F-table	2.68	F-value exceeded F-table
Sig.	0.000	Significant at $p < 0.05$
R2	0.471	47.1% of variance in critical thinking was explained by the model
Unexplained variance	52.9%	Influenced by variables outside the model

Table 5 shows that digital literacy, self-efficacy, and learning motivation simultaneously predicted critical thinking skills. The F-value of 34.251 was greater than the F-table value of 2.68, with a significance value below 0.05. The coefficient of determination (R2) was 0.471, indicating that 47.1% of the variation in students' critical thinking skills was explained by the three predictors, while the remaining 52.9% was related to other factors outside the model.

Table 6. Summary of Hypothesis Testing

Hypothesis	Statement	Result
H1	Digital literacy positively predicts critical thinking skills.	Accepted

H2	Self-efficacy positively predicts critical thinking skills.	Accepted
H3	Learning motivation positively predicts critical thinking skills.	Accepted
H4	Digital literacy, self-efficacy, and learning motivation simultaneously predict critical thinking skills.	Accepted

Table 6 summarizes the hypothesis testing results. All hypotheses were accepted, indicating that the technological, psychological, and motivational dimensions contributed to the prediction of critical thinking skills among elementary school students

Discussion

The findings indicate that digital literacy positively and significantly predicted critical thinking skills among elementary school students. This means that students who were better able to access, understand, and evaluate digital information tended to demonstrate stronger critical thinking skills. In the context of 21st-century learning, digital literacy should not be understood merely as technical skill in operating devices, but as a cognitive ability to process, verify, and use digital information responsibly (Falloon, 2020; UNESCO, 2021).

The finding is consistent with studies emphasizing the relationship between digital competence and higher-order thinking skills. Students with better digital literacy are more likely to compare sources, question information, identify relevant content, and avoid accepting digital information uncritically (Ng, 2021; van Laar et al., 2021). However, the descriptive findings also show that students still need improvement in evaluating information validity. This implies that digital literacy programs in elementary schools should shift from basic operational skills to critical digital content evaluation (Kemendikbud, 2021).

Self-efficacy also positively and significantly predicted students' critical thinking skills. This result can be explained through social cognitive theory, which states that individuals' belief in their own capability influences persistence, effort, cognitive strategy use, and resilience when facing difficult tasks (Bandura, 1997; Schunk & DiBenedetto, 2020). Critical thinking requires students to analyze arguments, detect bias, evaluate evidence, and draw logical conclusions. Such cognitive demands require confidence and persistence.

Students with stronger self-efficacy tend to perceive complex problems as challenges rather than threats. They are more likely to participate in discussions, express their reasoning, ask questions, and take intellectual risks. This finding supports previous research showing that self-efficacy is an important predictor of students' problem-solving ability and learning engagement in technology-supported learning environments (Wei et al., 2021; Zhang & Hu, 2025).

Learning motivation emerged as a significant positive predictor of critical thinking skills. The coefficient for learning motivation was the highest among the three predictors in the regression equation. This suggests that students' interest, persistence, and engagement in learning play an important role in encouraging them to think critically. Motivation provides the cognitive energy needed for students to stay engaged in analytical tasks, search for additional information, and complete challenging learning activities (Ryan & Deci, 2020; Sardiman, 2020).

This finding is in line with Self-Determination Theory, which emphasizes that students' learning engagement increases when they experience autonomy, competence, and relatedness in learning (Ryan & Deci, 2020). Students who are motivated tend to ask more questions, maintain attention, and persist in solving problems. In elementary school, motivation is particularly important because students are still developing their learning habits and self-regulation skills.

The simultaneous test results provide support for an integrative model of critical thinking development. Digital literacy, self-efficacy, and learning motivation together explained 47.1% of the variance in critical thinking skills. This finding indicates that critical thinking in elementary students

cannot be developed through a single intervention. Instead, it requires a multidimensional learning approach that combines access to digital information, psychological confidence, and motivational support.

The model suggests a synergistic relationship among the variables. Digital literacy provides students with access to information and the ability to evaluate digital content. Self-efficacy provides psychological readiness to process complex information and engage in reasoning. Learning motivation sustains the effort required to complete analytical tasks. Thus, these three dimensions should be strengthened simultaneously in elementary learning environments.

Despite the significant findings, 52.9% of the variance in critical thinking skills was explained by factors outside the model. This indicates that other variables, such as teacher pedagogical competence, classroom climate, parental support, reading literacy, collaborative learning experiences, and socio-economic background, may also contribute to students' critical thinking development. Future research should include these factors to build a more comprehensive model.

CONCLUSIONS

This study concludes that digital literacy, self-efficacy, and learning motivation positively and significantly predict elementary school students' critical thinking skills, both partially and simultaneously. Digital literacy helps students access and evaluate information, self-efficacy supports confidence and persistence in analytical tasks, and learning motivation sustains engagement in the thinking process. Simultaneously, the three variables explained 47.1% of the variance in critical thinking skills. These findings emphasize that strengthening critical thinking in elementary schools requires an integrative approach that combines technological competence, psychological confidence, and strong learning motivation.

IMPLICATIONS

The findings have practical implications for elementary education. Teachers should design learning activities that integrate digital literacy with problem-based learning, discussion, source evaluation, and evidence-based reasoning. Digital tasks should not only ask students to search for information, but also to compare sources, evaluate credibility, and justify conclusions.

Schools need to support students' digital literacy by providing equitable access to learning technology and by developing programs that strengthen students' academic confidence. In addition, teachers and school counselors can collaborate to build students' self-efficacy through positive feedback, guided practice, and opportunities for successful learning experiences.

Learning motivation should also be strengthened through meaningful, challenging, and interactive learning environments. Teachers can provide contextual tasks, collaborative activities, and student-centered learning strategies to encourage persistence and curiosity.

LIMITATIONS AND FUTURE RESEARCH

This study has several limitations. First, the data were collected using questionnaires, so the results depended on students' self-reported responses. Future studies should complement questionnaire data with performance-based critical thinking tests, classroom observations, or interviews. Second, the study used a survey design; therefore, causal interpretation should be made cautiously. Third, the sample was limited to elementary school students in Banggai Kepulauan, which may limit the generalizability of the findings.

Future research is recommended to examine additional variables, such as teacher competence, parental support, reading literacy, digital parenting, collaborative learning, and classroom climate. Mixed-methods research may also be used to obtain deeper insights into how digital literacy, self-efficacy, and learning motivation interact in the development of students' critical thinking skills.

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