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ANALYSIS OF THE RELATIONSHIP BETWEEN LEARNING INTEREST AND CRITICAL THINKING ABILITY ON ELEMENTARY SCHOOL STUDENTS' MATHEMATICS ACHIEVEMENT

Agus Hari Sutrisno[1]*, Wasilatul Murtafiah[2], Jeffry handika[3]
Master's Program in Primary Education, PGRI University of Madiun, Madiun[1,2,3]
E-mail: agus_2401203022@mhs.unipma.ac.id [1*], wasila.mathedu@unipma.ac.id [2], jhandhika@unipma.ac.id [3]

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Abstract

This study aims to analyze the relationship between learning interest and critical thinking skills on students' mathematics achievement. The research subjects were 47 fifth-grade students from SDN Kedungrejo 1 and SDN Kropak 1 in Probolinggo Regency. Data were collected using test instruments and questionnaires, both of which were assessed through validity and reliability testing. The results confirmed that all instruments were valid and reliable for use in data collection. Furthermore, a normality test using the Kolmogorov–Smirnov method indicated that the data were normally distributed, with a significance value of 0.200, which exceeds the 0.05 threshold. The findings reveal that neither learning interest nor critical thinking skills has a significant relationship with fifth-grade students' mathematics achievement at SDN Kedungrejo 1 and SDN Kropak 1. The significance values of the correlation were 0.580 for learning interest and 0.564 for critical thinking skills, both exceeding the 5% significance level. This indicates that these variables do not serve as direct predictors of mathematics achievement in this study. However, the analysis also shows that learning interest and critical thinking skills are strongly and significantly correlated with each other, with a correlation coefficient of 0.984 and a significance level of 0.001. This finding suggests that the two variables move in the same direction and mutually reinforce each other in the learning process, despite not directly influencing mathematics achievement.Therefore, this study indicates that students' mathematics achievement at SDN Kedungrejo 1 and SDN Kropak 1 is likely influenced by other factors beyond learning interest and critical thinking skills, such as instructional quality, family support, intrinsic motivation, or foundational mathematical abilities.

Keywords: Critical thinking, learning interest, learning achievement, mathematics (TNR 11, single spaced and italicized).

INTRODUCTIO

Education constitutes a crucial component in the development of a nation and state (Sirait, 2016). As a dynamic cultural product, education continuously undergoes transformation in response to social and technological developments in modern society (Arya Pratiwi et al., 2019). At the elementary school level, children experience rapid cognitive development, making the introduction of fundamental concepts including mathematics, a critical moment in fostering logical and systematic thinking skills. However, mathematics achievement among elementary school students in various regions remains stagnant and has yet to reach expected learning targets. This issue can be observed among several students at SDN in Gebang District, Purworejo Regency, who tend to show disengagement during mathematics lessons, often exhibiting inattentive behavior and preferring to talk with peers (Amalia et al., 2022). A learning process can be considered successful when teaching activities are well understood by students (Ardila et al., 2024). Such conditions indicate that fundamental factors in the learning process have not been optimally addressed, necessitating a more comprehensive academic analysis of determinants influencing mathematics learning outcomes. Learning interest is one of the key factors influencing the quality of students' engagement in the learning process. In classroom learning, interest is an essential aspect that students must possess (Kamasyani & Ain, 2024). Low learning interest tends to negatively impact students' critical thinking ability (Fachrunnisa et al., 2024). Interest does not emerge spontaneously; rather, it is shaped by underlying needs (Friantini & Winata, 2019). Essentially, activities that a person enjoys are accompanied by feelings of pleasure, attraction, focused attention, and conscious involvement, all of which characterize interest (Pratamawati et al., 2021). The

dynamics of learning interest are influenced not only by internal factors within students but also by instructional methods, teacher characteristics, classroom atmosphere, and the availability of learning resources. Therefore, mapping students' learning interest becomes a strategic step in understanding the quality of their participation in mathematics learning. In addition to learning interest, critical thinking ability is also a fundamental element in mathematics learning, as mathematics requires students to analyze information, evaluate strategies, and solve problems rationally. According to Richard Paul's theory, critical thinking begins with thinking about one's own thinking (Gusmayenti, 2021). Critical thinking skills encompass various competencies such as identifying information, evaluating arguments, making logical decisions, and solving problems systematically (Dalling et al., 2024).

In the context of elementary school learning, the integration of learning interest and critical thinking ability should be a crucial focus to foster more meaningful learning experiences. Teachers serve as facilitators who not only deliver content but also cultivate students' learning motivation and design activities that promote higher-order thinking skills (Wijayanti & Siswanto, 2020). Another study highlights that appropriate learning models are needed to support the enhancement of students' critical thinking skills (Daniel, 2017). These conditions should not be viewed as barriers but as opportunities for teachers to create mathematics learning experiences that emphasize not only achievement outcomes but also the strengthening of students' cognitive competencies. SDN Kedungrejo 1 and SDN Kropak 1 in Probolinggo Regency present concrete examples of these issues. Preliminary observations indicate that the mathematics achievement of fifth-grade students in both schools remains inconsistent and has not yet met the expected competency standards. This instability calls for an evaluation of the extent to which learning interest and critical thinking ability contribute to mathematics learning outcomes. A similar concern emerged from an interview conducted on 20 November 2025 with Rohmi Kusbiyanti, S.Pd.SD, the fifth-grade teacher at SDN Kropak 1, who stated that students' daily mathematics test scores tend to decline, possibly because mathematics is perceived as an unappealing subject. Therefore, this study seeks to provide empirical insights into the relationship between these two variables as part of efforts to enhance learning quality, particularly at SDN Kedungrejo 1 and SDN Kropak 1.

Previous studies have examined the influence of learning interest and critical thinking ability on mathematics achievement. Other research reported that students' learning interest contributed significantly 47.48% to the learning outcomes of students at SDN in Ujung Lare Village, Parepare City (Lauku, 2022). Sirait (2016) also demonstrated that learning interest had a significant effect of 49.8% on the academic performance of students at SMPN 160 Jakarta. Furthermore, Dalling et al. (2024) argued that critical thinking ability provides an effective contribution to improving student achievement. However, these studies generally examined the variables separately or did not focus on public elementary schools in rural areas. Moreover, research that simultaneously investigates the interaction between these two variables and their combined contribution to elementary school students' mathematics achievement, especially among fifth-grade students who are at a critical stage of cognitive development remains limited. Therefore, the novelty of this study lies in its simultaneous examination of the roles of learning interest and critical thinking ability, as well as its emphasis on rural student populations distant from urban centers. The urgency of this research is rooted not only in strengthening theoretical foundations regarding determinants of mathematics achievement but also in understanding the direct contributions of learning interest and critical thinking ability to elementary school students' mathematics performance. This study also serves as a basis for improving instructional practices at the elementary level. Thus, this research is essential for helping schools, teachers, and policymakers develop more targeted learning interventions to sustainably improve students' mathematics achievement.

LITERATURE REVIEW

Interest in learning mathematics is a psychological factor that plays an important role in determining the quality of students' engagement in the learning process. Interest can also be interpreted as a condition in which an individual has a sense of attraction or strong liking toward something (Rahayu, 2021). Learning interest involves curiosity, attention, and feelings of enjoyment when studying certain materials, including mathematics, which is often perceived as a difficult subject by many students. Several authors cited in related research state that learning interest refers to a person's sense of attraction, attention, and strong desire toward something without external pressure (Safitri et al., 2024). In the context of mathematics learning, interest is reflected through students' willingness to participate in learning activities, complete exercises independently, and show enthusiasm for solving mathematical problems. Critical thinking ability is a higher-order cognitive skill that enables individuals to analyze information deeply, evaluate arguments, and make logical and rational decisions. It represents an essential intellectual asset that students must possess when dealing with problems encountered in everyday life (Magdalena et al., 2020). In the field of education, critical thinking skills can be developed through mathematics instruction in

schools (Trimahesri et al., 2019). Critical thinking is considered an essential competency that students need to confront complex and dynamic problems. This ability not only involves understanding information but also identifying assumptions, conducting deductive and inductive reasoning, and providing accountable solutions. Therefore, critical thinking skills are highly important in learning mathematics, which is closely associated with analysis, reasoning, and logical justification. Mathematics learning achievement serves as an indicator of students' mastery of mathematical content, skills, and competencies outlined in the curriculum. Mathematics has been introduced to students since early childhood, beginning with simple concepts and progressing to more complex material. Consequently, students are expected to understand and master various mathematical competencies. Mastery of the material being studied is an important prerequisite for achieving learning success in school, particularly in mathematics. By understanding mathematical concepts well, students have a greater opportunity to attain optimal learning achievement (Putri & Sri, 2020). This achievement is typically measured through learning outcome tests that assess conceptual understanding, procedural fluency, and problem-solving abilities. Learning achievement is viewed as a reflection of the overall effectiveness of the learning process, which involves the interaction of internal factors such as motivation, interest, and cognitive ability and external factors such as teaching methods, learning environment, and parental support (Charli et al., 2019). Thus, mathematics learning achievement is a multidimensional outcome influenced by various interrelated variables.

METHOD

This study employed a quantitative approach with a correlational analysis design to examine the relationship between independent and dependent variables (Irna Daulatina Islamiah, 2019). The variables used in this study include the independent variables, namely learning interest (X_1) and critical thinking ability (X_2), while the dependent variable is students' mathematics achievement (Y). Quantitative research aims to identify the relationships that exist among sets of variables (Soesana et al., 2023). The population and sample in this study consisted of all fifth-grade students, totaling 47 students, from SDN Kedungrejo 1 and SDN Kropak 1, selected using a saturated sampling technique. Saturated sampling is a sampling technique in which all members of the population are included as research samples (Muin, 2021). Data collection in this quantitative study utilized research instruments in the form of questionnaires and documentation of test results. Data on learning interest were collected using a questionnaire and converted into numerical data based on a Likert scale of 1 to 4 (Wijayanti & Siswanto, 2020). Data on critical thinking ability were developed from documented results of students' achievement tests on plane geometry topics and aligned with the critical thinking indicators rubric developed by the fifth-grade teachers at SDN Kedungrejo 1 and SDN Kropak 1, as follows:

1. Problem-Formulation Ability
   a. Score 1: Does not identify the main problem
   b. Score 2: Identifies the main problem but unclearly
   c. Score 3: Identifies the main problem but less clearly
   d. Score 4: Clearly identifies the main problem
2. Reasoning Ability
   a. Score 1: Provides no reasoning
   b. Score 2: Provides reasoning, but it is incorrect
   c. Score 3: Provides reasoning, but it is partially incorrect
   d. Score 4: Provides appropriate reasoning
3. Action-Taking Ability
   a. Score 1: Unable to take action to solve the problem
   b. Score 2: Able to take action but incorrectly
   c. Score 3: Able to take action but less accurately
   d. Score 4: Able to take action accurately
4. Conclusion-Drawing Ability
   a. Score 1: Unable to draw a conclusion
   b. Score 2: Able to draw a conclusion but inaccurately
   c. Score 3: Able to draw a conclusion but less accurately
   d. Score 4: Able to draw a conclusion accurately

Before data collection, the instruments underwent validation procedures to determine their feasibility for use (Rahayu, 2021). Once the questionnaire data were collected, validity and reliability tests were conducted (Irawan, 2020).

The main data analysis was performed once prerequisite tests were completed to ensure that the data obtained from the 47 respondents were suitable for statistical analysis. The prerequisite tests included a normality test using the Kolmogorov–Smirnov test (Sujarweni, 2025). The results of the normality test determined the type of correlation test to be used in subsequent analyses. If the data were normally distributed, the relationships among variables were analyzed using the parametric Pearson Product-Moment correlation test. Conversely, if the data were not normally distributed, the non-parametric Spearman Rank correlation test was applied to identify the relationships between research variables (Mertha Jaya, 2024). All testing and data analysis procedures were carried out using IBM SPSS Statistics software to ensure accuracy and reliability.

The conceptual framework of this study illustrates the relationship among three main variables: learning interest and critical thinking ability as independent variables, and mathematics achievement as the dependent variable. These relationships were analyzed using correlational analysis to determine the extent to which learning interest and critical thinking ability influence and correlate with students' mathematics achievement. This study aimed to measure the strength and direction of the relationships between both independent variables (learning interest and critical thinking ability) and the dependent variable (mathematics achievement). The analysis was expected to reveal whether a significant positive relationship exists among these variables. In other words, the higher the students' learning interest and critical thinking ability, the higher their mathematics achievement. The following is the conceptual framework of this study:

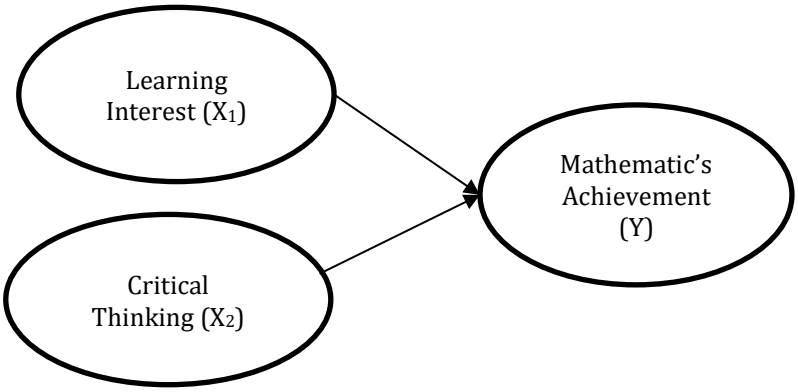

Image 1. Conceptual frameworks

RESULTS AND DISCUSSION

The validity test for the learning interest and critical thinking ability questionnaire instruments was conducted using the Pearson Product-Moment technique. The criteria for determining item validity were based on the r-table reference (df = n – 2), with n = 47, resulting in an r-table value of 0.246 at the 5% significance level. An item is considered valid if the calculated r-value (r-count) is greater than the r-table value and the Sig. (p) value is less than 0.05 (Roza et al., 2023). The results of the validity test for the learning interest questionnaire instrument are presented in Table 1 below :

Correlations

		X1.1	X1.2	X1.3	X1.4	X1.5
X1.1	Pearson Correlation	1	.747**	.776**	.755**	.853**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	47	47	47	47	47
X1.2	Pearson Correlation	.747**	1	.530**	.624**	.671**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	47	47	47	47	47
X1.3	Pearson Correlation	.776**	.530**	1	.692**	.796**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	47	47	47	47	47
X1.4	Pearson Correlation	.755**	.624**	.692**	1	.707**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	47	47	47	47	47
X1.5	Pearson Correlation	.853**	.671**	.796**	.707**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	47	47	47	47	47

**. Correlation is significant at the 0.01 level (2-tailed).

Table 1. SPSS Output of the Instrument Validity Test for Learning Interest

The validity test for the learning interest instrument was conducted using Pearson item-to-item correlations. Based on the results of the analysis, all items (X1.1–X1.5) showed Pearson correlation values ranging from 0.530 to 0.853, which fall within the category of moderate to very strong correlations. These results indicate that each item has a consistent relationship with the other items in measuring the same construct. In addition, all Sig. (2-tailed) values were recorded as < 0.001, which is lower than the 5% significance level ($\alpha = 0.05$). Thus, it can be concluded that all items in the learning interest instrument demonstrate statistically significant validity. No items were found to have a significance value greater than 0.05, meaning that all items are declared valid and suitable for use in measuring the students' learning interest variable. These findings confirm that the instrument used meets the criteria for construct validity and is therefore capable of accurately and consistently representing the dimensions of learning interest. The validity test results for the critical thinking ability instrument are presented in Table 2 below:

Correlations

		X2.1	X2.2	X2.3	X2.4
X2.1	Pearson Correlation	1	.650**	.889**	.753**
	Sig. (2-tailed)		.000	.000	.000
	N	47	47	47	47
X2.2	Pearson Correlation	.650**	1	.585**	.745**
	Sig. (2-tailed)	.000		.000	.000
	N	47	47	47	47
X2.3	Pearson Correlation	.889**	.585**	1	.768**
	Sig. (2-tailed)	.000	.000		.000
	N	47	47	47	47
X2.4	Pearson Correlation	.753**	.745**	.768**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	47	47	47	47

**. Correlation is significant at the 0.01 level (2-tailed).

Table 2. SPSS Output of the Instrument Validity Test for Critical Thinking Ability

The validity test for the critical thinking ability instrument was conducted using Pearson inter-item correlation analysis. Based on the calculation results, all items (X2.1–X2.4) demonstrated strong correlations with the other items, with correlation coefficients ranging from 0.585 to 0.889. These values indicate moderate to very strong correlations, confirming that each item is consistently related in measuring the construct of critical thinking ability.

All Sig. (2-tailed) values were recorded as < 0,001, which is below the 5% significance level (α = 0.05). Thus, each item in the critical thinking ability instrument is statistically valid, as it shows a significant relationship with the other items within the same variable. No items were found to have a significance value greater than 0.05, indicating that all four items meet the criteria for item validity. These results affirm that the critical thinking ability instrument used in this study possesses good construct validity. After the instrument was confirmed valid through inter-item correlation testing, the next step was to conduct a reliability test to ensure the internal consistency of each item in measuring the constructs of learning interest and critical thinking ability. Reliability testing is essential because a valid instrument is not necessarily reliable, while a reliable instrument must demonstrate a high level of consistency when used under similar conditions. In this study, the reliability of the instruments was analyzed using Cronbach's Alpha coefficient, which is the most widely used method in educational and social research. An instrument is considered reliable if the Cronbach's Alpha value is ≥ 0.70, indicating that the items in the instrument have good internal consistency. The reliability test results for the learning interest instrument are shown in Table 3 below :

Reliability Statistics

Cronbach's Alpha	N of Items
.924	5

Table 3. SPSS Output of the Reliability Test for the Learning Interest Instrument.

Based on the reliability calculation results presented in Table 3, the Cronbach's Alpha value obtained was 0.924. This value far exceeds the recommended minimum reliability threshold of 0.70, indicating that the learning interest instrument possesses a very high level of internal consistency. In other words, all items in the instrument function consistently and support one another in measuring the same construct. The reliability test results for the critical thinking ability instrument are presented in Table 4 :

Reliability Statistics

Cronbach's Alpha	N of Items
.916	4

Table 4. SPSS Output of the Reliability Test for the Critical Thinking Ability Instrument

Based on the reliability calculation results presented in Table 4, the Cronbach's Alpha value obtained is 0.916. This value far exceeds the recommended minimum reliability threshold of 0.70, indicating that the learning interest instrument has a very high level of internal consistency. After the instrument was declared valid and reliable, the next step was to test the normality of the mathematics learning achievement data to ensure that the data met the assumption of normal distribution before conducting parametric statistical analysis. The normality test was carried out using the Kolmogorov–Smirnov technique with the assistance of SPSS. The results of the normality test are presented in Table 5 below :

One-Sample Kolmogorov-Smirnov Test

			Y
N			47
Normal Parameters[a,b]	Mean		76.9574
	Std. Deviation		12.33757
Most Extreme Differences	Absolute		.070
	Positive		.068
	Negative		-.070
Test Statistic			.070
Asymp. Sig. (2-tailed)[c]			.200[d]
Monte Carlo Sig. (2-tailed)[e]	Sig.		.820
	99% Confidence Interval	Lower Bound	.810
		Upper Bound	.830

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.
e. Lilliefors' method based on 10000 Monte Carlo samples with starting seed 2000000.

Table 5. SPSS Output of Normality Test

The analysis results show that the significance value for the learning achievement test data is above the 0.05 significance level, namely 0.200, indicating that the data are normally distributed. This condition suggests that the distribution of students' scores is not concentrated at a particular value but is spread out following a reasonable distribution pattern. With the normality assumption fulfilled, the test results are appropriate for further analysis, specifically the correlation test. After conducting the prerequisite tests, a Pearson Product-Moment correlation analysis was performed on the three datasets, namely learning interest, critical thinking skills, and students' mathematics learning achievement. The correlation test results are presented in Table 6 below :

Correlations

		Y	X1	X2
Y	Pearson Correlation	1	.083	.086
	Sig. (2-tailed)		.580	.564
	N	47	47	47
X1	Pearson Correlation	.083	1	.984**
	Sig. (2-tailed)	.580		.000
	N	47	47	47
X2	Pearson Correlation	.086	.984**	1
	Sig. (2-tailed)	.564	.000	
	N	47	47	47

**. Correlation is significant at the 0.01 level (2-tailed).

Table 6. SPSS Output of Correlation Test

Based on the results of the Pearson correlation analysis presented in Table 6, the relationship between the learning interest variable (X_1) and mathematics learning achievement (Y) shows a coefficient value of 0.083 with a significance value of 0.580. This significance value is far above the critical threshold of $\alpha = 0.05$, indicating that there is no sufficient statistical evidence to confirm a significant linear relationship between learning interest and mathematics learning achievement. Thus, the level of learning interest among students in this sample cannot be used as a predictor of mathematics achievement. Furthermore, the relationship between critical thinking skills (X_2) and mathematics learning achievement (Y) yields a correlation coefficient of 0.086 with a significance value of 0.564. Similar to the previous result, the significance value greater than 0.05 indicates that there is no significant relationship between critical thinking skills and students' mathematics learning achievement. This finding suggests that variations in students' critical thinking skills are not accompanied by meaningful variations in mathematics achievement within the context of this study.

Although both independent variables do not show significant relationships with learning achievement, the analysis reveals a very strong correlation between learning interest (X_1) and critical thinking skills (X_2), with a coefficient of 0.984 and a significance level of < 0.001. This indicates a highly significant linear relationship between the two variables. This strong association suggests that students with higher learning interest tend to have better critical thinking skills, or vice versa, showing that both variables move in the same direction in the context of the mathematics learning process. Overall, the findings indicate that although learning interest and critical thinking skills are significantly and strongly correlated, they do not directly contribute to the variation in students' mathematics learning achievement in this sample. These results suggest that there are other factors beyond the two variables that play a more dominant role in influencing mathematics performance at the elementary school level. This opens opportunities for further research to identify other more relevant determinants.

CONCLUSION

Based on the results of the data analysis conducted, this study concludes that students' learning interest and critical thinking skills do not have a significant relationship with mathematics learning achievement among fifth-grade students at SDN Kedungrejo 1 and SDN Kropak 1. This is indicated by the correlation significance values of 0.580 for the relationship between learning interest and learning achievement, and 0.564 for the relationship between critical thinking skills and learning achievement, both of which exceed the 5% significance level. Thus, these two variables cannot serve as direct predictors of mathematics achievement within the context of this research. Nevertheless, the study finds that learning interest and critical thinking skills among students at SDN Kedungrejo 1 and SDN Kropak 1 have a very strong and significant relationship, as evidenced by a correlation coefficient of 0.984 with a significance level of < 0.001. This finding indicates that the two variables move in the same direction and reinforce each other in the learning process, even though they do not directly contribute to learning achievement.

Overall, the findings suggest that students' mathematics learning achievement at SDN Kedungrejo 1 and SDN Kropak 1 is likely influenced more by other factors beyond learning interest and critical thinking skills, such as instructional quality, family support, intrinsic motivation, or basic mathematical ability. Therefore, further studies should consider these variables to obtain a more comprehensive understanding of the determinants of mathematics learning achievement in elementary schools. This study is expected to serve as a foundation for teachers and schools in this case, SDN Kedungrejo 1 and SDN Kropak 1 to evaluate the learning strategies implemented, as well as to encourage the development of more targeted interventions aimed at improving students' mathematics learning outcomes..

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