The effect of learning interest on students' mathematical critical thinking ability in vocational high school

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Abstract: This research investigates the impact of students’ interest in learning critical mathematical thinking skills in the context of vocational high schools (SMK) by using a quantitative approach with correlational research methods. This research involved all class XI students of Ma'arif Al-Ghozali Vocational School as the population. Purposive sampling was used to select a sample of 30 students. Data analysis includes various statistical tests, including normality, linearity, correlation, and simple regression tests. The findings of this study reveal an essential relationship between students' learning interests and their mathematical critical thinking abilities. In particular, there is a significant favorable influence between interest in learning and students’ critical mathematical thinking abilities. These results underscore the importance of nurturing and improving their mathematical critical thinking skills. This study contributes to our understanding of the factors influencing mathematical critical thinking skills in vocational high school students. It offers valuable insights for educators and policymakers seeking to improve mathematics education in such settings.

Keywords: Critical thinking Skills, Learning interest, Vocational high school

INTRODUCTION

High-level thinking is a type of cognitive process that includes deliberate mental effort to investigate complicated events with the intention of learning (Wardana, 2012). A person’s capacity for high-level thinking may be shown in a number of ways, including their capacity for problem-solving, creativity, and critical thought. Higher level thinking includes having the ability to think critically (Crismasanti & Yunianta, 2017). The capacity to think critically involves analyzing arguments and coming up with concepts for each meaning in order to establish logical thought patterns (Jumaisyaroh et al., 2015). To be able to produce unique ideas, this thinking process needs a solid grasp of the arguments. People who have critical thinking skills can provide meaning from different points of view (Nurhikmayati, 2019). With different points of view, students are able to make the right decision in solving a problem.

Characteristics of critical thinking according to Sulistiani and Masrurkan (2017) is being able to think rationally in responding to a problem, being able to make the right decision in resolving a problem, being able to analyze, organize and dig up information based on facts correctly and systematically. These characteristics will form the basis of future research. Someone who has
critical thinking skills will think rationally about something, then gather as much information as possible about that something, which includes methods or reasoning that will be used to make a decision or take the right action.

Everyone needs the ability to use critical thinking to cope with issues that arise in the course of living that cannot be avoided (Maulana, 2008). A person can organize, modify, enhance, or change his thoughts through critical thinking, enabling him to decide how to act in a more acceptable manner. In addition, because they are accustomed to consistency in thought, children who possess critical thinking abilities will be able to think methodically. This is in line with Aizikovitsh-Udi and Cheng (2015) who emphasize that critical thinking must become a pervasive basis of the educational experience of all students from pre-school to high school and university. Critical thinking may be cultivated in the classroom, particularly in the study of mathematics. Students should practice critical thinking since it can help them solve problems more effectively in daily life.

Since critical thinking is a process that results in judgments about what we should believe and what we will do, it is one of the critical thinking abilities that students should possess (Rohaeti, 2010). In line with Dewey (1964), a belief or body of information that is taken for granted must be actively, persistently (continuously), and carefully reviewed in light of the arguments for and conclusions drawn in response to it. This indicates that a person with critical thinking abilities will carefully examine all of the information they get, reprocess it, and then search for further evidence based on their prior knowledge to arrive at the correct conclusion.

Despite the fact that students’ critical thinking abilities still tend to be inadequate, critical thinking skills are crucial. Based on their performance in TIMSS and PISA, Indonesian students do poorly in mathematics because they struggle to correctly answer TIMSS and PISA questions. In line with the results of Kharisma (2018), it is claimed that vocational school students’ average levels of mathematical critical thinking are still rather poor across the majority of critical thinking metrics. The questions are therefore unanswerable by pupils. Additionally, because they are rarely taught how to handle problems that call for critical thinking, students frequently struggle to tackle situations that demand for this kind of thinking (Tresnawati et al., 2017). Students still struggle with a number of signs while working on mathematical critical thinking tasks, including reviewing questions, replies, pertinent arguments, and re-examining a statement or method that can be claimed to have not been able to establish the findings are right or wrong (Fatmawati et al., 2014). As a result, it's important to provide pupils with a variety of critical thinking tasks so that they become more adept at solving challenging mathematical thinking issues.

Learning that actively includes students, one of which is that students have a strong interest in learning, helps increase students' mathematical critical thinking skills (Chrissanti & Widjajanti, 2015). Therefore, pupils' great interest in learning contributes to their development of high-level mathematical critical thinking abilities. Interest in learning according to Guilford in (Lestari & Yudhanegara, 2018) is the psychological support that kids need to study anything with complete attention, control, and discipline, making them eager and motivated to accomplish it. Lestari and Yudhanegara (2018) said that delight, interest in learning, paying attention when studying, and engagement in learning are all signs of learning interest. It's crucial to take students' learning interests into account in order to boost their critical mathematical thinking abilities.

There has been prior research on the impact of learning interest on the capacity for mathematical critical thought. The research results of Laila and Virgana (2022), Damayati (2020) and Kencawaty (2016) assert that, at the junior high school level, pupils' motivation in studying has a considerable impact on their capacity for mathematical critical thought. In contrast to other studies, this study will look at how students' levels of enthusiasm in learning affect their mathematical critical thinking skills. The impact of each indication on students' mathematics critical thinking skills and motivation to learn is more thoroughly explored in this
study. This study looks at how students at vocational schools' mathematical critical thinking skills are affected by their desire in learning.

**METHOD**

This study uses quantitative correlational research techniques. This study was done to examine how students' learning interests, which were the independent variable X, influenced their mathematical critical thinking abilities, which were the dependent variable Y. Figure 1 shows how this study was structured.

![Figure 1. Research Design](image)

In this context, X represents students' learning interest, while Y refers to critical thinking ability in mathematics. The symbol → denotes the influence or relationship between students' learning interest (X) and critical thinking ability in mathematics (Y). In other words, the information implies that students' learning interest can have an impact or influence on their critical thinking abilities in mathematics. The relationship between X and Y becomes relevant in understanding how students' learning interest can play a role in the development of their critical thinking skills in the field of mathematics.

This research was carried out at Ma’arif Al-Ghozali Vocational School in the even semester of the 2022/2023 academic year with the population is all class XI students at Ma’arif Al-Ghozali Vocational School. The sampling technique used was *purposive sampling* with certain considerations (Lestari & Yudhanegara, 2018). Based on interviews with mathematics teachers, all class XI have the same characteristics and the same critical mathematical thinking skills, so they use existing classes. Another consideration is classes that have not received the material to be delivered. The sample for this research was class XI BDP 2 with a total of 30 people. The learning interest variable instrument is a *Likert scale* with 30 statement items equipped with 4 answer choices, namely SS (Strongly Agree), S (Agree), TS (Disagree) and STS (Strongly Disagree). Each answer has a score of 1-4. The variable instrument for mathematical critical thinking ability is a test in the form of a description of 6 questions. Each student's work is given a score of 1-4 in accordance with the scoring guidelines that have been created based on indicators of students' mathematical critical thinking abilities. This instrument has previously been tested for validity, reliability, distinguishing power and difficulty index. The research data obtained was tested for analytical prerequisites, including a normality test, a linearity test, then a correlation test was carried out to see the effect of interest in learning on students' mathematical critical thinking abilities. Students' mathematical critical thinking abilities can increase with a high interest in learning.

**RESULTS AND DISCUSSION**

**Results**

Research data processing was carried out with the help of the SPSS 16.0 program. The statistical techniques used are descriptive statistics, normality test, linearity test, correlation test, and regression analysis. The results of data processing and descriptive statistical analysis are described in Table 1.

<table>
<thead>
<tr>
<th>Table 1. Descriptive Statistical Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematical Critical Thinking Ability</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>Interest to learn</td>
</tr>
</tbody>
</table>
Based on Table 1, the results of the mathematical critical thinking ability test carried out on 30 respondents obtained a mean value of 79.83 and the results of interest in learning obtained a mean of 80.30. This information shows that pupils' mathematics critical thinking skills and learning enthusiasm are generally good and exhibit high numbers.

To ascertain if the data collected by researchers are representative of a normally distributed population, the normality test is used. This is done as a prerequisite if testing is carried out with non-parametric statistics. Normality Test, using SPSS 16.0 as a tool. Table 2 summarizes the findings of the normalcy test for both variables.

### Table 2. Normality Test

<table>
<thead>
<tr>
<th></th>
<th>Kolmogorov-Smirnov</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Statistics</td>
</tr>
<tr>
<td>Interest to learn</td>
<td>133</td>
</tr>
<tr>
<td>Mathematical Critical Thinking Ability</td>
<td>142</td>
</tr>
</tbody>
</table>

Based on Table 2, it is found that each significance value is > 0.05 so that the variables of mathematical critical thinking ability and interest in learning are normally distributed.

The purpose of the linearity test is to determine and demonstrate that the connection between the variables under study is linear. The linearity test hypothesis in this research is:

- \( H_0: \mu_1 = \mu_2 \): There is no linear relationship between students' learning interest and students' mathematical critical thinking abilities.
- \( H_1: \mu_1 \neq \mu_2 \): There is a linear relationship between students' learning interest and students' mathematical critical thinking abilities.

To determine the influence of the learning interest variable on critical mathematical thinking skills, it was carried out using SPSS 16.0. The criteria \( H_0 \) were accepted if the Sig. < 0.05 and \( H_0 \) rejected if Sig. > 0.05. The linearity test results for the simple regression model can be seen in Table 3.

### Table 3. Linearity Test

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest*</td>
<td>346,680</td>
<td>16</td>
<td>21,668</td>
<td>2,737</td>
<td>.270</td>
</tr>
<tr>
<td>Critical Thinking Ability</td>
<td>9,403</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In Table 3, the results of the Linearity Test show that the Deviation From Linearity value is 0.270. Sig value .270 > 0.05 means that \( H_0 \) it is rejected, meaning there is a linear relationship between the learning interest variable and the student's mathematical critical thinking ability variable. Next, a hypothesis test is carried out using a correlation test which can be seen in Table 4.

### Table 4. Correlation Test

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Interest in Mathematical Critical Thinking</td>
<td>30</td>
<td>.000</td>
</tr>
</tbody>
</table>

In Table 4, it is known that the significance value is 0.000 < 0.05, this shows that students' interest in learning is correlated or related to students' mathematical critical thinking abilities, so it \( H_0 \) is rejected. It is clear from the preceding statement that all necessary tests have been completed. After that, a regression analysis was done to determine how much interest in learning affected students' capacity for mathematical critical thought. The results are shown in Table 5.

### Table 5. Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.678</td>
<td>.460</td>
<td>.441</td>
<td>9.403</td>
</tr>
</tbody>
</table>
Based on Table 5, the R Square is 46.0%, which shows that interest in learning influences students' mathematical critical thinking abilities, while the remaining 48.9 is influenced by other factors outside of interest in learning. Based on Table 6, it is known that the significance value is 0.000 <0.05, this shows that interest in learning has a significant positive effect on students' mathematical critical thinking abilities.

Table 6. ANOVA

<table>
<thead>
<tr>
<th></th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>10.21550</td>
<td>1</td>
<td>2110.550</td>
<td>23.871</td>
<td>.000</td>
</tr>
</tbody>
</table>

Based on Table 7, the equation $Y = 16.962 + 0.750$ is obtained with the student interest coefficient having a positive value, the regression coefficient $x$ is 0.750, meaning that for every additional 1 value of interest in learning, the value of mathematical critical thinking increases by 0.750, as a result, students' critical mathematical thinking skills are influenced by their motivation in studying.

Table 7. Coefficients

<table>
<thead>
<tr>
<th></th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Constant)</td>
<td>16.962</td>
<td>12.982</td>
<td>1,307</td>
<td>.202</td>
</tr>
<tr>
<td>Interest</td>
<td>0.750</td>
<td>.153</td>
<td>.678</td>
<td>4.886</td>
</tr>
</tbody>
</table>

Discussion

The impact of learning interest on students' capacity for mathematical critical thought in vocational high school is examined in this study. Based on the outcomes of the data processing that has been done, it is evident that students' capacity for mathematical critical thought is influenced by their level of interest in the subject matter. The association between interest in learning and mathematical critical thinking is linear, thus children with high levels of interest in learning will also have high levels of mathematical critical thinking. The percentage results of each indicator show that students with high levels of enthusiasm in studying may develop their mathematical critical thinking skills.

The association between learning interest and critical mathematical thinking abilities is favorable, therefore students who are highly motivated to study actively urge themselves to improve their critical mathematical thinking abilities. The findings of this study are consistent with this notion. They may develop fundamental skills, give straightforward explanations, draw conclusions, and develop plans and tactics. The regression test's findings demonstrate that students' enthusiasm in learning has a beneficial impact on their capacity for mathematical critical thought. This demonstrates that a student's capacity for mathematical critical thought will develop in direct proportion to their level of learning interest.

Interest in learning is very necessary in carrying out actions to achieve learning goals, because actions accompanied by interest can encourage someone to do more, for example being more active in studying (Kencanawaty, 2016). High enthusiasm in studying is one aspect that affects pupils' ability to think critically about mathematics (Damayati, 2020). Students that are motivated to study can develop critical mathematical thinking abilities. In line with Kencanawaty's (2016) the notion that students' learning interests affect their mathematical critical thinking skills is true, and that the more the students' learning interests, the better their mathematical critical thinking skills.

The results of the student interest questionnaire in learning mathematics with an average score of 80.30 are relatively high. The results of the questionnaire on students' interest in learning are included in the indicators: (1) Feelings of happiness, an average score of 80% in the high category, meaning that it can be seen that the majority of students are enjoying the learning process; (2) Interest in learning, an average score of 70% in the medium category,
meaning that most students are more interested in learning; (3) Showing attention when studying, the average score is 59% in the medium category, meaning that some students do the tasks given by the teacher well; (4) Involvement in learning, an average score of 60% in the medium category, meaning that most students follow the learning process well.

Students' scores on the mathematical critical thinking ability test with an average score of 79.83 are relatively high. The results of the mathematical critical thinking ability test are contained in the indicators: (1) Providing a simple explanation, average score of 78% in the high category; (2) Building basic skills, average score 81% with very high category; (3) Making explanations, the average score is 82% very high; (4) Concluding, the average score is 80% in the high category; (5) Strategy and Tactics, average score 78% in the high category.

Because the instructor may provide the following information with questions and instructions on how to respond to them, students have a positive opinion of mathematics learning and a positive image of the teacher. Keep an open mind when studying and accepting the instructor's tasks since the teacher provides pupils the chance to communicate thoughts and opinions without worrying about being incorrect. Due to the fact that there are different learning styles within the group, pay close attention when studying and contribute well during discussions. Because instructors often relate mathematics to daily life, be conscious of studying both before and after school. Due to a number of these factors, pupils have quite advanced mathematical critical thinking skills. In line with Kencanawaty's (2016) according to studies, a student's capacity for mathematical critical thought increases in proportion to their level of interest in the subject matter. By getting to know students better and piquing their interest in learning more in accordance with learning interest indicators, you may promote a good learning environment and pique students' curiosity.

The teacher's approach to instruction emphasizes the importance of the pupils being able to pay close attention to what is being taught. The indicator of happiness has an impact on developing fundamental abilities and providing justifications. The reality in the field is that students can work on questions by building basic skills and are able to make explanations with a feeling of enjoyment so that the answers are correct and precise. Students should appreciate the lecture on the value of mathematics in daily life so that they will be interested in studying mathematics (Prastika, 2020). The indicator of interest in learning has the effect of providing simple explanations, with this the teacher makes students interested in mathematics lessons as much as possible. The reality in the field is that students can work on questions by giving simple explanations because they have an interest in learning so that the answers are correct and correct. Students that are passionate about a subject usually demonstrate more interest in that subject (Slameto, 2015). Indicators showing attention when studying influence drawing correct conclusions. The reality in the field is that students can draw conclusions by showing attention when studying so that the answers are correct and appropriate. Student interest in learning can directly change student learning behavior (Sirait, 2016). Indicators of engagement in learning influence strategy and tactics. The reality in the field is that students are able to choose the right strategies and tactics because students are involved in learning, so they answer correctly and precisely. Learning mathematics demands pupils to think critically, rationally, and precisely in addition to learning and understanding the knowledge contained therein (Buyung et al., 2016).

Students scored highly on the test for their mathematical critical thinking abilities, and their level of enthusiasm in the subject matter was also strong. This occurs as a result of using effective learning tactics that pupils can effectively follow. Most pupils were able to work on the questions effectively while doing so. Therefore, it can be claimed that pupils who are very motivated to study would also possess highly developed critical mathematical thinking skills.

**CONCLUSION**

Mathematical critical thinking skills are statistically significantly influenced by learning interest. Students that are engaged in their studies will have strong critical thinking abilities. As
a result, for pupils to develop their critical thinking abilities in mathematics, they must have a strong interest in what they are learning. High levels of learning interest make it simpler for students to follow the mathematical learning process, which naturally affects the learning results attained. For pupils to be motivated to study and develop stronger mathematical critical thinking abilities, encouragement from the instructor is necessary.

**Declaration**

**Author Contribution**

- AA: Conceptualization, Writing - Original Draft, Methodology, Editing and Visualization, Writing - Review & Editing, and Formal analysis; NK and IN: Writing - Review & Editing, Formal analysis, Validation and Supervision.

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**Conflict of Interest**

- The authors declare no conflict of interest.

**Additional Information**

- Additional information is available for this paper.

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