



The Effect of Critical Thinking on The Scientific Attitude of Grade IV Elementary School Students

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Abstract. This study aims to see the effect of Critical Thinking on the Scientific Attitude of Grade IV Elementary School Students. This study uses a quantitative approach, using linear regression techniques with hypothesis testing t-tests. The research results obtained were the t-test of 3.173 with degrees of freedom (df) = $N-2 = 40-2 = 38$. From the t-table, it was found that the t-table was 1.686. So, it can be concluded that $t\text{-count} > t\text{-table}$ ($3.173 > 1.686$). Because $t\text{-count} > t\text{-table}$, H_0 is rejected, and H_a is accepted. This means there is a significant influence between critical thinking and scientific attitude. And from the t-test result, the sign value is known. 0.003 is smaller than 0.05 ($0.003 < 0.05$), which means there is a close influence between critical thinking and scientific attitudes. Students with good critical thinking skills will cultivate good scientific attitudes as well. Students' critical thinking skills can develop a sense of sensitivity to the environment around them, and they can find out the truth of information, solve problems, and solve these problems appropriately. This is a form of scientific attitude.

Keywords: Critical Thinking, Scientific Attitude, Elementary School

1 Introduction

Science has a unique way of studying it, related to recognizing, finding out, uncovering, searching for truth, looking for cause and effect and so on, so science should be analyzed using a series of scientific processes such as finding facts, studying, observing, making hypotheses, and carrying out experiments such as simple observations directly. Objective and systematic. Therefore, skills are needed to support activities participating in science learning, including critical thinking.

Critical thinking is the cognitive process of students in analyzing the systematic and specific ways of the problems they face, causing the emergence of internal issues in learning ways. Careful and thorough identifying and reviewing information and planning strategies to solve problems [Azizah et al. 2018]. Critical thinking for students in elementary schools is essential because it will form a condition for a reasoning system in deciding and solving problems.

Trends in International Mathematics and Science Study (TIMSS) in 2018 announced that the science score of Indonesian students was still at the low level of 45 out of 50 countries. The ability and capacity of Indonesian students to do questions in the domain of reasoning also do not increase their knowledge, which is still to be improved [Suhartati, 2018].

The United States Agency for International Development (USAID) states that effective science learning is learning to build a scientific attitude. A scientific attitude is an attitude or values that arise from within oneself which encourage individual cells to behave in a manner towards objects carried out systematically through scientific steps [Kencana, 2022]. In their research, Nurani et al. also stated that it is not enough to learn the concepts in science learning. You have to practice teaching scientific attitudes to students. The research results show that seven of the dimensions of scientific perspective appear unevenly among students [Sudana, 2018].

Dona Fitriawan et al., in their research, said that critical thinking and scientific attitudes have significant results on student learning achievement [Fitriawan, Gordah, and Dafrita 2016]. According to Haryadi et al., students looking for relationships between concepts and problems that occur must be able to address them scientifically to develop their critical thinking skills [Haryadi, Djatmiko, and Setyosari nd].

Based on these data, it shows that critical thinking skills influence scientific attitudes. Therefore, this research aims to see how much influence essential thinking skills have on the scientific attitudes of fourth-grade elementary school students in learning science.

2 Style Palate

This study uses quantitative research with a simple regression analysis technique. Critical thinking ability is the independent variable (X), and scientific attitude is the dependent variable (Y).

The data collection instrument in this research is a critical thinking ability questionnaire as variable X in the form of scores obtained by students after being given a questionnaire about critical thinking. Indicators of critical thinking that have been described as characteristics: (1) being able to analyze, (2) having the ability to compare, (3) having the ability to evaluate, (4) being able to draw logical conclusions, (5) being able to reach conclusions. Meanwhile, variable Y uses an attitude scale.

2.1 Critical Thinking Ability Test

This test contains questions related to the science lesson content on the Energy theme to measure students' critical thinking abilities. Before conducting research, validity and reliability tests were carried out. The instrument validity test consists of theoretical and empirical reality. The data obtained from the academic validity test, the instrument created is by the subject matter that fourth-grade elementary school students have studied. Empirical validity was tested using Pearson's Product Moment, and eight valid question

items were obtained from a total of 12 question items. The reliability coefficient using Cronbach's Alpha calculation is 0.760, which means the reliability level is high.

2.2 Scientific Attitude Scale

The skip scale created in this research instrument contains positive and negative statements that students must respond to honestly. In preparing the device, each item uses a Likert response scale of one to four: strongly agree, agree, disagree and strongly disagree. The attitude scale instrument has been adapted to each scientific attitude indicator.

In the attitude scale instrument, the calculation used Pearson's Product Moment using the SPSS statistics 21 application and the results obtained 22 valid question items from the 34 items created. The results of Cronbach's Alpha calculations show that the reliability coefficient value for the attitude instrument is 0.776, which shows that the level of reliability is high. The population in this study was all students in class IV of State Elementary School 03 Jagakarsa, South Jakarta, totalling 126 participants. This research requires 40 students to take samples using a random sampling technique.

3 Math and Equations

3.1 Test Requirements Analysis

Instrument Validity and Reliability Test

Test the validity of this study in its calculations using SPSS for Windows version 16.0. Testing was carried out on 40 respondents. With $df = n - 2 = 38$; $\alpha = 0.05$ r table of 0.320. If the value of $r_{\text{count}} > r_{\text{table}}$, then the items in the questionnaire are declared valid and vice versa.

The reliability test was carried out on 30 questionnaire items with 40 respondents. Based on the Reliability Statistics output above, the Alpha Part 1 value is 0.738, the Alpha Part 2 is 0.531, while the r table value at 5% significance with $n = 40$ is 0.312. Because the Cronbach's Alpha Part 1 value is $> r$ table and the Cronbach's Alpha Part 2 value is also $> r$ table, it can be concluded that the research instrument items are reliable and can be used as a research data collection tool.

Normality test

The following data output is obtained after testing the normality with SPSS for Windows Version 16.0. From the test of normality table, it is known that the liliefors calculation value = 0.106, the liliefors_{table} value for significance is 0.05 and $n_{40} = 0,886\sqrt{40} = 0.140$. Because $\text{liliefors}_{\text{count}} < \text{liliefors}_{\text{table}}$ ($0.106 < 0.140$), the decision is that H_0 is accepted and H_1 is rejected. Thus, the data in this study are typically distributed.

Homogeneity Test

$F_{\text{count}} \text{ value} = 0.541$, $F_{\text{table}} \text{ value for significance } 0.05 \text{ and } df_1(1), \text{ and } df_2(38) = 4.08$. Because $F_{\text{count}} < F_{\text{table}}$, the decision is that H_0 is accepted or H_1 is rejected, meaning that the sample data comes from homogeneous distribution data. Likewise, if seen from the

significant value. sig. value = 0.467 and > 0.05 then the decision is H_0 is accepted or H_1 is rejected. This means that with a significance level of 0.05, it can be concluded that the sample data comes from a homogeneous distribution of data.

Linearity Test

The linearity test is a fundamental measurable method that's utilized to evaluate the nearness of a direct relationship between factors in investigate information. The linearity test is decided utilizing the F test, and the model is on the off chance that the sig esteem is > 0.05 . Linear regression may be a broadly utilized measurable procedure that looks at the relationship between an autonomous variable and a subordinate variable, on the off chance that $F_{count} < F_{table} > 0.05$, so the free variable and the subordinate variable are straight, or by comparing F_{count} (0.383) is smaller than F_{table} (2.35) with an importance level of 5%. This applies to the autonomous variable on the subordinate variable, so it can be concluded that the autonomous variable includes a direct relationship with the subordinate variable so that the relapse investigation can continue to parameter measurements.

3.2 Simple Linear Regression Test

Determination Test (*R square*)

The coefficient of determination (*R square*) aims to determine how much the independent variable (critical thinking) can explain the dependent variable (scientific attitude).

Researchers used SPSS for Windows Version 16.0 and obtained the following data: Based on the table of Summary Model Determination Test results above, it is known that the R square value is 0.458 (45.8%). This shows that using a regression model, the independent variable (critical thinking) influences the dependent variable (scientific attitude) by 45.8%. In contrast, 43.2% is influenced by other variables.

ANOVA test

The ANOVA table explains whether there is a real (significant) effect on the Trust variable (X) on the Participation Variable (Y). From the resulting output, it is found that F_{count} is 10.065 with a probability significance level of $0.003 < 0.05$, so the regression model can be used to predict participation variables.

Hypothesis testing

t-test

The results of the simple linear regression equation coefficients, t-count critical thinking is 3.173. With degrees of freedom (df) = $N-2 = 40-2 = 38$ from the t table, it is found that the t table is 1.686. So, it can be concluded that $t_{count} > t_{table}$ (3.173 $>$ 1.686). Because $t_{count} > t_{table}$, H_0 is rejected, and H_a is accepted. This means there is a significant influence between critical thinking and scientific attitudes. And also, from the results of the t-test, the sign value is known. 0.003 is smaller than 0.05 (0.003

<0.05), which means there is a close influence between critical thinking and scientific attitudes.

4 Authors' Contribution

In the 21st century, critical thinking skills are one of the aspects that elementary school students must have, namely 4C (Critical Thinking, Collaborative, Communication and Creativity). Critical thinking is also a series of activities in analyzing an idea or ideas to be more specific, distinguishing an object precisely, and identifying and studying it into a more perfect form. Therefore, critical thinking skills are needed in solving problems and formulating an appropriate and efficient solution.

From this situation, if students can think critically, it will encourage their curiosity (scientific attitude). A scientific perspective is critical for students to have. The scientific perspective must come from within the student with the initial experience and insight each students possessed.

Students with good critical thinking skills will also cultivate good scientific attitudes. Students' necessary thinking skills can foster a sense of sensitivity to the environment around students. They can find the truth of information, solve problems, and create appropriate solutions to these problems. This is a form of scientific attitude.

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