

# The Relationship Between Logical Intelligence and Critical Thinking Attitudes of FKIP UHAMKA Students of Physics Education Study Program on the Results of the Magnetic Electricity Course

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ABSTRACT

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In today's world of education and teaching, intelligence or intelligence is a topic of much research, so it is not surprising that this problem is widely studied. The problem of intelligence is currently a concern among educators, this is because intelligence has been considered a norm that determines the optimal development and achievement of one's learning outcomes. Logical intelligence is a person's ability to solve logical problems or problems related to calculating number patterns. Critical thinking is the ability of students to understand the problems they face and then be able to examine them with the abilities they already have and be able to explain logically and structured. Research to determine the relationship between critical thinking and logical intelligence through the results of the Magnetic Electricity lecture at the Physics Education Study Program, FKIP UHAMKA. The method used in this research is a survey research method with a quantitative approach, because the observed symptoms can be measured and expressed in the form of numbers. This type of research was conducted to examine the relationship between variables, namely the relationship between the dependent variable and the independent variable. Based on the significance test that has been carried out, it is found that the  $t_{\text{count}}$  is 25.31 while the  $t_{\text{table}}$  is 1.7. So that  $t_{\text{count}} > t_{\text{table}}$  25.31 > 1.7. Based on the test criteria that have been set,  $H_0$  is rejected, so it can be concluded that there is no relationship between logical intelligence and the results of the Magnetic Electric lectures and the correlation coefficient is very significant.

**Keywords:** Intelligence, critical thinking, magnetic electric.

## INTRODUCTION

In the world of education and teaching, the problem of intelligence or intelligence is one of the main problems, so it is not surprising that many people discuss this problem, both specifically and in general. The problem of intelligence is currently a concern among educators, this is because intelligence has been considered a norm that determines the development and optimal achievement of one's learning outcomes. By knowing his intelligence, a person can be categorized as smart or intelligent, moderate or not smart. Thus, many assume that the success achieved by a person is nothing but the influence of the level of intellectual intelligence that a person has.

In the educational process in the university world, the most important activity is to carry out the learning process, where students use all of their basic abilities and knowledge as a benchmark for knowledge both in terms of conceptual thinking and ability in understanding the majors taken. Physics Education study program as the chosen major by students as one of the hopes of becoming a teacher at the junior and senior high school level. Being a physics teacher must have good logic skills so that students who will be taught understand Physics material well [1]. Most students understand the physics learning process is studied through a physical and mathematical approach, so that students find it difficult to understand the physics course material, it is hoped that students will be able to understand the concepts contained therein. So that students are able to write in parameters or symbols, understand problems and solve physics and mathematics.

Physics describes and analyzes the structures and events that occur in nature, Engineering and the environment around us. In the process found a number of rules or laws in nature that can apply these natural phenomena logically and rationally. The process of describing and analyzing is based on the application of a causal logic structure (causality). In turn, the process of describing and analyzing aims to understand natural phenomena. The meaning of understanding here is to be able to adjust the image and in the human soul.

The Magnetic Electricity material taught in the

odd semester, namely in the fifth semester, is a main course that must be taken by UHAMKA Physics education students. The Magnetic Electricity course is a continuation of the previous courses so that the abilities possessed by students must be structured [2]. The ability to think critically must be balanced with the logical intelligence of students.

"Intelligence or intelligence is the ability to grasp new situations and the ability to learn from one's past experiences." The role of intelligence in the lecture process is considered the most important so that it will determine the success or failure of a person in terms of mastering the material. Viewed from a psychological perspective, intelligence is considered as a person's mental ability to respond and solve problems that are quantitative and phenomenal such as mathematics, physics, data, history, and so on.

In general, in a class there are students who have different intelligences. This results in a difference in the speed of each student in receiving and understanding a lecture material. For this reason, competent lecturers are able to use appropriate learning methods, so that they can accommodate the diversity of intelligence of students. Intelligence is more as a guide for many other diverse concepts such as critical thinking [3], metacognition, common sense, practical intelligence, creativity and logical thinking [1].

According to Howard Gardner cited by Robbert J. Sternberg that, "intelligence as a single construct and type. However, in addition to discussing the different abilities that together make up intelligence, Gardner proposes a theory of multiple intelligences. Where the 8 different intelligences function independently of each other. However, they can interact to produce an intelligent behavior through elements of linguistic intelligence, logic-mathematics, musical, visual-spatial, kinetic body movements, interpersonal relationships (interpersonal), self-understanding (interpersonal) and sensitivity to nature (naturalists)".

Logical intelligence is a person's ability to solve logical problems or problems related to calculating number patterns. Critical thinking is the ability of students to understand the problems they face and then be able to examine them with the abilities they

already have and be able to explain logically and structured [4]. Students who have critical thinking skills that include logical intelligence are able to create imaginations in their minds or the ability to create three-dimensional shapes [5]. Thus, being able to imagine a real form and then solve various problems. Of the eight intelligences above, logical intelligence can be related to the critical thinking ability of students in the Magnetic Electricity course as a process for solving problems and thinking processes [6].

Based on the above abilities, this research is entitled "The Relationship between Logical Intelligence and Critical Thinking Attitudes for Students of FKIP UHAMKA Physics Education Study Program on Magnetic Electricity Course Results".

### RESEARCH METHOD

#### 1. Type of Research

This study uses a survey research method with a quantitative approach, because the observed symptoms can be measured and expressed in the form of numbers. This type of research was conducted to examine the relationship between variables, namely the relationship between the dependent variable and the independent variable. There are several variables in this study, including two independent variables (independent variables), namely logical intelligence and critical thinking attitude, and one dependent variable, it is the results of lectures.

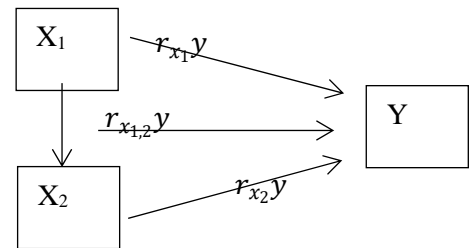
The survey method is used to get data from certain natural (not artificial) places, but the research does the data collection treatment [7].

Based on the theory above, it can be described that the survey method of research can carry out treatments where this need is not the same as experiments. Researchers can choose a large population or a small population which is then obtained from the population data and from one variable can be related to other variables.

#### 2. Research Design

This study uses a correlation analysis technique, namely the correlational approach because the researcher is intended to determine whether or not there is a relationship between two variables or several variables. A group of subjects is taken from a certain population and posttest is carried out. After being subjected to a posttest, the subject was given an intelligence questionnaire to

measure the relationship between logical intelligence and critical thinking skills through the results of lectures in the group. The given instrument contains the same weight. The pattern of correlation analysis is described as follows:



Gambar 1. Correlation Analysis

Description:

- X<sub>1</sub> = Logical Intelligence
- X<sub>2</sub> = Critical Thinking
- Y = Magnetic Electricity Course Results
- r<sub>x<sub>1</sub>y</sub> = Correlation Coefficient of X<sub>1</sub> on Y
- r<sub>x<sub>2</sub>y</sub> = Correlation Coefficient of X<sub>2</sub> on Y
- r<sub>x<sub>1,2</sub>y</sub> = Correlation Coefficient of X<sub>1</sub> X<sub>2</sub> on Y

The population is the entire research subject. The population that is the target of this research is all fifth semester students of UHAMKA Physics Education Study Program.

##### a. Reached Population

The reached population in this study was in the VA semester at the UHAMKA Physics Education Study Program.

#### 3. Sample

The sample is part of the number and characteristics possessed by the population.

##### a. Sampling Technique

The sampling technique used in this study was simple random sampling. This sample is done simply because the sampling of members of the population is done randomly without regard to the strata that exist in the population.

##### b. Sample Criterion

The number of samples taken was 20 students, it is the experimental class who were given a *posttest*.

### RESULT AND DISCUSSION

#### RESULT

**1. Validity and Reliability Test of The Trial Instrument**

**a. Non-Test Instrument**

In testing the validity of non-test questions, the researcher used the product moment correlation formula. In this study, the number of students was 30 students with  $r_{table}$  of 0.3661. So, if there are items that get a value less than 0.3661 then it is certain that the question is invalid or dropped. The results of the validity test on non-test there are 25 valid questions and 15 invalid questions or drop.

After obtaining a total of 15 valid questions, then the reliability test calculation is carried out. Reliability testing is done by calculating the reliability test. This reliability test uses the product moment formula with the test criteria being the value that has been obtained from the results of the reliability test adjusted to the reliability interpretation table. So, it will be seen whether the question is reliable or unreliable and belongs to which reliability criteria. Then it can be concluded as follows:

**Table 1.** Reliability Test Result Non-Instrument Test

	$X^2_{count}$	$X^2_{table}$	$\alpha$	dK	Criteria
$X_1Y$	4,42	8,78	0,05	9	$X^2_{count} < X^2_{table}$
$X_2Y$	2,68	8,78	0,05	8,5	$X^2_{count} < X^2_{table}$

**2. Testing Requirements Analysis**

In testing the prerequisites of this analysis, normality and homogeneity tests were carried out. The tests are as follows:

**a. Data of Homogeneity**

Bartlett's test was used to test the homogeneity of variance of a group of data in this study. How to test the homogeneity of variance of a group of data as described in the previous chapter. The following are the results of the

homogeneity test of the variance of the data obtained, which can be explained in the following table:

**Table 2.** Homogeneity Criteria

Number of Question	$r_{count}$	$r_{table}$	Criteria
25		0,3661	Because $r_{count} \geq 0,3661 \geq r_{table}$ , the instrument is reliable and based on the Reliability Interpretation it is concluded that the level of reliability is high.

Table 2 above is the result of the calculation of the homogeneity test of the variance of the data group using the Barlett test. From the table of the results of the homogeneity test of the variance of the data groups above, it is found that the magnitude of  $X^2_{count}$  is 4.42 by comparing the value of  $X^2$  in the table  $\alpha = 5\%$  at  $dK = 8.5$ , it is obtained  $X^2_{0,95} = 9$  With the test criteria:

- If  $X^2_{count} \geq X^2_{table}$  then  $H_0$  is rejected (Not Homogeneous)
- If  $X^2_{count} < X^2_{table}$  then  $H_0$  is accepted (Homogeneous)

Based on the results obtained, it can be seen that  $X^2_{count} < X^2_{table}$   $4,42 < 8,78$  so  $H_0$  is accepted (homogeneous). So, it can be concluded that the grouping of critical thinking data ( $X_1$ ) on the data from Magnetic Electricity lectures ( $Y$ ) has a homogeneous variation. From the homogeneity test tables for the variance of the data group above, it was found that the magnitude of  $X^2_{count}$  was 4.42 by comparing the  $X^2$  value in the table with  $\alpha = 5\%$  at  $dK = 8.5$ ,  $X^2_{0,95} = 9$  was obtained. With the test criteria:

- If  $X^2_{count} \geq X^2_{table}$ , then  $H_0$  is rejected (Not Homogeneous)
- If  $X^2_{count} < X^2_{table}$ , then  $H_0$  is accepted (Homogeneous)

Based on the results obtained, it can be seen that  $X^2_{count} < X^2_{table}$   $2,68 < 9$  so  $H_0$  is accepted (homogeneous). So, it can be concluded that the grouping of logical intelligence data ( $X^2$ ) on the data from Magnetic

Electricity lectures (Y) has a homogeneous variation.

### 3. Hypothesis Test

#### 1) Regression and Correlation Test

##### a) Significance and Linearity Test of $X_1$ on Y

The regression significance test and critical thinking linearity ( $X_1$ ) with the results of the Magnetic Electric lecture (Y) were carried out using a linear regression equation  $\hat{Y} = a + bX_1$ , after the calculations were carried out, it was obtained  $a = -7.36$  and  $b = 1.02$  so that the regression equation  $\hat{Y} = -7,36 + b1,02$ , the regression equation was obtained, was tested regression linearity to see that this regression equation is linear by using analysis of variance (ANOVA). From the linearity test obtained  $f_{count} = 4.42$ .

**Table 3.** Regression and Linearity Test  $X_1$  on Y

$t_{count}$	$t_{tabel}$	$\alpha$	Criteria
17,74	1,17	0,05	$t_{count} > t_{tabel}$

From table 3 it can be seen that at the significance level  $\alpha = 5\%$ , the value of  $F_{count} > F_{table}$  is  $446.30 < 4.67$  and at the significance level  $\alpha = 1\%$ , the value of  $F_{count} > F_{table}$  is  $446.30 < 9.07$  then regression model  $X_1$  on Y is not significant.

From the regression linearity test for  $X_1$  on Y, it was obtained at the significance level  $\alpha = 5\%$ , the value of  $F_{count} > F_{table}$  was  $4.42 < 8.78$ , so the  $X_1$  regression model on Y was linear.

##### b) Correlation Test

Based on the research data, the correlation coefficient between logical intelligence and the results of lectures on magnetic electricity is 17.74. This means that there is a positive relationship between logical intelligence and the results of the Magnetic Electricity course. This correlation will then be tested for significance by using the *t-test*.

The following are the results of the *t-test* calculation of the variance of the data groups obtained, which can be explained in the following table:

**Table 4.** Hypothesis Test Result  $X_1 Y$

Variations	db	JK	RJK	Fh	Ft	
					$\lambda =$	$\lambda =$
Total	15	63218	4208,53		0,05	0,01
Reg (a)	1	58406,4	58406,4	446,30	4,67	9,07
Reg (b)	1	4587,96	4587,96			
Reg(S)	13	133,64	10,28			
Fitness	10	125,14	12,51			
Galat	3	8,5	2,83	4,42		8,78

Based on the significance test that has been carried out, it is found that the  $t_{count}$  is 17.74 while the  $t_{table}$  is 1.17. So  $t_{count} > t_{table}$   $17.74 < 1.17$ . Based on the test criteria that have been determined,  $H_0$  is accepted, so it can be concluded that there is no relationship between the critical thinking of Physics education students and the results of Magnetic Electric lectures.

##### c) Significance and Linearity Test of $X_2$ on Y

The regression significance test and critical thinking linearity ( $X_2$ ) with the results of the Magnetic Electric lecture (Y) were carried out using a linear regression equation  $\hat{Y} = a_2 + b_2X_2$ , after the calculations were carried out, it was obtained  $a = -0.75$  and  $b = 1.09$  so that the regression equation, namely  $X_2$ , was carried out after the regression equation was obtained. regression linearity test to see that this regression equation is linear by using analysis of variance (ANOVA). From the linearity test obtained  $f_{count} = 2.68$ .

**Table 5.** Regression and Linearity Test  $X_1 Y$



Variations db-	JK	RJK	Fh	Ft	
				$\lambda =$	$\lambda =$
				0,05	0,01
Total	15	63218	4208,53		
Reg (a)	1	58406,4	58406,4	672,29	4,67 9,07
Reg (b)	1	4632,06	4632,06		
Reg(S)	13	89,54	6,89		
Fitness	10	80,54	8,05		
Galat	3	9	3	2,68	8,78

From table 5 it can be seen that at the significance level  $\alpha = 5\%$ , the value of  $F_{count} > F_{table}$  is  $672.29 < 4.67$  and at the significance level  $\alpha = 1\%$ , the value of  $F_{count} > F_{table}$  is  $672.29 < 9.07$  then regression model  $X_2$  on  $Y$  is not significant.

From the regression linearity test of  $X_2$  on  $Y$ , it was obtained at the significance level  $\alpha = 5\%$ , the value of  $F_{count} > F_{table}$  was  $2.68 < 8.78$  and had a significant level.

#### d) Correlation Test

Based on the research data, the correlation coefficient between logical intelligence and the results of lectures on Magnetic Electric is 672.29. This means that there is a positive relationship between logical intelligence and the results of the Magnetic Electricity course. This correlation will then be tested for significance by using the *t-test*.

The following are the results of the *t-test* calculation of the variance of the data groups obtained, which can be explained in the following table:

**Table 6.** Hypothesis Test  $X_2Y$

$t_{count}$	$t_{table}$	$\alpha$	Criteria
25,31	1,7	0,05	$t_{count} > t_{table}$

Based on the significance test that has been carried out, it is found that the  $t_{count}$  is 25.31 while the  $t_{table}$  is 1.7. So that  $t_{count} > t_{table}$   $25.31 < 1.7$ . Based on the test criteria that have been set,  $H_0$  is rejected, so it can be concluded that there is no relationship between logical intelligence and the results of the Magnetic

Electric lectures and the correlation coefficient is very significant.

## 2) Hypothesis Test Result

From the test results, the hypothesis that has been formulated is that there is a relationship between critical thinking and logical intelligence through the results of magnetic electricity lectures, in other words  $H_0$  is rejected and has a positive effect, which means that there is a relationship between critical thinking and logical intelligence through the results of magnetic electricity lectures. The results of testing this hypothesis are not a coincidence

## 3) Research Limitation

The researcher realizes that this researcher has several limitations despite maximum efforts. The research carried out was only limited to one place, it is at Physics Education Study Program FKIP UHAMKA. So, it is possible that different results if the same research is carried out in different places. In this study, the instrument used to measure the value of learning outcomes was in the form of validated essay questions and question banks as a data collection tool and still had many weaknesses, students also lacked confidence in answering questions, for example by asking friends. Instrument of logical intelligence and critical thinking is a Likert scale questionnaire. In making this questionnaire, the author made his own, so that it is not the same or plagiarism with the existing one

## SUMMARY

### A. Summary

Based on the results of the study, several conclusions can be drawn as follows:

1. Significant test of linear regression of critical thinking  $\hat{Y} = -7,36 + 1,02 X_1$  the regression equation was obtained. The linearity test of regeneration from linearity test was obtained  $f_{count} = 4.42$ . For the significance level  $\alpha = 5\%$ , the value of  $f_{count} > f_{table}$  is  $446.30 < 9.07$ , so the  $x_1$  regression model on  $Y$  is not significant.

From the linearity test of the  $X_1$  on  $Y$  regression, it was obtained at a significant level,  $\alpha = 5\%$ , the value of  $f_{count} > f_{table}$  was  $4.42 < 8.78$ , the regression model  $X_1$  over  $Y$  was linear, the correlation between critical thinking and magnetic electricity lectures was 17.74 with  $t$  count 1.17. This indicates that there is a positive relationship between the two. Thus,  $H_0$  is rejected, so it can be concluded that there is a relationship between the critical thinking of Physics Education students and the results of the Magnetic Electric lectures.

2. The significance test of the regression of logical intelligence ( $X_2$ ) with the results of the Magnetic Electric ( $Y$ ) lecture obtained the regression equation, it is  $\hat{Y} = -0,75 + 1,09 X_2$  and obtained the results of the linearity test obtained  $f_{count} = 2.68$  it can be seen that at the level of the significance of  $\alpha = 5\%$ , the value of  $f_{count} > f_{table}$  is  $672.29 < 4.67$  and at the significance level  $\alpha = 1\%$ , the value of  $f_{count} > f_{table}$  is  $672.29 < 9.07$ , so the regression model  $X_2$  on  $Y$  is not significance. From testing the linearity of the regression  $X_2$  on  $Y$ , a significant level was obtained  $\alpha = 5\%$ , the value of  $f_{count} > f_{table}$  was  $2.68 < 8.78$  and at the significance level. The correlation coefficient between logical intelligence and the results of magnetic electricity lectures is 672.29, this indicates a relationship between logical intelligence and lecture results. The significance test indicates the value of  $f_{count}$  is 25.31 while  $f_{table}$  is 25.31 while  $t_{table}$  is 1.7. So that  $f_{count} > f_{table}$   $25.31 < 1.7$ . Based on the test criteria that have been set,  $H_0$  is rejected, so it can be concluded that there is a relationship between logical intelligence and the results of the Magnetic Electric lectures and the correlation coefficient is very significant.

## B. Suggestions

Based on the conclusions that have been presented, the suggestions put forward are as follows:

1. Critical thinking and logical intelligence can be applied in the lecture process in various ways using methods, media, and

lecture models.

2. Students are more involved in the lecture process by increasing group discussion activities by working on varied questions so that students will get sources of knowledge to add to the maximum repertoire of knowledge and make students interact with one another.

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