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# The Effect of Learning Strategies and Cognitive Styles on Learning Outcomes of Mathematics after Controlling Intelligence

**Robby Rezeki[1], Harun Sitompul[2], Julaga Situmorang[3]**
[1]*Methodist High School, Tanjung Morawa, Indonesia*
[2,3]*Departement of Educational Technology, State University of Medan, Indonesia*
robbyrezeki25@gmail.com

**Abstract**

*This study aims to determine the differences in learning outcomes of mathematics subjects between groups of students who are taught with modified inquiry learning strategies and guided inquiry that has a cognitive style after being controlled by intelligence. This research method uses quasi-experimental with 2 x 2 factorial design The research sample consisted of 80 people, each consisting of 1 (one) class of 40 students, both students of Senior High School 5 Stabat and 40 students of Senior High School 1 Stabat. Hypothesis testing results show that: (1) student learning outcomes in mathematics taught with modified inquiry free learning strategies are better than mathematics learning outcomes of students taught with guided inquiry learning strategies after controlling intelligence, (2) learning outcomes of group mathematics students who have FI cognitive style are better than the group of students who have FD cognitive style after controlling intelligence, (3) the effect of interaction between learning strategies and cognitive style on mathematics learning outcomes of students after controlling intelligence, (4) for students who have FI cognitive style obtains better learning outcomes of mathematics learning outcomes if taught with modified free inquiry learning strategies compared to if taught with guided inquiry learning strategies after controlling intelligence.*

Keywords
learning strategies; inquiry; cognitive style

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## I. Introduction

To realize the function of education as a vehicle for human resources in developing a constructive learning climate for the development of students' creative potential, the government through the Ministry of Education and Culture adopts various policies aimed at providing an environment that allows students to develop their talents and abilities optimally, so that they can realize themselves and function fully in accordance with their personal needs and the needs of the community (Law No. 20 of 2003). The aforementioned policies are contained in the National Medium-Term Development Plan (RPJMN) and the National Long-Term Development Plan (RPJPN), as stated in Permendiknas Number 32 of 2005, concerning the Ministry of National Education Strategic Plan (Renstra). The 2010-2014 RPJMN is intended to further strengthen Indonesia's development in all fields by emphasizing efforts to improve the quality of human resources (HR) including the development of science and technology capabilities and strengthening competitiveness (Ministry of Education and Culture Ministry 2010-2014: 79).

In preparing quality human resources in order to face the coming era of global competition, increasing the competitiveness of quality education is a key condition. This requires educational institutions to be able to equip graduates to have technical skills (hard skills), and the ability to think analytically, communicate, and cooperate in teams that are summarized as soft skills (RPJMN 2010: 6).

Although the government has made various efforts to improve education management, including curriculum development, improvement of educational facilities and infrastructure, improvement of professionalism of teachers and education personnel, but in reality these efforts are still not maximized at the level of implementation. Based on UNESCO data, it was reported that the Human Development Index (HDI) placed Indonesia ranked 108 out of 187 countries. In 2013, Indonesia was in the middle range, with a figure of 0.684. This figure is greater than the majority of other Southeast Asian countries such as Vietnam, Laos, Myanmar, and the Philippines, but still lower than Thailand, Singapore and Malaysia (Tribunnews.com accessed July 25, 2014).

The data presented above shows that the quality of Indonesian education is still low, including the quality of mathematics learning outcomes. According to Mahmuzah, the results of the Trends In International Mathematics and Science Study (TIMSS) and PISA studies show that the ability of junior high school students, especially in the field of mathematics is still below international standards. The latest TIMSS 2011 results ranked Indonesia 38th out of 42 countries and the latest PISA 2012 results are even more alarming, Indonesia ranks 64th out of 65 countries (Mahmuzah et al, 2010). The same thing was stated by Mullis, quoted by Ismaimuza, about the mastery of mathematical material in Indonesia is still far from expected. TIMSS research results reveal that the mathematical abilities of Indonesian students for non-routine questions and conceptual understanding are still very weak (Ismaimuza, 2015).

learning can be a medium that is very helpful for both students and teachers in the learning process in the classroom. The use of appropriate learning media can foster interest in learning, even improve student learning outcomes (Daryanto in Simorangkir, 2018). In general, in formal education, mathematics learning that has taken place so far has not used the right media. As a result students feel less interested, bored and less motivated in learning so that student learning outcomes are low. (Simorangkir, 2018)

The low learning outcomes of mathematics as stated above are not much different from the reality on the ground, including the results of learning mathematics at the junior high school level, so it needs to be studied more deeply to find the cause of the problem as well as the solution. The low quality of students in terms of mathematical mastery is reinforced by the TIMSS evaluation results cited by Hartanto, revealing that the average math score for 8th grade students in Indonesia is 411 and is ranked 34th. The average score of students' mathematical abilities at the international level is 467 from 50 participating countries (Hartanto, 2014).

Preliminary observations made by researchers of the students of Junior High Schools (SMP) in Stabat District related to the implementation of the mathematics learning process, concluded that the implementation of the learning process in the classroom conducted by the teacher is still not optimal. The learning paradigm adopted still tends to be centered on the teacher (teacher centered), with conventional learning methods with a single assumption that knowledge can be transferred intact from the teacher's mind to the learner's mind. The teacher acts as an active subject and students as passive objects and are treated not to be part of what is being taught to them. The learning process is dominated by the teacher, so that it only focuses on emphasizing content recitation, without giving sufficient time to students to reflect on the material presented, students only accept, store, and carry out other activities in accordance with the information provided by the teacher, so that student activity in learning becomes low which results in low interest and student mathematics learning outcomes.

**Table 1.** Semester Exam scores for Mathematics in Junior High School 1 in Stabat District

| No | School year | Class/ Semester | KKM Score | The highest score | Lowest Score | Average Score |
|---|---|---|---|---|---|---|
| 1 | 2012/2013 | 8/Ood | 70 | 89 | 58,50 | 61,85 |
| 2 | 2012/2013 | 8/ even | 70 | 89 | 58,80 | 62,09 |
| 3 | 2013/2014 | 8/ Ood | 70 | 91 | 59,30 | 60,98 |
| 4 | 2013/2014 | 8/ even | 70 | 90 | 60,50 | 63,78 |
| 5 | 2014/2015 | 8/ Ood | 70 | 91 | 61,70 | 65,81 |
| 6 | 2014/2015 | 8/ even | 70 | 92 | 61,70 | 67,73 |

*Data Source: List of Semester Examinations for SMP Negeri 1 Stabat District*

**Table 2.** Semester Exam scores for Mathematics in Junior High School 5 in Stabat District

| No | School year | Class/ Semester | KKM Score | The highest score | Lowest Score | Average Score |
|---|---|---|---|---|---|---|
| 1 | 2012/2013 | 8/Ood | 70 | 90 | 57,55 | 59,39 |
| 2 | 2012/2013 | 8/ even | 70 | 91 | 58,19 | 63,53 |
| 3 | 2013/2014 | 8/ Ood | 70 | 91 | 58,80 | 61,87 |
| 4 | 2013/2014 | 8/ even | 70 | 90 | 60,10 | 63,75 |
| 5 | 2014/2015 | 8/ Ood | 70 | 91 | 61,21 | 65,50 |
| 6 | 2014/2015 | 8/ even | 70 | 92 | 61,30 | 65,01 |

*Data Source: List of Semester Examinations for Junior High School 5 in Stabat District*

From the table above, it can be understood that the acquisition of mathematics learning outcomes for Stabat District Junior High School students is still low. This causes some people to feel disappointed and less satisfied with the quality of education. This dissatisfaction is caused by the achievement of students in certain subjects whose grades are still far from what is expected, especially in mathematics.

Based on the aims of learning mathematics above, it can be understood that to obtain the results of learning mathematics as expected, it requires learning strategies that are able to empower students in the teaching and learning process. The learning strategy implemented by the teacher should be able to provide opportunities for students to collect, process data and information, and be able to find themselves scientifically the answer to the mathematics learning problems faced.

In addition to choosing the right learning strategy, the acquisition of learning outcomes of a learning activity is influenced by the ability of the teacher to recognize and understand student characteristics. A teacher is able to recognize the characteristics of students will be able to help the implementation of the learning process effectively that allows increased student learning outcomes.

Based on the above phenomena and reality, the author is interested in conducting experimental research on the application of learning strategies that are applied with guided inquiry learning strategies, and modified free inquiry learning strategies, and how they relate to cognitive styles (FD and FI cognitive styles) and intelligence ( IQ) in improving mathematics learning outcomes for students of class VIII (eight) Public Middle School in Stabat District in Semester II of the 2015/2016 Academic Year.

## II. Research Methods

This study uses a quasi-experimental method with treatment design by level 2 x 2. The research variable consists of one dependent variable, namely mathematics learning outcomes and two independent variables namely learning strategies (modified free inquiry and guided inquiry) as a treatment variable and cognitive style (independent and dependent) as a moderator / attribute variable. The initial knowledge as a covariate variable. The design of this study uses covariance analysis (ANAKOVA) with 2 x 2 factorial design. The experimental design of the research can be presented as follows:

**Table 3.** 2 x 2 Factorial Experiment Design**.**

| Cognitive style (B) | Inquiry Learning Strategies (A) | |
|---|---|---|
| | Free Modified ($A_1$) | Guided ($A_2$) |
| Field Independent ($B_1$) | $[X,Y]_{11k}$<br>k=1, 2, …., n11<br>$A_1B_1$ | $[X,Y]_{12k}$<br>k=1, 2, …., n12<br>$A_1B_2$ |
| Field Dependent ($B_2$) | $[X,Y]_{21k}$<br>k=1, 2, …., n21<br>$A_1B_2$ | $[X,Y]_{22k}$<br>k=1, 2, …., n22<br>$A_2B_2$ |

Information:
X : Student intelligence score
Y : Student mathematics learning achievement score
k : The number of samples in each group
A1B1: Modified free inquiry learning strategies in FI cognitive style students
A1B2: Modified free inquiry learning strategies in students' FD cognitive style
A2B2: Guided inquiry learning strategies in students of FI's cognitive style
A2B2: Guided inquiry learning strategies in students' FD cognitive style

## III. Result and Discussion

In this chapter the results of the research that have been obtained will include: a. description of research data from each study group, (b). Testing requirements analysis as a condition so that data can be further analyzed, (c) testing the research hypothesis, as a condition to answer the problems that were formulated and (d) discussion of research results.

### 3.1 Description of Research Result Data

Complete data summarizing the scores of students' mathematics learning outcomes for each group is presented in the following table.

**Table 4.** Data on Intelligence Scores and Mathematical Learning Outcomes

| Cognitive style (B) | | Learning strategies (A) | | | | ∑ | |
|---|---|---|---|---|---|---|---|
| | | Free Modified Inquiry ($A_1$) | | Guided Inquiry ($A_2$) | | | |
| | | Xi | Yi | Xi | Yi | Xi | Yi |
| FI B1 | n | 18 | 18 | 19 | 19 | 37 | 37 |
| | Mean | 108.3 | 85.7 | 107.9 | 72.8 | 108.1 | 79.1 |
| | Std. Deviasi | 8.97 | 5.13 | 10.13 | 6.92 | 9.45 | 8.90 |
| FD B2 | n | 22 | 22 | 21 | 21 | 43 | 43 |
| | Mean | 108.3 | 73.6 | 99.3 | 73.5 | 103.9 | 73.5 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Std. Deviasi** | 7.19 | 6.80 | 7.95 | 7.14 | 8.77 | 6.88 |
| ∑ | **N** | 40 | 40 | 40 | 40 | | |
| | **Mean** | 108.3 | 79.1 | 103.4 | 73.1 | | |
| | **Std. Deviasi** | 7.93 | 8.56 | 9.93 | 6.95 | | |

Information:
A1 : Student groups with free inquiry learning strategies modified
A2 : Group of students with guided inquiry learning strategies
B1 : Groups of students who have FI cognitive style
B2 : Group of students who have a FD cognitive style
X : Intelligence
Y : Mathematics Learning Outcomes
N : Number of students in each group

## 3.2 Testing Requirements Analysis

Test data requirements analyzed by using ANKOVA are: (1) data distribution in normal distribution; (2) the data to be compared has a variance homogeneity; (3) the resulting regression between covariate variables and linearly dependent variables; (4) regression coefficients in each homogeneous group 1; (5) covariate variables affect the dependent variable; and (6) the slope of the regression lines of each homogeneous cell group.

### a. Data Normality Test

Testing the normality of sample data is carried out using the Lilliefors test with the following results:

**Table 5.** Summary of Normality Test Calculation Results

| Group | N | $L_{count}$ | $L_{table}$ | Information |
|---|---|---|---|---|
| $A_1$ | 40 | 0,0564 | 0,1401 | Normal distribution |
| $A_2$ | 40 | 0,0985 | 0,1401 | Normal distribution |
| $B_1$ | 37 | 0,0664 | 0,1456 | Normal distribution |
| $B_2$ | 43 | 0,0921 | 0,1351 | Normal distribution |
| $A_1B_1$ | 18 | 0,1221 | 0,2088 | Normal distribution |
| $A_1 B_2$ | 22 | 0,1293 | 0,1888 | Normal distribution |
| $A_2 B_1$ | 19 | 0,0951 | 0,2032 | Normal distribution |
| $A_2 B_2$ | 21 | 0,1245 | 0,1933 | Normal distribution |

Based on the above, because the $L_{count}$ value $<L_{table}$, it is concluded that all Mathematics learning outcomes in this study are sourced from normally distributed populations.

### b. Variance Homogeneity Test

To test the homogeneity of data between groups A1 and A2. The calculation results obtained $F_{count}$ value = 1.52 and $F_{table}$ value ($\alpha$ = 0.05) (39.39) = 1.704. Because $F_{count} <F_{table}$, it means that H0 is accepted. The conclusion is that the groups A1 and A2 have the same or homogeneous variance.

To test the homogeneity of data between groups B1 and B2. The calculation results obtained $F_{count}$ = 1.67 and $F_{table}$ ($\alpha$ = 0.05) (36.42) = 1.696. Because $F_{count} <F_{table}$, it means that H0 is accepted. The conclusion is that between groups B1 and B2 have the same or homogeneous variance.

As for the combined homogeneity test using the Bartlett test, with the result that the value of $X^2_{count}$ ^ 2 (6.66) < (7.82) (_ (table (0.05; 3)) ^ 2 which means $H_0$ is accepted. The conclusion is that the variance of the four data groups (A1B1, A1B2, A2B1, A2B2) is the same or homogeneous.

**c. Regression Linearity Test**

The results of the linearity calculation X with Y are presented in the following table:

**Table 6.** List of ANKOVA Regression Linearity Tests

| Source of Variance | Dk | JK | RJK | $F_{count}$ | $F_{table}$ ($\alpha = 0,05$) |
|---|---|---|---|---|---|
| Total | 80 | - | - | - | - |
| Regression (a) | 1 | 463220.7 | 463220.7 | 43,14 | 4.027 |
| Regression (b/a) | 1 | 1940.0 | 1940.0 | | |
| Rest | 78 | 3508.0 | 45.0 | | |
| Tuna Match | 13 | 431.5 | 33.2 | 0,70 | 1,874 |

Based on the calculation shows Fcount 0.70 <Ftable (α = 0.05) (13.65) = 1.887 so that it can be concluded that the regression model of the influence of student intelligence on learning outcomes in linear patterned mathematics.

**d. Significance Test of the Effect of Regression**

Based on the results of calculations on the regression line Table 6, the value of $F_{count}$ = 43.14> from $F_{table}$ (α = 0.05) (52.1) = 4.027, so it can be concluded that the covariate variable (intelligence) has a significant influence on the dependent variable (yield learning mathematics) .10

**e. Regression Alignment Test (Homogeneity Slopes)**

Based on the calculation results obtained $F_{count}$ = 1.69 <$F_{table}$ (α = 0.05; 3.79) = 2.720. Thus it can be concluded that groups A1B1, A1B2, A2B1, and A2B2 have homogeneous regression coefficients (slopes), or all four regression lines are assumed to be parallel.

## 3.2 Hypothesis Testing

The analysis technique used in testing the research hypothesis is the 2-way ANKOVA Test with the following results:

**Table 7.** Summary of Hypothesis Tests with ANKOVA

| Source of Variance | Jkyres | Db | RJKyres | Fo | F-table |
|---|---|---|---|---|---|
| Delivery A | 183.49 | 1 | 183.49 | **8.783** | 3.968 |
| Delivery B | 189.07 | 1 | 189.07 | **9.049** | 3.968 |
| Interaction AxB | 1452.34 | 1 | 1452.34 | **69.515** | 3.968 |
| PA (X) | 1731.85 | 1 | 1731.85 | **82.893** | 3.968 |
| Within | 1566.94 | 75 | 20.89 | **-** | - |
| Total | 3391.84 | 78 | - | **-** | - |

** = significant (Fcount <F table at alpha 0.05)

ts = not significant (Fcount <F table)

Based on the results of the calculation of covariate analysis at the source of the variance of interaction A x B, there is a significant interaction between the learning approach and cognitive style as evidenced by $F_{count}$ = 69.515> from $F_{table}$ = 3.968; then it is necessary to carry out further tests with the Scheffe Test, and the calculation results are presented in the following table:

**Table 8.** Summary of Further Tests with Scheffe Test

| Criteria | Hypothesis | $F_{count}$ | $F_{table}$ | Decision |
|---|---|---|---|---|
| Reject Ho if $F_h > F_t$ accept Ho if $F_h < F_t$ | $H_0: \mu_{11} \leq \mu_{21}$ $H_1: \mu_{11} > \mu_{21}$ | 8,44 | 2,725 | Ho Reject |

| | | | | |
|---|---|---|---|---|
| | $H_o: \mu_{12} \leq \mu_{22}$ $H_1: \mu_{12} > \mu_{22}$ | 3,50 | 2,725 | Ho Reject |
| | $H_o: \mu_{11} \leq \mu_{12}$ $H_1: \mu_{11} > \mu_{12}$ | 11 | 2,725 | Ho Reject |
| | $H_o: \mu_{21} \leq \mu_{22}$ $H_1: \mu_{21} > \mu_{22}$ | 5,1 | 2,725 | Ho Reject |

**The learning outcomes of mathematics between groups of students taught with the free inquiry learning model are modified higher than the group of students taught with the guided inquiry approach after controlling intelligence.**

Based on the ANKOVA calculation the source of variance A shows that the value of $F_{count}$ = 8.783> $F_{table}$ (α = 0.05) = 3.968. Thus it was concluded that there were differences in mathematics learning outcomes between groups of students taught with the modified free inquiry learning model (A1) and groups of students who were taught with the guided inquiry learning model (A2) after controlling intelligence. This means that the magnitude of the $F_{count}$ value generated in testing this hypothesis is purely derived from the treatment effect of the modified free inquiry learning model given to students because the influence of intelligence has been purified or controlled systematically.

Free inquiry learning is modified with an average correction of $\bar{Y}_{(res)\ A1}$ = 77.67 while the group of students taught with guided inquiry learning strategies with an average correction of $\bar{Y}_{(res)\ A2}$ = 74.51. The results of these calculations indicate that the learning outcomes of mathematics between groups of students taught with free inquiry learning strategies are modified higher than groups of students taught with guided inquiry learning strategies after controlling intelligence. Thus learning with a modified free inquiry learning strategy carried out in this study can improve mathematics learning outcomes better than learning with guided inquiry learning strategies. This finding also answers the research hypothesis that the learning outcomes of students taught with free inquiry learning strategies are modified better than students who are taught with guided inquiry learning strategies.

**The learning outcomes of mathematics between groups of students who have a FI cognitive style are higher than that of a group of students who have a FI cognitive style after controlling intelligence.**

Based on ANKOVA calculation, source of variance B shows that the value of $F_{count}$ = 9.049> $F_{table}$ (α = 0.05) = 3.968. Thus it is concluded that there are differences in mathematics learning outcomes between groups of students who have a cognitive style of FI (B1) and groups of students who have a cognitive style of FD (B2) after controlling intelligence. This means that the magnitude of the $F_{count}$ value generated in testing this hypothesis is purely derived from the FI's cognitive style of students because the influence of intelligence has been purified or systematically controlled.

This is consistent with the mathematics learning outcomes of groups of students who have FI cognitive style with an average correction of $\bar{Y}_{(res)\ B1}$ = 77.8 while the group of students who have a cognitive style of FD with an average correction of $\bar{Y}_{(res)\ B2}$ = 74 , 62. The results of these calculations indicate that mathematics learning outcomes among groups of students who have a cognitive style of FI are higher than those of students who have a cognitive style of FD after controlling intelligence. Thus the FI cognitive style possessed by students in this study can improve mathematics learning outcomes better than students with

FD cognitive styles. This finding also answers the research hypothesis that the learning outcomes of students who have the cognitive style of FI are better than students who have the cognitive style of FD.

**The effect of the interaction between the learning approach and cognitive style on mathematics learning outcomes after controlling intelligence.**

Based on ANKOVA calculation, the source of variance of Interaction A x B shows that the value of $F_{count}$ = 69.515> $F_{table}$ (α = 0.05) (1.69) = 3.968. Thus H0 is rejected H1 is accepted. This means that there is an interaction effect between the learning approach (A) and cognitive style (B) on mathematics learning outcomes after controlling intelligence. It can be further explained that the approach to mathematics learning of students depends on cognitive style after controlling intelligence, and vice versa, cognitive style (FI / FD) affects the learning outcomes of students mathematics depends on learning models after controlling intelligence.

In the form of graphs of interaction between learning approaches with cognitive styles on learning outcomes in mathematics can be seen in **Figure 1.**

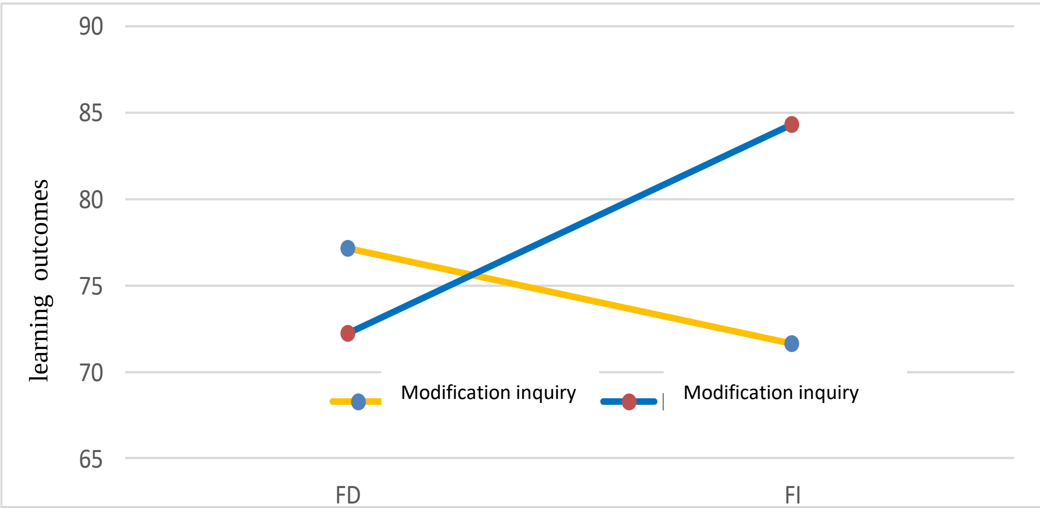


**Figure 1. Graph of Interaction of Learning Model and Cognitive Style on Learning Outcomes of Mathematics After Controlling Intelligence**

The above results indicate an interaction between the selection of learning strategies and cognitive styles. To improve mathematics learning outcomes of students who have the FI cognitive style, they are better suited to be taught with modified free inquiry learning strategies, while students who have the FD cognitive style are better suited to be taught with guided inquiry learning strategies.

**For students who have the FI cognitive style, the mathematics learning outcomes between groups of students taught with the free inquiry learning model are modified higher than the group of students taught with the guided inquiry learning model after controlling intelligence.**

Based on the calculation of the test Schaffer shows that the value of $F_{count}$ (A1B1; A2B1) = 12.28 <$F_{table}$ (α = 0.05) (3.76) = 2.725, meaning that H0 is rejected H1 is accepted. This is consistent with the results of mathematics learning groups of students who are taught guided inquiry learning models that have the FI cognitive style with an average corrected of

$\bar{Y}_{(res)\ A1B1}$ = 84.32, while the group of students taught with guided inquiry learning models with cognitive style FI with the corrected average of $\bar{Y}_{(res)\ A2B1}$ = 71.63. The results of these calculations show that the learning outcomes of mathematics between groups of students taught with the modified inquiry learning model are higher than the group of students taught with the guided inquiry learning model that both have the FI cognitive style after controlling intelligence.

Thus learning with the modified free inquiry learning model conducted in this study can improve mathematics learning outcomes better than learning with guided inquiry approach for students who have FI cognitive style after controlling intelligence. This finding answers the research hypothesis that the learning outcomes of students taught with the free inquiry learning model are modified better than students taught with the guided inquiry learning model for students who have the cognitive style of FI after controlling intelligence.

**For students who have a FD cognitive style, students 'mathematics learning outcomes taught with guided inquiry learning strategies are higher than students taught with free inquiry learning strategies that are modified after controlling students' intelligence.**

Based on the calculation of the test scheffe shows that the value of $F_{count\ (A1B2;\ A2B2)}$ = 3.5 $< F_{table}$ ($\alpha$ = 0.05) (3.76) = 2.725, meaning that H0 is rejected H1 is accepted. Based on the calculation of the corrected average learning outcomes of groups of students who are taught free inquiry learning models are modified and have a FD cognitive style of $\bar{Y}_{\_\ (res)\ A1B2}$ = 72.07, significantly lower than the group of students taught with guided inquiry learning models with cognitive style FD with a corrected mean of $\bar{Y}_{\_\ (res)\ A2B2}$ = 77.27. Thus from the results of this study explain that to improve mathematics learning outcomes with the modified inquiry free learning strategy is more appropriate to be applied to students who have the FI cognitive style compared to students with the FD cognitive style after controlling intelligence. This finding answers the research hypothesis that the mathematics learning outcomes of students who have the cognitive style of FI are higher than students who have the cognitive style of FD, if taught with a modified free inquiry learning strategy, after controlling intelligence

Cognitive style is one of the psychological factors related to learning. Cognitive style is described as stability in personality that affects attitudes, values, and social interactions. Students who have the cognitive style of FI, are students who are analytic, ie students who are less dependent on the environment or less influenced by the surrounding environment. This was also stated by Nunuk Suryanti (2014: 1392), that students who have the FI cognitive style have a higher analysis in the reception and processing of information, so it is often referred to as analytical thinkers. They show a tendency to organize information into manageable units and have greater capacity for information storage. These people like and are accustomed to using problem solving, organizational, analytical and structuring techniques when involved in learning and working situations.

Students who have a cognitive style of FD will get less than optimal learning outcomes if they are taught with a modified free inquiry learning strategy. Modified free inquiry learning requires active participation and optimal student involvement, whereas students with FD cognitive styles tend to be less independent in getting what they need to learn, because students with FD cognitive styles are strongly influenced by the surrounding environment, and choose to learn in groups and as often as possible interact with the teacher. The same thing was stated by Suryanti (2014: 1393) that students with dependent fields are more global and holistic in processing perceptions and information so that they are often referred to as "global thinkers". They tend to accept information as it is presented or encountered and rely mostly on memorization. They also manifest a clear tendency to use social framework references to determine attitudes, feelings and beliefs.

**For students with a modified free inquiry learning approach, the mathematics learning outcomes of students who have the cognitive style of FI are higher than students who have the cognitive style of FD after controlling the intelligence of students' intelligence.**

Based on the calculation of the test scheffe shows that the value of $F_{count (A1B1; A1B2)}$ = 12.27 $<F_{table}$ ($\alpha = 0.05$) (3.76) = 2.725, meaning that H0 is rejected H1 is accepted. Based on the calculation of the corrected average learning outcomes of the group of students taught by the free inquiry learning model modified with the FI cognitive style with a corrected average of $\bar{Y}_{(res)\ A1B1}$ = 84.32, lower than the group of students taught the inquiry learning model freely modified and has a FD cognitive force of $\bar{Y}_{(res)\ A1B2}$ = 72.24. Thus the hypothesis which states that the mathematics learning outcomes of students who have a cognitive style of FD is higher than students who have the cognitive style of FI, who is taught with guided inquiry learning strategies, after controlling the intelligence of students the truth is proven.

Guided inquiry learning is relevant to students who have a cognitive style of FD, because students with a cognitive style of FD have a nature of dependence on the surrounding environment. Students with FD cognitive styles have difficulty in finding and processing the skills and information needed without any hints or outside help. Students who have a cognitive style of FD are very dependent on external influences, so through guided inquiry learning, students tend to be able to accept and understand the meaning and essence of the important subject matter, because the teacher directs and guides students to find the knowledge and skills needed to answer the problem topic specified by the teacher.

Based on the description above, it can be concluded that the guided inquiry learning strategy will get better mathematics learning outcomes if it is taught to students who have FD cognitive style compared to students who have FI cognitive style, after controlling the intelligence of students' intelligence.

**For students with modified guided inquiry learning approaches, the mathematics learning outcomes of students who have a FD cognitive style are higher than students *who have the FI cognitive style, after controlling students' intelligence***

Based on the calculation of the test scheffe shows that the value of $F_{count (A2B1; A2B2)}$ = 11 $<F_{table}$ ($\alpha = 0.05$) (3.76) = 2.725, meaning that H0 is rejected H1 is accepted. Based on the calculation of the corrected average learning outcomes of the group of students taught by the guided inquiry learning model with the cognitive style of FD with an average corrected of $\bar{Y}_{(res)\ A2B2}$ = 77.12, significantly higher than the group of students taught the learning model free inquiry is modified and has a FI cognitive style of $\bar{Y}_{(res)\ A2B1}$ = 71.63. Thus the hypothesis stating that the learning outcomes of students taught with free inquiry learning strategies is modified lower than students taught with guided inquiry learning strategies for students who have a cognitive style of FD after controlling intelligence proven to be true.

Students with FD cognitive style have the nature of dependence on the surrounding environment. Students with FD cognitive styles will have difficulty in finding and processing the skills and information needed without any hints or outside help. Students who have a cognitive style of FD are very dependent on outside influences, so through guided inquiry learning, students tend to be able to accept and understand the meaning and essence of the important subject matter, because in learning using guided inquiry learning strategies, the teacher directs and guides students to find the knowledge and skills needed to answer the problem topic specified by the teacher, so that the acquisition of learning outcomes in accordance with the instructional goals that have been set.

Thus, guided inquiry learning is relevant to students who have a FD cognitive style, because students with a cognitive style have a dependence on the surrounding environment. Students with FD cognitive styles will have difficulty in finding and processing the skills and information needed without any hints or outside help. Students who have a cognitive style of FD are very dependent on external influences, so through guided inquiry learning, students tend to be able to accept and understand the meaning and essence of the important subject matter, because the teacher directs and guides students to find the knowledge and skills needed to answer the problem topic specified by the teacher, so that the acquisition of learning outcomes in accordance with instructional goals that have been set.

## IV. Conclusion

Based on the results of the study, data analysis, hypothesis testing, and discussion of the results of the study the following conclusions are drawn:

1. Student mathematics learning outcomes taught by modified free inquiry learning strategies are higher than students taught with guided inquiry learning strategies after controlling student intelligence.
2. Student mathematics learning outcomes that have a FI cognitive style are higher than students who have a FD cognitive style after controlling students' intelligence.
3. There is an interaction effect between inquiry learning strategy and cognitive style on students 'mathematics learning outcomes after controlling students' intelligence.
4. Mathematics learning outcomes of students who are taught with modified free inquiry learning strategies are higher than students who are taught with guided inquiry learning strategies, on students who have the cognitive style of FI, after controlling the intelligence of students' intelligence.
5. Student mathematics learning outcomes taught with guided inquiry learning strategies are higher than students taught with modified free inquiry learning strategies, on students who have a FD cognitive style, after controlling the intelligence of students' intelligence.
6. Student mathematics learning outcomes that have a FI cognitive style are higher than students who have a FD cognitive style, if taught with a modified free inquiry learning strategy, after controlling students' intelligence.
7. Mathematical learning outcomes of students who have a FD cognitive style are higher than students who have FI cognitive style, who are taught with guided inquiry learning strategies, after controlling the intelligence of students' intelligence.

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