# The Influence of Inquiry Learning Strategies and Cognitive Style on Mathematics Learning Outcomes of Grade V SD Pematangsiantar

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### *Abstract*

This study aims to find out the effect of inquiry learning strategies and cognitive styles on mathematics learning outcomes in grade V SD Pematangsiantar. The research method used is the experimental method with a quasi-experimental design 2 x 2 factorial design. In this study, the samples were grouped into two groups. The two groups were used as the experimental group and the control group respectively. The data collection technique was done through pre-test and post-test to the control group and the experimental group. The results of this study indicate that the mathematics learning outcomes of primary school students who are taught with guided inquiry learning strategies are higher than those taught with free inquiry learning strategies with a mean value of 90,50. Mathematics learning outcomes of primary school students who have an independent cognitive style are higher than those who have a dependent cognitive style with an average score of 89. Mathematics learning outcomes of primary school students have an interaction between inquiry learning strategies and dependent cognitive styles with an average score of 79. The mathematics learning outcomes of the students in free inquiry class have an independent cognitive style with an average score of 87. Mathematics learning outcomes of guided inquiry class students have a dependent cognitive style (A1B2) with an average score of 87. Primary students' mathematics learning outcomes among those taught using Free inquiry learning strategies are no better than students who are taught using guided inquiry learning strategies and Mathematics learning outcomes of primary students among those who have better independent field cognitive style with dependent learning styles

**Keywords:** Free inquiry; Guided inquiry; quasi experiment; independent field cognitive style.

**INTRODUCTION**

Education plays an important role for all aspects of human life, because education is a vehicle for improving and developing the quality of human resources who are taught and trained to acquire knowledge, skills and attitudes (Hasbullah, 2015). Learning is an effort to advance the quality of life and optimize the development of human quality that can bring hope for future improvements (Yamin, 2014). Self-change from not knowing to knowing, from not doing something to doing something, from being unable to do to being able to do is the result of learning activities (Hamdayama, 2016). The learning stage must be adjusted to the cognitive development stage that students go through, namely the metoric sensor stage, the pre-operational stage, the concrete operational stage, and the formal operational stage (Rhofiq, 2013). Cognitive style is a human characteristic of feeling, thinking, solving problems, remembering and making decisions (Witkin in Candiasa, 2002). Cognitive style is part of the cultural history of each group that can be observed through daily activities or with psychological tests (Denny in Rofiq (2009).

According to Thobroni (2015), learning styles are the ways we prefer to think, process and understand information. Marton, et al (in Ghufron, 2014) argue that learning someone to know their own learning styles and learning styles of others in their environment will advance their effectiveness in learning, thus affecting learning outcomes of primary school children (ages 7- 11 years) are at the concrete operational stage so naturally the best way of learning for children is real by seeing, feeling and doing it directly (Piaget, 2015).

The low mathematical reasoning of students is because educators are only able to apply the subject matter equipped based on examples and practice routine questions, but when the students were given questions not as a routine, they would have difficulty on where to start working (Nasution, 2011). Educators must provide their time for students to discuss and answer statements and other response questions with correct and clear arguments (Pugalee, 2001).

Mathematics is one of the lessons learned by Primary School (SD) students which is the science of numbers, the relationship between numbers, and operational procedures used in solving problems regarding numbers (KBBI, 2014). Mathematics subjects must be given to students starting from primary school in order to equip students with learning to think logically, sharply, systematically, critically, and creatively, even learning collaboratively (BSNP, 2006).

There are 2 factors found to be opposite in the middle of learning Mathematics. First, students see and stay quiet and listen to the learning from educators due to inappropriate learning styles. Second, learning is often done by educators is conventional teaching (lectures), which is centered on the learning stage educator (teacher centered). At SDN 125537 Pematangsiantar, the results of Mathematics learning from 30 students of class Va, 20 of them stated that they had not reached the Maximum Completion Criteria (70) and of the 25 students of class Vb, 17 students were declared not to have reached the criteria (70). This may be influenced by inappropriate strategies and learning styles. In addition, there is no research on the effect of inquiry learning strategies and cognitive styles on mathematics learning outcomes in grade V at the school.

**RESEARCH METHODS**

This research was conducted at SDN 125537 Pematangsiantar in August-November 2019/2020 Academic Year. The population in this study were all students in class V, amounting to 75 people and consisted of 3 classes. The sampling technique in this research is the sampling technique of probability sampling which is done by cluster random sampling.

Based on sampling by cluster random sampling, from the three rolls of paper with the name of each class on it, the sample used in this study is the scroll that reads class Va as an experimental class or one that is taught with guided inquiry learning strategies, totaling 30 people, and class Vb as a control class (control) was taught with free inquiry learning strategies, amounting to 25 people, thus the total number of samples in this study were 55 people.

This research method was conducted by using an experimental method with a quasi-experimental design 2 x 2 factorial design. This design will compare the influence of guided inquiry strategies with independent inquiry strategies, the aim is to obtain convincing data about the effect

of inquiry learning strategies and cognitive styles on mathematics calculations. The sample was divided into two groups, each of which was used as an experimental group (class Va) and a control group (class Vb). In the experimental group (class Va) the guided inquiry learning strategy was applied while the free inquiry strategy was applied to the control group (class Vb).

The implementation of learning activities for the experimental class (class Va) and the control class (class Vb) were held within 8 meetings. The first meeting of students in the experimental class and the control class was given a cognitive style test, to identify and classify students who have a cognitive style of FI and students who have a cognitive style of FD. Then the 2nd to 7th meeting of students was given a learning approach. The experimental class was given a guided inquiry learning strategy and the control class was given a free inquiry learning strategy. At the eighth meeting, the experimental class and control class students were given a *post-test* about makingdistribution tables frequency, drawing learning histograms and calculating distance, time and speed according to the material that had been studied.

After the post test, the data analysis performed was to find (1) the mean (average); (2) Median (middle data); (3) Mode (frequently appeared data); and (4) Standard Deviation (standard deviation). After the data analysis was complete, the hypothesis was tested by testing the requirements of the analysis which included the normality test using lilifors test and the homogeneity test of the data using the Fisher (F) test and the Barlet test, followed by thetechnique two-way ANAVA to see the group average differences. If the ANAVA technique test results illustrate the interaction between learning strategies and learning attitudes, it is necessary to carry out further tests, because in this study the number of samples in each ANAVA cell is different, then further tests are carried out with the Scheffe test, to provide direction in data analysis, then the hypothesis needs to be stated. in statistical formulas.

**RESULTS AND DISCUSSIONS**

The results of the study were grouped into 8 sections, they are: Mathematics learning outcomes of primary school students who were taught using free inquiry learning strategies had a mean score of 82 (Table 1), Mathematics learning outcomes of primary school students who were taught using guided inquiry learning strategies had a mean score of 89 (Table 2), Primary students' Mathematics learning outcomes among students with field independent learning style had an average score of 89 (Table 3), Primary school students Mathematics learning outcomes with field dependent learning style having a mean score of 79 (Table 4), Mathematics learning outcomes of Guided inquiry class students with field independent cognitive style has a mean score of 89 (Table 5), Mathematics learning outcomes of the students in free inquiry class with field dependent cognitive style have a mean score of 79 (Table 6), Mathematics learning outcomes of Guided inquiry class students with field dependent cognitive style has an average score of 87 (Table 7), Mathematics learning outcomes of free inquiry class students with field independent cognitive style with a mean score of 87 (Table 8).

**Table 1. Frequency distribution of primary school students' mathematics learning outcomes taught by  using free inquiry learning strategies**

| No | Class Interval | Limit | | Frequency | | |
|----|----------------|-------|-------|-----------|-----------|----------|
| | | Lower | Upper | Absolute | Cumulative | Relative |
| 1. | 67-71 | 66,5 | 71,5 | 2 | 2 | 8,00% |
| 2. | 72-76 | 71,5 | 76,5 | 2 | 4 | 8,00% |
| 3. | 77-81 | 76,5 | 81,5 | 3 | 7 | 12,00% |
| 4. | 82-86 | 81,5 | 86,5 | 3 | 10 | 12,00% |
| 5. | 87-91 | 86,5 | 91,5 | 9 | 19 | 36,00% |
| 6. | 92-96 | 92,5 | 96,5 | 3 | 22 | 12,00% |
| 7. | 97-101 | 96,5 | 101,5 | 3 | 25 | 12,00% |
| Total | | | | 25 | | 100,00% |

*Source: 2020  Data Analysis*

**Table 2. Frequency distribution of primary school students' mathematics learning outcomes taught by guided inquiry learning strategies**

| No. | Class Interval | Limit | | Frequency | | |
|-----|----------------|-------|-------|-----------|-----------|----------|
| | | Lower | Upper | Absolute | Cumulative | Relative |
| 1 | 80-82 | 79,5 | 82,5 | 1 | 1 | 3,33 |
| 2 | 83-85 | 82,5 | 85,5 | 4 | 5 | 13,33 |
| 3 | 86-88 | 85,5 | 87,5 | 5 | 10 | 16,67 |
| 4 | 89-91 | 88,5 | 91,5 | 7 | 17 | 23,33 |
| 5 | 92-94 | 91,5 | 94,5 | 7 | 24 | 23,33 |
| 6 | 95-97 | 94,5 | 97,5 | 4 | 28 | 13,33 |
| 7 | 98-100 | 97,5 | 101,5 | 2 | 30 | 6,67 |
| | Total | | | 30 | 30 | 100% |

*Source: 2020  Data Analysis*

**Table 3. Frequency distribution of primary school students' mathematics learning with independent field learning styles**

| No. | Class Interval | Limit | | Frequency | | |
|-----|----------------|-------|-------|-----------|-----------|----------|
| | | Lower | Upper | Absolute | Cumulative | Relative |
| 1 | 80-82 | 79,5 | 82,5 | 1 | 1 | 3,45 |
| 2 | 83-85 | 82,5 | 85,5 | 3 | 4 | 10,34 |
| 3 | 86-88 | 85,5 | 87,5 | 6 | 10 | 20,69 |
| 4 | 89-91 | 88,5 | 91,5 | 7 | 17 | 24,14 |
| 5 | 92-94 | 91,5 | 94,5 | 6 | 23 | 20,69 |
| 6 | 95-97 | 94,5 | 97,5 | 4 | 27 | 13,78 |
| 7 | 98-100 | 97,5 | 101,5 | 2 | 29 | 6,90 |
| | Total | | | 29 | 29 | 100% |

*Source: 2020  Data Analysis*

**Table 4. Frequency distribution of primary school students' mathematics learning outcomes with field  dependent learning style**

| No. | Class Interval | Limit | | Frequency | | |
|-----|----------------|-------|-------|-----------|-----------|----------|
| | | Lower | Upper | Absolute | Cumulative | Relative |
| 1 | 67-72 | 66,5 | 72,5 | 2 | 2 | 3,45 |
| 2 | 73-78 | 72,5 | 78,5 | 3 | 5 | 10,34 |
| 3 | 79-84 | 78,5 | 84,5 | 6 | 11 | 20,69 |
| 4 | 85-90 | 84,5 | 90,5 | 8 | 19 | 24,14 |
| 5 | 91-96 | 90,5 | 96,5 | 4 | 23 | 20,69 |
| 6 | 97-102 | 96,5 | 102,5 | 3 | 26 | 13,78 |
| | Total | | | 26 | 26 | 100% |

*Source: 2020  Data Analysis*

**Table 5. Frequency distribution of students' learning outcomes in guided inquiry class with field independent cognitive style**

| No. | Class Interval | Limit | | Frequency | | |
| --- | --- | --- | --- | --- | --- | --- |
| | | Lower | Upper | Absolute | Cumulative | Relative |
| 1 | 83-85 | 66,5 | 72,5 | 1 | 1 | 5,88 |
| 2 | 86-88 | 72,5 | 78,5 | 3 | 4 | 17,65 |
| 3 | 89-91 | 78,5 | 84,5 | 5 | 9 | 29,41 |
| 4 | 92-94 | 84,5 | 90,5 | 4 | 13 | 23,53 |
| 5 | 95-97 | 90,5 | 96,5 | 3 | 16 | 17,65 |
| 6 | 98-100 | 96,5 | 102,5 | 1 | 17 | 5,88 |
| | Total | | | 17 | 17 | 100% |

*Source: 2020 Data Analysis*

**Table 6. Frequency Distribution of Mathematics learning outcomes in the free inquiry class of the students with field dependent cognitive style**

| No. | Class Interval | Limit | | Frequency | | |
| --- | --- | --- | --- | --- | --- | --- |
| | | Lower | Upper | Absolute | Cumulative | Relative |
| 1. | 67-72 | 66,5 | 72,5 | 1 | 1 | 7,69 |
| 2. | 73-78 | 72,5 | 78,5 | 3 | 4 | 23,08 |
| 3. | 79-84 | 78,5 | 84,5 | 5 | 9 | 38,46 |
| 4. | 85-90 | 84,5 | 90,5 | 3 | 12 | 23,08 |
| 5. | 91-96 | 90,5 | 96,5 | 1 | 13 | 7,69 |
| Total | | | | 13 | 13 | 100,00% |

*Source: 2020 Data Analysis*

**Table 7. Frequency distribution of learning outcomes of the students in guided inquiry class with field dependent cognitive style**

| No. | Class Interval | Limit | | Frequency | | |
| --- | --- | --- | --- | --- | --- | --- |
| | | Lower | Upper | Absolute | Cumulative | Relative |
| 1 | 80-83 | 79,5 | 83,5 | 1 | 1 | 7,69 |
| 2 | 84-87 | 83,5 | 87,5 | 2 | 3 | 23,08 |
| 3 | 88-91 | 87,5 | 91,5 | 3 | 6 | 38,46 |
| 4 | 92-95 | 91,5 | 95,5 | 4 | 10 | 23,08 |
| 5 | 96-99 | 95,5 | 99,5 | 2 | 12 | 7,69 |
| 6 | 100-103 | 99,5 | 103,5 | 1 | 13 | |
| | Total | | | 13 | 13 | 100% |

*Source: 2020 Data Analysis*

**Tabel 8. Frequency Distribution of Mathematics learning outcomes of the students in free inquiry class with independent field cognitive style**

| No. | Class Interval | Limit | | Frequency | | |
| --- | --- | --- | --- | --- | --- | --- |
| | | Lower | Upper | Absolute | Cumulative | Relative |
| 1 | 80-83 | 79,5 | 83,5 | 1 | 1 | 8,33 |
| 2 | 84-87 | 83,5 | 87,5 | 3 | 3 | 25,00 |
| 3 | 88-91 | 87,5 | 91,5 | 4 | 6 | 33,33 |
| 4 | 92-95 | 91,5 | 95,5 | 3 | 10 | 25,00 |
| 5 | 96-99 | 95,5 | 99,5 | 1 | 12 | 8,33 |
| | Total | | | 12 | 12 | 100% |

*Source: 2020 Data Analysis*

The results of the normality test in the processor $p > \alpha = 0.05$ so that the overall data is normally distributed, while the homogeneity test results in $Si^2$ count = 1.447 and $Si^2_{table}$ = 7.81 ($Si^2$ count $< Si^2_{table}$) it can be ascertained that the samples come from populations that have homogeneous variances.

Based on the results that have been obtained and the tests that have been done, the first hypothesis was decided to reject Ho and accept Ha. This shows that the Mathematics learning outcomes of students who are taught using free inquiry learning strategies are lower than the Mathematics learning outcomes of students who are taught usinginquiry learning strategies guided. Successful learning is influenced by various factors including the students themselves. These factors can come from students themselves such as emotional intelligence and can also come from outside of students such as learning strategies designed by educators. This difference is indicated by the mean score of mathematics learning outcomes of students who study with free inquiry learning strategies of 85.48, and the average scores of mathematics learning outcomes of students who study with guided inquiry learning strategies of 90.50.

In the second hypothesis it is decided to reject Ho and accept Ha. This means that the mathematics learning outcomes of students with field independent cognitive style is higher (mean score 90.55) than students have a field dependent cognitive style (mean score 85.62). This is because children who have field independent cognitive style tend to be stronger in receiving information and can be solved, are able to parse complex things, and learn natural science is not so difficult if working individually, while children who have field dependent cognitive style are stronger to accept information that is social in nature, such as conversations or interpersonal interactions, makes it easier to study history, literature, language and social science.

The third hypothesis, there is an interaction between learning strategies and cognitive styles in influencing students' Mathematics learning outcomes (rejecting Ho and accepting Ha). On average, groups of students who have an independent field cognitive style and are taught using guided inquiry learning strategies have better mathematics learning outcomes than those who use independent inquiry learning strategies. There are differences in the interaction between learning strategies and cognitive styles, learning strategies of 90.71 and the average score of mathematics learning outcomes of students learning cognitive styles of 90.33.

In hypothesis four, this difference is indicated by the mean score of mathematics learning outcomes of students who study with independent field cognitive style in free inquiry of 90.55, and the mean score of mathematics learning outcomes of students who study with guided inquiry learning strategies is 85.62 (accepting Ho and refused Ha). This means that students who learn with free inquiry learning strategies have a lower mean score than the scores of students who learn with guided inquiry learning strategies. It can be ascertained that students who learn with the independent field cognitive style in the free inquiry learning strategy have a higher mean score than the scores of students who learn with guided inquiry learning strategies.

From the results of data analysis, it was found that on average the mathematics learning outcomes of students who had free inquiry style were lower (average score 85.62) than students who had guided inquiry styles in a field dependent cognitive style (average score 90,55) then the hypothesis is decided to accept Ho and reject Ha. Field dependent cognitive style procedures in free inquiry of activities, looking for the results of questions from classmates or who the same as the students want, making summaries proven to be able to enrich students' answers that have an impact on Mathematics learning outcomes without any direction from educators. This condition is in line with the field dependent cognitive style in guided inquiry, where there are activities in which students, although free to seek answers, educators still provide guidance to students in part to motivate students, make summaries with guidance from educators so that they are free but focused.

## CONCLUSION

From the research results it can be concluded that; (a) the mathematics learning outcomes of students who are taught using free inquiry learning strategies are lower than the mathematics learning outcomes of students who are taught using guided inquiry learning strategies; (b) Mathematics learning outcomes of students with field independent cognitive style higher than students with field dependent cognitive style; (c) there is an interaction between learning strategies and cognitive styles in influencing students' Mathematics learning outcomes; (d)

students who have field independent cognitive learning styles, students' mathematics learning outcomes are higher when taught with free inquiry than those taught with guided inquiry and (e) mathematics learning outcomes of students who have free inquiry styles are lower than students with guided inquiry style in a field dependent cognitive style.

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