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Dependent and Independent Cognitive Style Learning Model in Mathematics Subject Outcomes

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ABSTRACT

The need to improve learning outcomes in class VII students of Al Washliyah Middle School, then a learning model is sought that encourages students to like mathematics, motivate students to learn independently, and encourage students to have curiosity, and involve active students in learning, both mentally mentally , physical, or social. Therefore a teacher must be able to understand the cognitive style of students. This is because the ability of people in processing information of each individual is different. Therefore this study tests and compares several learning models that are more effective in the learning outcomes of the Alwashliyah Middle School Mathematics, Deli Serdang among them is 1) Problem Learning Model Posing with direct learning models, 2) Independent Field Cognitive Style with Field Dependent Cognitive Style. This study also analyzed whether there was an interaction in the learning model and cognitive style of students that could influence the learning outcomes of the Mathematics of Class VII of Al Washliyah Middle School. The method used in this study is a pseudo experimental method with a factory research design of 2 x 2. This study was conducted at Al Washliyah Middle School, Deli Serdang. The results of this study among others are 1) Mathematical learning outcomes of students taught with a higher problem posing model than direct learning models, 2) Students who have cognitive styles of independent fields obtain higher mathematical learning outcomes than mathematical learning outcomes students who have cognitive styles Field Dependent.

KEYWORDS

problem posing; cognitive; cognitive field dependent; cognitive independent field

INTRODUCTION

The ability of educators to understand the characteristics of participants is very important, namely how educators are able to identify the characters of each individual (Darmono, 2012). Cognitive style is a way chosen by someone to process information and do assignments (Schunk, 2012; Witkin & Moore 1974). In addition to knowing the character of students, the success of educators in the learning process can be seen from the learning outcomes of students. Learning outcomes are the abilities possessed by students after he receives his learning experience (Sudjana, 2009). The problem is a learning problem faced by students in Al Washliyah Junior High School is to use the method of being taught (1) theory/definition/theorem, (2) given examples, and (3) given exercises or questions. This kind of learning is commonly referred to as conventional learning (Muzaini, 2015) from observations and interviews that researchers conducted with several teachers in Al Washliyah Junior High School, it was found that the tendency of students was less passionate, not serious, and felt unable to do the assignments or mathematical exercises

given by the teacher. This is seen from students tend to be afraid of answering questions and considering the questions given by the teacher is difficult. Students also lack curiosity about the mathematical problems given to them. Judging from the indicator of successful learning objectives in the form of semester final exams from the last 2 years, the average value of mathematics subjects, especially class VII, is still under the KKM (Minimum Completeness Criteria) set at 70. This problem has been sought to be overcome, but the results still not significant.

To improve the learning outcomes of class VII students of Al Washliyah Junior High School, a learning model is sought that encourages students to like mathematics, motivate students to learn independently, and encourage students to have curiosity, and involve active students in learning, both mentally, mentally, physical, or social. One of the learning models in question is the Problem Posing learning model. Problem posing is a learning model that requires students to arrange their own questions or break down a question into simpler questions that refer to the completion of the problem.

Several studies that have been conducted in the application of the Problem Posing learning model include: Research conducted by Guvercin and Verbovskiy (2014) at the first level of high school level shows that student learning outcomes that use the problem posing learning model increase. Research conducted by Simarmata (2016) at the junior high school level that uses the Problem Posing learning model shows that student Mathematic Subject outcomes that use the problem posing learning model are higher than the learning outcomes of students who use direct learning models. Research was also conducted by Muzaini (2015) at the first level high school level showing that student Mathematic Subject outcomes were taught using a problem posing approach higher than students who were taught with conventional approaches.

In learning mathematics, another thing that needs to be considered by the teacher is the cognitive style of students. Cognitive stylistics deals with the conceptual processes of how texts (written or spoken) are represented in the human mind and how text producers influence others through such representation (Freeman, 2014; Kadhim, & Yahya Al-Hilo, 2021). This is because the ability of people in processing information of each individual is different. The cognitive force is divided into two parts, namely Independent Field (FI) and Field Dependent (FD). Individual independent fields tend to be independent and are not influenced by environmental and social situations, while individual field dependent tends to pursue themselves to the environment and social. Cognitive style has been reported as one of the significant factors that influence learning outcomes in various subjects in schools including, Andriani (2015) examines the effect of cognitive style on the learning outcomes of science in grade F junior high school students, finding cognitive styles significantly influences science learning outcomes, FI learner superior to FD learners. Muzaini (2015) states that students' Mathematic Subject achievement between students who are cognitive FI -style is better than the learning achievement of students who are cognitive FD. Sudarman, et al (2016) examine the effect of cognitive style on Mathematic Subject outcomes in class VII junior high school students, they found that cognitive styles influence the learning outcomes of mathematics, where students who have cognitive styles of FI have higher Mathematic Subject outcomes than learning outcomes of students who have a style Cognitive FD.

Based on the learning problems described above, to improve Mathematic Subject outcomes specifically for junior high school students, it is necessary to do a study of learning models that involve students actively thinking, discussing and innovating. Especially to answer problems students who experience obstacles in following Mathematic Subject. Researchers choose and are interested in the Problem Posing learning model because this

model is a learning model based on students as students, while researchers are interested in using cognitive styles as moderator variables because in learning things that also need to be considered by teachers are student cognitive styles. This is because a person's ability to process information is different. By knowing the existence of individual differences in cognitive styles, the teacher can understand that students present in class have different ways in approaching problems or facing the assignments given. For this reason, the title of this study is: "The Effect of Learning Models and Cognitive Styles on Mathematic Subject Outcomes of Class VII Junior High School Students in Medan City".

RESEARCH METHODS

This research was conducted at Al Washliyah Junior High School, Deli Serdang in the even semester of the 2022/2023 school year, January - March. It was also conducted 8 meetings in mathematics. The method used in this study is a quasi -experimental research method with a factory research design of 2 x 2. The population is also not just the amount that exists in the object/subject being studied, but includes all the characteristics/traits possessed by the subject or object (Sugiyono, 2016: 117).

The population of this study was all students of Class VII Al Washliyah Junior High School consisting of 3 parallel classes namely VIIA, VIIB, and VIIC. The total population of 69 people. Selection of Al Washliyah Junior High School as a research population based on the assumption that these students have relatively the same characteristics, for example: have a relatively the same age, using relatively the same learning facilities, no students have lived in class and are educated by teachers who are has a relatively the same educational background.

Random sampling group (cluster random sampling) is done by taking all individuals in the sample class into research subjects. The main objectives of random sampling are: In order to be concluded for the population, it is possible to use inferential statistical calculations. From the class VII population of Al Washliyah Junior High School, the drawing was carried out, and from the drawing the results obtained one class as a sample for the treatment of the problem posing learning model, namely class VIIB and one class as a sample to treat direct learning models namely class VIIC. The entire research sample amounted to 47 students. Determination of the cognitive force value of independent fields and field dependent is determined based on the upper and lower groups. Students are categorized into an independent field cognitive style group if the score is in the range of 27% high score. Then students are categorized into the Field Dependent Cognitive Style group if the cognitive force score is 27% lowest. So that from class VIIB there are 7 students who have FI cognitive styles and 8 students who have FD cognitive styles. While from class VIIC there are 7 students who have FI cognitive styles and 7 students who have FD cognitive styles.

RESULTS AND DISCUSSION

Student Mathematic Subject Outcomes Are Taught Using the Problem Posing Learning Model

Data on student Mathematic Subject outcomes that are taught with the learning model of the problem posing as follows: The highest score is 29 and the lowest score is 12, the average score is 21.77, mode of 18.16, median 21.5 and standard deviation of 5.55. To see student scores used interval classes, absolute frequencies, and relative frequencies. A picture of student Mathematic Subject outcomes that are taught with the Problem Posing learning model can be seen in Table 1 below:

Table 1. Description of Mathematic Subject Outcomes Data taught with Problem Posing Learning Models

Class	Class Interval	$f_{absolut}$	$f_{relatif}$
1	12 – 15	2	13,33
2	16 – 19	4	26,67
3	20 - 23	3	20
4	24 – 27	3	20
5	28 – 31	3	20
	Total	**15**	**100**

Based on Table 1 obtained data on student Mathematic Subject outcomes learned with the Problem Posing learning model, with the following details: there are 3 people or 20% of students with a score in the class, 6 people or 40% of students are below the class average and 6 students or 40% of students are above the class average.

Mathematic Subject Outcomes of Students Taught Using Direct Learning Models

Data on student Mathematic Subject outcomes that are taught with direct learning models as follows: The highest score is 25 and the lowest score is 8, the average score is 17.79, mode of 17.9, median 17.9 and standard deviation of 5,075. To see student scores used interval classes, absolute frequencies, and relative frequencies. A picture of student Mathematic Subject outcomes that are taught with direct learning models can be seen in Table 2 below:

Table 2. Description of Mathematic Subject Outcomes Data taught with direct learning models

Class	Class Interval	$f_{absolut}$	$f_{relatif}$
1	8 – 11	2	14,29
2	12 – 15	2	14,29
3	16 – 19	5	35,71
4	20 – 23	3	21,43
5	24 – 27	2	14,29
	Total	**14**	**100**

Based on Table 2 obtained data on student Mathematic Subject outcomes that are learned with direct learning models, with the following details: there are 5 people or 35.71% of students with a score at an average class, 4 people or 28.58% of students are below flat -The class and 5 students or 35.72% of students are above the class average.

Mathematic Subject Outcomes Students Who Have the Cognitive Style of Independent Fields

Mathematical Subject outcomes of students who have the cognitive style of independent field as follows: The highest score is 29 and the lowest score is 9, the average score is 22.21, mode 24, median 23.1 and standard deviation of 5.75. To see student scores used interval classes, absolute frequencies, and relative frequencies. The picture of Mathematic Subject Outcomes Students who have the cognitive style of independent fields can be seen in the following table 3:

Table 3. Description of Student Mathematic Subject Outcomes Data that has an Independent Field Cognitive Style

Class	Class Interval	$f_{absolut}$	$f_{relatif}$
1	7 – 11	1	7,14
2	12 – 16	1	7,14

3	17 – 21	3	21,43
4	22 – 26	6	42,86
5	27 – 31	3	21,43
	Total	**14**	**100**

Based on table 3 obtained data on student Mathematic Subject outcomes that have an independent field cognitive style with the following details: there are 6 people or 42.86 % of students with a score at the class, 5 people or 35.71 % of students are below the average Class average and 3 students or 21.43% of students are above the class average.

Mathematic Subject Outcomes of Students Who Have a Cognitive Style of Field Dependent

Mathematical Subject outcomes of students who have the cognitive style of field dependent as follows: The highest score is 27 and the lowest score is 8, the average score is 17.71, mode of 17.2, median 17.5 and standard deviation of 4.40. To see student scores used interval classes, absolute frequencies, and relative frequencies.

Table 4. Description of Mathematic Subject Outcomes Students who have a cognitive style of field dependent

Class	Class Interval	$f_{absolut}$	$F_{relative}$
1	8 – 11	1	6,67
2	12 – 15	3	20,00
3	16 – 19	7	46,67
4	20 – 23	2	13,33
5	24 – 27	2	13,33
	Total	**15**	**100**

Based on Table 4 obtained data on student Mathematic Subject outcomes who have a cognitive style of field dependent with the following details: There are 7 people or 46.67 % of students with a score at the class, 4 people or 26.67 % of students are below the average Class average and 4 students or 26.67% of students are above the class average.

Mathematic Subject Outcomes Students who have the cognitive style of independent fields taught using the posing problem learning model

Mathematical Subject outcomes of students who have the cognitive style of independent fields that are taught with the learning model of the problem posing as follows: The highest score is 29 and the lowest score is 18, the average score is 24.29, the first mode is 24.29 and the second mode is 29.5, median 23 and standard deviation of 3.77. To see student scores used interval classes, absolute frequencies, and relative frequencies.

Table 5. Description of Mathematic Subject Outcomes Students who have the cognitive style of independent fields taught with Problem Posing learning models

Class	Class Interval	$f_{absolut}$	$f_{relatif}$
1	17 – 19	1	14,29
2	20 – 22	1	14,29
3	23 – 25	2	28,57
4	26 – 28	1	14,29
5	29 – 31	2	28,57
	Total	**15**	**100**

Based on Table 4.5 obtained data on student Mathematic Subject outcomes that have an independent field cognitive style that is taught with a problem posing learning model, with the following details: there are 2 people or 28.57% of students with scores at the class average, 2 people or 28, 57 % of students are below the class average and 3 students or 42.86 % of students are above the class average.

Mathematic Subject Outcomes Students Who Have a Cognitive Style of Field Dependent Taught Using the Problem Posing Learning Model

Mathematical Subject outcomes data for students who have a cognitive style of field dependent studied with the learning model of problem posing as follows: The highest score is 27 and the lowest score is 12, the average score is 18.85, the mode is 15.8 and the median 16.9 and standard deviation 5.65. To see student scores used interval classes, absolute frequencies, and relative frequencies. Overview of Mathematic Subject Outcomes Students who have the cognitive style of field dependent that are taught with the Problem Posing learning model can be seen in Table 6 below:

Table 6. Description of Mathematic Subject Outcomes Students who have a cognitive style of field dependent taught with a problem posing model

Class	Class Interval	$f_{absolut}$	$f_{relatif}$
1	11 – 14	2	25
2	15 – 18	3	37,5
3	19 – 22	1	12,5
4	23 – 26	1	12,5
5	27 – 30	1	12,5
	Total	**15**	**100**

Based on Table 4.6 obtained data on student Mathematic Subject outcomes that have a cognitive style of field dependent taught with a problem posing learning model, with the following details: there are 4 people or 50 % of students with scores in the class, 2 people or 25 % of students is below the class average and 2 students or 25% of students are above the class average.

Mathematics Subject Outcomes of Students Who Have the Cognitive Style of Independent Fields Taught Using Direct Learning Models

Mathematical Subject outcomes of students who have the cognitive style of independent fields taught with direct learning models as follows: The highest score is 25 and the lowest score is 16, the average score is 19.64, the mode is 22.5 and the median 21.64 and Standard deviation 5.52. To see student scores used interval classes, absolute frequencies, and relative frequencies. Overview of Mathematic Subject Outcomes Students who have the cognitive style of independent fields that are taught with direct learning models can be seen in Table 7 below:

Table 7. Description of Mathematic Subject Outcomes Students who have the cognitive style of independent fields taught with direct learning models

Class	Class Interval	$f_{absolut}$	$f_{relatif}$
1	9 – 12	1	14,29
2	13 – 16	1	14,29
3	17 – 20	1	14,29
4	21 – 24	3	42,86
5	25 – 28	1	14,29
	Total	**15**	**100**

Based on Table 4.7 obtained data on student Mathematic Subject outcomes that have an independent field cognitive style that is taught with a direct learning model, with the following details: there are 1 person or 14.29% of students with a score in the class, 2 people or 28, 58 % of students are below the class average and 4 students or 57.16 % of students are above the class average.

Mathematic Subject Outcomes of Students Who Have A Cognitive Style of Field Dependent Taught Using Direct Learning Models

Mathematical Subject outcomes of students who have a cognitive style of field dependent studied with direct learning models as follows: The highest score is 23 and the lowest score is 8, the average score is 16.65, the mode is 16.5 and the median 16.5 and Standard deviation 5.16. To see student scores used interval classes, absolute frequencies, and relative frequencies. The picture of student Mathematic Subject outcomes can be seen in Table 8 below:

Table 8. Description of Mathematic Subject Outcomes Students Who Have a Cognitive Style of Field Dependent Taught with Direct Learning Models

Class	Class Interval	$f_{absolut}$	$f_{relatif}$
1	7 – 10	1	14,29
2	11 – 14	1	14,29
3	15 – 18	3	42,89
4	19 – 22	1	14,29
5	23 – 25	1	14,29
	Total	**15**	**100**

Based on Table 4.8 the following details are obtained: there are 3 people or 42.89% of students with a score in the class average, 2 people or 28.58% of students are below the class average and 2 students or 28.58% of students is above the class average.

Differences in Mathematic Subject Outcomes between Students Who Have the Cognitive Style of Independent Fields and the Cognitive Style of Field Dependent

The results showed that there were differences in Mathematical Subject outcomes between students who had FI cognitive styles and students who had FD cognitive styles. The average learning outcomes of students who have a cognitive style of FI are higher than the average learning outcomes of students who have FD cognitive styles. Where I XFI = 21.2 while I XFD = 17, 71. Thus, the proposed hypothesis is that students who have the cognitive style of FI obtained Mathematical Subject outcomes higher than students who have the cognitive style of FD accepted. The findings of the results of this study support the results of research obtained by Irene et al (2014), Muzaini (2015), and Sudarman et al (2016), where students who have cognitive styles of FI have higher Mathematical Subject outcomes than students who have FD cognitive styles.

Students who have a cognitive style of FI obtain higher Mathematical Subject outcomes than students who have FD cognitive styles, this is suspected because: First, students who have FI cognitive styles in the learning process likes fields that require analytical skills and the ability to analyze things -Abstracts such as mathematics while students who have cognitive styles of FD tend to choose fields oriented to subjects related to society such as the field of social science. When students like a field of science, enthusiasm and interest will appear. Enthusiasm and interest in a lesson make students a good learner (Pound, 2011: 15). FI Student Interest in Mathematics Affects Mathematic Subject Outcomes Better than

Mathematic Subject Outcomes of FD Students. This is seen from the results of research where student Mathematic Subject outcomes that have FI cognitive styles are taught with problem posing models and are taught with direct learning models than Mathematical Subject outcomes that have FD cognitive styles that are taught with the problem posing and direct learning models .

Second, this is allegedly because students who have FD cognitive styles require external motivation in their activities or learning. While students who have cognitive styles FI like to try new things without the help of the teacher. According to Uno (2014: 122-123) external motivation arises due to stimuli from outside the individual. Internal motivation does not require stimulation from outside because it exists in the individual itself. Intrinsic motivation is stronger than external motivation. The emergence of motivation to learn will be born power to learn seriously where the consequences of learning will give birth to the success of learning. Intrinsic motivation possessed by FI students affects Mathematic Subject outcomes. Mathematic Subject Outcomes of FI Students who are better than the learning outcomes of FD students mathematics.

Third, the purpose of learning mathematics and the nature of learning mathematics which has a core of problem solving. Students who have an independent field cognitive style have the ability to solve problems. Students who have a cognitive style of field dependent tend to require guidance in solving problems. Students who have an independent field cognitive style will provide higher learning outcomes than students who have a cognitive style of field dependent.

CONCLUSION

Based on the results of research and discussion that had been previously raised, it can be concluded that:

1. Mathematic Subject Outcomes Students who are taught with posing problem models are higher than the learning outcomes of students who are taught with learning models are directly tested scientifically and empirically.
2. Students who have cognitive styles FI obtain higher Mathematical Subject outcomes than Mathematic Subject outcomes students who have FD cognitive styles. Mathematic Subject outcomes students who have FI cognitive styles with an average of 21.85 higher than student Mathematic Subject outcomes who have FD cognitive styles with an average of 17.33.

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