ATLANTIS PRESS

Advances in Social Science, Education and Humanities Research, volume 178

1st International Conference of Innovation in Education (ICoIE 2018)

The Influence of Treffinger Model on Creative Thinking Ability in Terms of Cognitive Style

1st Marjoni Mawardino
Mathematics Department
State University of Padang
Padang, Indonesia
marjonimd@gmail.com

2nd Ahmad Fauzan
Mathematics Department
State University of Padang
Padang, Indonesia
ahmad.zan66@gmail.com

***Abstract*-- This study aims to see the effect of the Treffinger model on students' creative thinking skills. The method used is Quasi-Experiment. The research subjects were 7th grade students of Junior High School in Padangpanjang city. The data were collected through creativity tests by using t-test. The results showed that the experimental thinking ability of creative thinking was better than the control class. It can be concluded that the Treffenger model contributes to the improvement of the ability in creative mathematical thinking.**

Keywords--creative thinking ability, cognitive style, Treffinger , conventional learning

I. INTRODUCTION

Creative thinking is needed to design something, improve quality of life, create changing , solve problems and are needed in everyday life, even to the work place because creative thinking shows human adaptability [1] [2]. Creative thinking can enhance one's positive attitude by not knowing desperately in solving problems. The purpose of learning mathematics in the 2013 curriculum also states that one of the objectives of learning mathematic to develop students' creative thinking skills. It is important for students to have creative abilities because it will help them in solving problems that exist both in the learning process and in their lives.

In Elementary and Junior High School graduates are required to have the ability to think logically, analytically, systematically, critically and creatively, and have the ability to work together[3]. But in reality the ability to think creatively in Junior High School students is still low [4]. In fact, based on the background, creative thinking is also rarely noticed by teachers in learning mathematic. From the observations of the authors in the field, it can be seen from the way of teachers teach mathematics in school conventionally by focusing learning on training formulas, calculating exercises, and memorizing concepts. There is not visible indicator of creative thinking according to [5] where smooth thinking skills are sparking many ideas, answers, solving problems and questions, thinking flexibly that can produce the form ideas, original thinking provides answers to others and thinking in detail is developing, adding, enrich an idea.

To overcome these problems, Treffinger model is applied. Treffinger model is a model found by Donald J. Treffinger in 1980 with the following steps: basic tools or divergent creativity techniques and creative techniques. The skills of these techniques include how to develop fluency, flexibility, authenticity, detail and willingness for others. Learning activities at this stage are: (1) the teacher provides an open solution with more than one answer, (2) the teacher guides the participants to have discussions to present their ideas or ideas while providing prices for each group.

Level II or Practice with process to give students the opportunity to apply what has been learned at level I in practical situations. Proficiency in creative thinking requires the students to have skills to perform functions such as analysis, evaluation, imagination and fantasy. At this level, the cognition (cognitive) and affective factors of level I are expanded and applied. The introduction aspect of level II includes application, analysis, synthesis and assessment. The learning activities in stage II in this study are,(1)the teacher guides and directs students to discuss by giving problems (activities) to understand the material,(2)the teacher asks students to make examples in daily life.

Level III or working with real problem is by applying skills learned at level II to challenge the real world. Here the students use their abilities in ways that are meaningful to their live. In the realm of recognition (cognitive), that means involvement in asking independent and self-directed questions. Likewise in the process of learning mathematics it can be seen from the activities of students asking questions-individual questions. Learners' creative learning leads to the identification of challenges or problems, the submission of questions related to these problems, and the management of resources that lead to the development of results or products. The learning activities in stage III in this study, namely: (1) the teacher provides a problem in everyday life, (2) the teacher guides students to mention the steps in solving a problem,(3) the teacher gives rewards.

The Treffinger is kind of models that deal with the problem of creativity directly and provides practical suggestions on how to achieve integration by involving cognitive and affective skills at each level of this model [5]. In addition to the creative learning process, the divergent thinking process is used (the process of thinking in various directions and produces many alternative solutions) and the process of convergent thinking (thinking processes that seek a single answer).

A success of a person in solving the problem depends heavily on awareness of what they know and how do they do. This is related to cognitive style, namely the attitude or way of a person in organizing information and experiences that determine the way person receives, remembers, thinks and solves problems [6]. Cognitive style is related to the process used by students to organize, receive and transmit information and behavior. There are two types of cognitive styles, namely field independence (FI) and field dependence (FD)[7].

The main differences between FD and FI students in mathematic can be seen from a visual perspective. FD

students who are asked to identify the simple geometric shapes embedded in complex forms will take longer to identify simple forms of FI students, or FD students may not be able to do it at all. It means FD students are not visually responsive and have more difficulty in abstracting relevant information from visual (or even textual) teaching materials that support learning tasks [8] [9]. The incompatibility of teaching style with cognitive style is not very important for FI students, but it is very important for students with FD cognitive style [10]

It is clear that FD students are more influenced by the existing environment, so that students often fail to isolate target information[11], because other information tends to disguise what they are looking for teaching and learning process becomes more productive and valuable [12]

The research questions in this study are stated as follows: 1) Is creative thinking ability of the students taught using Treffinger model higher than that of students taught using conventional approaches?; 2) Is the creative thinking ability of students F1 taught using Treffinger model better than that of students taught using conventional approaches?; 3) Does the creative thinking ability of FD students taught using Treffinger model better than that of students taught using conventional approaches?

II. METHOD

This research is a quasi-experimental study intended to compare the treffinger model with conventional one on students' creative thinking. The variables used in this study are independent variable, independent variable as independent variable, and cognitive style as moderator variable.

The population of this study was all students of class VII of SMPN in Padangpanjang. Sampling in this study was conducted using non probability sampling and purposive sampling technique. Five schools in junior high schools at Padangpanjang are divided into three strata, namely upper, middle and lower level schools by first looking for standard deviations. The division is based on the results of National Exam from school at Junior High School state in Padangpanjang academic year 2016/2017. The upper level school is represented by SMP 1 Padangpanjang, the middle level school is represented by S M P 5 Padangpanjang, and the lower level school is represented by SMP 4 Padangpanjang. In every school, there were two classes selected as the sample classes; experimental class and control class. Students in the experimental class learn with the Treffinger model while those in the control class learn with conventional learning.

Data in this study were obtained through cognitive style tests and creative thinking ability tests. Students' cognitive style is detected using GEFT (Group Embedded Figure Test) while creative thinking skills are taken from tests given to students. The test used was validated by two mathematic lecturers and one mathematics teacher, and then the test was tried out on another class VII which had the same characteristics as the sample class to determine the validity and reliability of the test. Indicators of communication skills used in the test are 1) Elaboration, 2) Fluency, 3) Flexibility, and 4) Originality. The data were analyzed using Mann Whitney U and t-test after being tested for normality and homogeneity.

III. III. RESULT AND DISCUSSION

Based on data analysis, the students' creative thinking abilities are classified based on the Treffinger model applied during the learning and cognitive styles of students can be seen in Table 1 and Table 2.

TABLE I. AVERAGE SCORE OF PARTCIPANTS' CREATIVE THINKING ABILITY

Strata	Sample Class	Average	*s*
Upper	Experiment	79.59	1.9
	Control	69.4	2.4
Middle	Experiment	73.06	1.6
	Control	65.03	1.7
Lower	Experiment	65.2	1.7
	Control	63.27	1.9

Table 1 shows that the average score of students who learn using the Treffinger model is higher than that of students learn using conventional approach. The standard deviation of the experimental class score is lower than that of the control class; it shows that the experimental class score is more homogenous.

TABLE II. AVERAGE VALUE OF CAPABILITY TO CREATIVE PARTICIPANTS BASED ON COGNITIVE STYLE.

Strata	Cognitif Style	Sample Class	Average	*S*
Upper	FI	Experiment	85.42	1.02
		Control	82.66	2.06
	FD	Experiment	76.88	1.40
		Control	56.90	2.70
Middle	FI	Experiment	77.00	1.19
		Control	76.14	7.40
	FD	Experiment	71.75	1.70
		Control	61.08	1.60
Lower	FI	Experiment	79.25	1.00
		Control	70.00	1.40
	FD	Experiment	64.00	1.80
		Control	59.72	1.96

Table 2 shows the average number of good participants who have the cognitive style of FI and FD who learn using the Treffinger model. Their average score is higher than that of students learn using conventional approaches. Overall, it can be concluded that students who have FI cognitive style has the highest average scores compared to others.

To find out the test used in hypothesis testing, a normality and homogeneity test is carried out. The tests carried out were assisted by *SPSS software*. The result of the test can be seen in Table 3 and Table 4.

TABLE III. NORMALITY TEST RESULTS

Strata	Sample Class	Sig.
Upper	Experiment	0.001
	Control	0.040
Midle	Experiment	0.013
	Control	0.044
Lower	Experiment	0.013
	Control	0,046

Table 3 shows that all sample classes have a Sig value. < 0.05 indicate that the sample class value is not normally distributed. Next, Mann Whitney U test was carried out with the following results.

TABLE IV. TEST MANN WITHNEY U

Strata	Sig.
Upper	0.017
Middle	0.049
Lower	0.045

The result of hypothesis test in Table 4 shows that the value of Sig. is <0.05. So it can be declared that H_0 is rejected showing that creative thinking ability of the students who learn using the Treffinger model is better than that of students who learn using conventional approaches.

TABLE V. NORMALITY TEST RESULTS BASED ON COGNITIVE STYLE

Strata	Cognitif Style	Sample Class	Sig.
Upper	FI	Experiment	0.001
		Control	0.200
	FD	Experiment	0.015
		Control	0.200
Middle	FI	Experiment	0.132
		Control	0.000
	FD	Experiment	0.045
		Control	0.200
Lower	FI	Experiment	0.234
		Control	0.910
	FD	Experiment	0.213
		Control	0.161

From table 4, it can be seen that for upper and middle level schools with FI and FD students are not normally distributed, while for lower level schools with FI and FD students are normally distributed. Then the homogeneity test for the lower level is carried out, with the help of SPSS software, the sig value is obtained. 0.510 > 0.05, which means homogeneous data that will be followed by t-test. Furthermore, for the upper and middle level schools Mann Witney U test was conducted. The following data were obtained.

TABLE VI. RESULTS OF U AND TEST MANN WITHNEY TEST

Strata	Cognitive Style	Sample Class	Sig.
Upper	FI	Experiment	0.756
		Control	
	FD	Experiment	0.007
		Control	
Midlle	FI	Experiment	1.00
		Control	
	FD	Experiment	0.035
		Control	
Lower	FI	Experiment	0.475
		Control	
	FD	Experiment	0.034
		Control	

The result of hypothesis in Table 6 shows that for all levels of schools, the Sig value obtained by FI students is > 0.05. So H_0 is accepted indicating that there is no significant difference of creative thinking ability of the students who have FI cognitive style taught using Treffinger and those taught using conventional models. Meanwhile the average score of the students with FD cognitive style is Sig. < 0.05 indicate that H_0 is rejected. In other words, creative thinking ability of the students who have FD cognitive style taught using Treffinger model is better than that of students taught conventionally.

IV. CONCLUSIONS

Based on the results of the research, it is concluded that there is no significant difference of creative thinking ability of the students who have FI cognitive style taught using Treffinger and those taught using conventional models. In addition creative thinking ability of the students who have FD cognitive style taught using Treffinger model is better than that of students taught conventionally.

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