

Influence of Creative Problem Solving (CPS) Mathematics Learning Model to Mathematical Problem Solving and Self-Efficacy Students of SMA Negeri 3 Binjai

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Abstract— This study aims to: (1) describe the differences in mathematical problem solving ability among students who follow the learning with CPS model and follow the learning with conventional model. (2) To describe the difference of mathematical Self-Efficacy between students who follow the learning with CPS model and who follow the learning with conventional model. (3) To describe the process of completion of answers made by students in solving problems about problem solving skills on learning model of Creative Problem Solving and conventional learning. This type of quasi experimental research. Population of all students of SMA Negeri 3 Binjai. Sumpel uses a cluster sampling technique. Population of all students of SMA Negeri 3 Binjai. Sumpel uses a cluster sampling technique. The XIPA-3 class (38 students) is taught with the Creative Problem Solving model and the XIPA-2 class (38 students) is taught Conventional. The instruments used consisted of problem solving and mathematical communication test. The analysis used T-test. The result of the research shows that: (1) the problem solving ability of students who follow the learning of mathematics with CPS model is better than those that get the learning with conventional model. (2) Self-Efficacy of students who follow the learning of mathematics with model CPS is better than those that get learning with conventional models. (3) The process of solving student answers with Creative Problem Solving model better than conventional

Keywords—problem solving, self-efficacy, creative problem solving.

I. INTRODUCTION

To face the globalization era, it is needed to master mathematic earlier, so that it is suggested to learn mathematics for young learners since in primary level to make them think logically, analytically, critically and independently, moreover they will be able to work together in their society. Cockroft (1982) [5] stated that mathematics is needed to be taught to students because: (1) it is always used in our daily life; (2) all subjects need suitable mathematics (3) it is an effective communication; (4) it can be used to present information in various ways; (5) it can develop thinking skill logically, accurately and (6) it can satisfy when solving a challenging problem. So that our government has tried to improve the education system, one of them is by improving the curriculum.

Hendriana and Soemarno (2014) [7] said that KTSP (2006) has been revised in curriculum 2013, putting the goal of learning mathematics as follows:

- 1) to understand mathematic concept, to explain the relationship between the concept and to apply the concept or algorithm accurately in problem solving,
- 2) to think logically about the features and characteristics, to do mathematic manipulation in generalizing, proving or explaining ideas and mathematic statement.
- 3) to solve problem including problem solving understanding, planning mathematic model, solving the model and predicting the solution.

- 4) to communicate the ideas with symbol, table, diagram, or other media to clarify to situation or problem, and
- 5) to respect the use of mathematic in the real life, to develop curiosity, attention and passion in learning mathematic, to build up confidence in problem solving as well.

Basically, curriculum 2013 has a vision in which the knowledge cannot be transferred to the students by the teachers straight away. Students are the subject who need to find out and follow the process as active learners to gain their knowledge. To make it real, in learning process, the students must be given chances to gain their knowledge in cognitive process. So that, they will be able to try harder, understand and apply it because of the encouragement of the teachers.

Ruseffendi (1991) [15] stated that problem solving skill is very important, not only for those who take mathematics, but also for everyone to apply in the real life. At this time, learning mathematics should be started with an introduction based on situation (contextual problem). By giving contextual problem, the students will be guided step by step to master mathematic concept.

In fact, the education does not do it. Trianto said that our learning process up today is still dominated by the teachers and does not give any access for the children to develop independently from their own findings. Teachers used to do conventional teaching method, the teachers only transferring the knowledge, while the students as receivers.

According to Armanto (2002) [3] this tradition has been Indonesian teachers' characteristics in teaching. Conventional learning process is teacher center, teacher explains and the students are passive, the questions from the students are rare, one right answer oriented and the class activity is writing or copying. These activities will not bring up the students skill in problem solving, analytically and mathematic communication. As the result, cognitive thinking skill of the student is very weak because of requiring low thinking skill. This reality was also found in mathematics learning process of year ten SMA Negeri 3 Binjai, especially on the topic of quadrate function. Based on the observation at that school, they did not show high thinking skills toward the given assessment. The assessment was given to 38 students, 5 of them did not answer, 10 of them answered correctly, and 23 students answered wrongly.

Disability of the students in problem solving above was also effected by their presence. Arends (in Trianto 2009) [17] stated "*it is strange that we expect students to learn yet seldom teach them about learning, we expect student to solve problems yet seldom teach them about problem solving.*" This implies that as teachers, we need to guide them more in problem solving.

To overcome the poor of problem solving among the students in Indonesia, teachers have responsibility to think and do appropriate learning process.

Beside of cognitive aspect which is problem solving, it is needed to increase affective aspect which is psychology aspect related to students' behaviour to support their success in learning process, especially when they are facing problem, which is called *Self-Efficacy*. *Self-Efficacy* is how someone

trust about the probability that they can do it successfully in the future and how to achieve it.

Social studies theory from Bandung which is well-known as *Social cognitive theory* in 1986 ((Brosnan, 1998; Schunk & Pajares, nd; Lennon, 2010 ; Zulkosky, 2009, dalam Nwosu & Okoye, 2014) [13] stated that: : *which is a theoretical framework regarded as "triadic reciprocal determinism" and widely accepted in predicting individual behavior using several key concepts and identifying methods in which behavior can be modified or changed.* Amir and Risnawati (2016:157) stated that *Self-Efficacy* is someone's belief towards the ability to present attitude related to the situation he is facing through. *Self-Efficacy* can be how someone thinks, motivates themselves, trusts something.

Self-Efficacy of year X SMA Negeri 3 Binjai is slow, it can be seen through how they answered the questions, they could not complete the assignment, gave up easily, some of them were nervous and lack of knowledge which lead to low self-confidence.

Some factors that effected the lack of *Self-Efficacy* and problem solving skill are how the teachers teach, students' interest and respond toward mathematics itself.

Creative Problem Solving learning process gives chances to students to share their ideas and make the CONCLUSION at the end of the discussion. Their findings will be collected, filtered, shared, arranged to get the solution regarding to the problem. *Creative Problem Solving*(CPS) is an approach to students center and ability of problem solving skill (Pepkin, 2004) [14]. According to Karen (2004) [10]*Creative Problem Solving* (CPS) is an approach to problem solving skill with creativity.

The result of these two researchers was teachers should apply *Creative Problem Solving* (CPS) method because the activity will help the students to develop their self-efficacy in doing assignments.

In this case, writer is interested to do a research about "The Effect of *Creative Problem Solving* (CPS) Mathematics Learning Method towards Mathematic Problem Solving Skills and Self-Efficacy of SMA Negeri 3 Binjai Learners".

II. METHOD

This research would analyze the effect of learning mathematics with CPS model towards solving skill ability and students' *Self-Efficacy*. In this case, CPS model was given to experiment class and conventional method was given to conventional class. This was *quasy experiment* research and to have mathematic solving skill ability and *Self-Efficacy* of high school students which effected by *Creative Problem Solving* and conventional learning. All populations in this research were year ten students in ten classes, totally 368 students of SMA Negeri 3 Binjai. Sample technique was choosing groups randomly. According to Ruseffendi (2005) [15] cluster sampling is one technique of choosing sampling randomly by groups, not based on the members. As the subject sample in this research, it was chosen two classes out of ten classes. These two classes were XMIA₂ as the control class and XMIA₃ as the experiment class. Before it went

further, make sure that the population was homogeny or equally.

The research design was described as follows:

TABLE VII. RESEARCH DESIGN

Class	Treatment	Postest
Eksperimen	X	O
Control	-	O

Notes: O : Postest and X : Treatment of CPS learning method

There were two instruments which used for this test, they were test and questionnaire:

- 1) to get the data of students' ability to solve problem by cognitive test by measuring problem solving, solving planning, counting and rechecking in which the data was taken from pencil paper test.
- 2) to get *Self-Efficacy* data which was done by questionnerie

Before tested to the subject of research, the task need to be tested before we do that to experiment class. So that we can good the criteria to test it to experiment class as the subject research.

This analysis includes validity, difficulties, reliability. The result of the test as follows:

TABLE VIII. EXPERIMENT

Validity	COEFFICIENT CORELATION	0.662	0.681	0.847	0.643
	INTERPRETATION	T	T	ST	T
	t counted	3.95	4.16	7.11	3.75
	t table	1.72	1.72	1.72	1.72
	INTERPRETATION	valid	Valid	valid	valid

Based on instrument validity test result on table 3.3 shows that four of assessments related to the counting, the CONCLUSION is four of them are valid.

The difficulties level to know whether the assessment is easy, medium or hard, and four of them are medium.

To analyze this research, it was used formula t, in which the result was based on t counted > t table, it concludes that four of them were valid. The result of instrument reliability research can be seen that mathematic problem solving skill has a high reliable coefficient criteria. The data to measure students' *Self-Efficacy* was from the questioneerie created by the writer with Likert scale.

III. RESULT

The result of test normally were:

1. Students' marks of experiment class showed 0,200 of significance. If the significance was > 0,05 the data for the student's experiment class mark were normal.

2. Students marks of control class showed 0,200 of significance. This showed that the significance was >0,05, which meant the data for control class was distributed normally.

To test the homogeneity of the variables, it was used F Test (Fisher Test). The result was $F_{count} = 1,05 < F_{table} = 1,07$ and according to the test standard, it concludes that H_0 was equally given to these two homogeneity variables. After knowing the data was equal and homogeny, so the data of student's KAM tested together to know the average with t-independent test and used SPSS 21.

The average was $t_{count} = 0,333 < t_{table} = 1,668$ with 0,05 significance based on the criteria so H_0 were accepted and H_1 was rejected because there was not difference the beginning and the average result of these two classes, experiment and control class. It implies that these two classes had almost the same mathematics basic.

The Data of Post Test Mathematic Problem Solving Test and Self-Efficacy Experiment and Control Class.

After doing normality test, the result was drawn as follows:

- a. The marks for mathematics problem solving of experiment class had 0,107 significance. It implies that the mathematic problem solving was distributed normally.
- b. The marks for mathematics problem solving of control class had 0,200 significance. It implies that the mathematic problem solving was distributed normally.
- c. The marks for *Self-Efficacy* of experiment class had 0,200 significance. It implies that the *Self-Efficacy* was distributed normally.
- d. The marks for *Self-Efficacy* of control class had 0,200 significance. It implies that the *Self-Efficacy* was distributed normally.

Based on homogeneity test of mathematic problem solving in experiment class and control class, they conducted $F_{counted} = 1,22 < F_{table} = 1,71$ so the accepted H_0 and rejected H_1 were from the same variables. The homogeneity test of *Self-Efficacy* data in experiment class and control class, they conducted $F_{counted} = 1,45 < F_{table} = 1,71$ so the accepted H_0 and rejected H_1 were from the same variables.

Based on mathematic problem solving skills retest in experiment and control class using t-test independent, they showed that $t_{counted} = 2,874 > t_{table} = 1,668$ which meant accepted H_1 and rejected H_0 showed the average of mark in these two classes were different. Then, the result showed $t_{counted} = 2,874 > t_{table} = 1,668$ it meant that accepted H_1 and rejected H_0 of students who took Creative Problem Solving Class were better than conventional class in learning process. In other words, CPS method has given a significant effect toward mathematic problem solving of students.

Based on self-efficacy data of students retest in experiment and control class using t-test independent, they conducted $t_{counted} = 1,794 > t_{table} = 1,668$ which meant accepted H_1 and rejected H_0 of self-efficacy questionnaire in

experiment and control class were not the same. Then, $t_{\text{counted}} = 1,794 > t_{\text{table}} = 1,668$ which meant accepted H_1 and rejected H_0 of self-efficacy of students who took CPS method were better than conventional method. In other words, CPS has given a significant effect towards self-efficacy of students.

The average percentage of students' choice totally was 78,42 % in experiment class and 72,73 % in control class, they have been proved positive since the average percentage of students' choice was higher than the medium percentage (P=50%). Then, based on questionnaire criteria, it conducted mostly students had a good *self-efficacy*. But, in percentage of these two classes, *self-efficacy* of students in experiment class was higher than students in control class.

IV. CONCLUSION

After analyzing the data, conclusions could be drawn as the following.

1. There was a different average towards mathematic problem in these two methods (*Creative Problem Solving* and conventional) and it effected learning approaching towards mathematics problem solving of students, based on the formula $t_o > t_{\text{table}}$ which meant students' ability who used CPS method was better than conventional.
2. There was a different average of students' *self-efficacy* in these two methods (*Creative Problem Solving* and conventional) and it effected learning approaching towards *self-efficacy* of students, based on the formula $t_o > t_{\text{table}}$ which meant students' ability who used CPS method was better than conventional.
3. The process of students' learning and answering with *Creative Problem Solving* method was better than conventional method.

REFERENCES

- [1] Alexander, K. D. 2007. Effect of Instruksion In Creative Problem Solving in Coqnition, Creativity and Satisfaction among Ninth Grade Student in An Introduction To Word Agricultural Science and Technologi Cours. Disertation The Graduate Faculty Of Texas Teach University, Tersedia di <http://www.scirus.com>. [22 Maret 2017]
- [2] Arikunto, S. 1990. *Dasar-dasar Evaluasi Pendidikan*. Jakarta: PT Bumi Aksara.
- [3] Armanto, Dian 2009. *Pembelajaran Imajinatif Berbasis Lingkungan*. Makalah disajikan dalam Seminar Internasional Pembelajaran Berbasis Aneka Sumber di Unimed Medan Tanggal 21 Pebruari 2009
- [4] Bandura, A. 1994. Self Efficacy. In V.S. Ramachaudran (Ed). *Encyclopedia of human behavior, Vol 4: 71-81*
- [5] Cockcroft, W. (1982), *Mathematics counts: report of the Committee of Inquiry into the teaching of mathematics in schools*. London: HMSO. Tersedia Online <http://www.educationengland.org.uk/documents/cockcroft/> (5 Maret 2017).
- [6] Dewi, K. E. 2006. Penerapan Pendekatan Creative Problem Solving (CPS) dalam Pembelajaran Matematika untuk Meningkatkan Kemampuan Berpikir Kreatif Siswa SMP (Suatu Penelitian di Kelas Tujuh SMP Negeri 5 Bandung). Tersedia di: <http://digilib.upi.edu/pasca/available/etd-1003106-112848/> [10 Oktober 2016].
- [7] Hendriana, H.H. & Soemarno, U. 2014. *Penilaian Pembelajaran Matematika*. Bandung: PT Refika Aditama.
- [8] Hosnan M. 2014. Pendekatan Saintifik dan Konstektual Dalam Pembelajaran Abad 21. Bogor: Ghalia Indonesia.
- [9] Kadir, 2015. *Statistika Terapan*. Jakarta: PT Raja Grafindo Persada.
- [10] Karen, L. 2004. *Creative Problem Solving Atn School*. Diakses dari <http://www.uh.edu/hti/cu/2004/v02/04.htm> [22 Maret 2017]
- [11] Myrnel. M.K.2003. *Effect of Using Creatif Problem Solving In Eight Grade Technologi Education Class At Hopskin Nort Junior Hight School*. Research Paper To Submitted In Partial Fulfillment Of The Requipments For Master Of Sains Degree. The Graduate School University of Winconsin: Stout. Diakses dari <http://www.scirus.com>. Diakses pada 22 Maret 2017.
- [12] Myrnel. M.K.2003. *Effect of Using Creatif Problem Solving In Eight Grade Technologi Education Class At Hopskin Nort Junior Hight School*. Research Paper To Submitted In Partial Fulfillment Of The Requipments For Master Of Sains Degree. The Graduate School University of Winconsin: Stout. Diakses dari <http://www.scirus.com>. Diakses pada 22 Maret 2017.
- [13] Nwosu, Kingsley Chinaza & Okoye, Romy O. (2014). Students' Self-Efficacy and Self-Rating Scores as Predictors of Their Academic Achievement. Italy : Journal of Educational and Social Research. Vol. 4 No.3
- [14] Pepkin, K. L. 2004. *Creative Problem Solving In Math*. Tersedia di: <http://www.uh.edu/hti/cu/2004/v02/04.htm> [14 Februari 2017].
- [15] Ruseffendi, (1991). Pengantar Kepada Guru Mengembangkan Kompetensinya dalam Mengajar Matematika
- [16] Sudjana, *Metoda Statistika*. 2005. Bandung: Penerbit Tarsito.
- [17] Trianto, (2009). *Mendesain Model Pembelajaran Inovatif-Progresif*. Surabaya: Bumi Aksara