



The problem-solving ability in terms of self-efficacy with Creative Problem-Solving Learning

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Abstract

This study aims to determine the quality of learning with the CPS model on PSA, the CPS learning model to achieve learning mastery and to describe PSA in terms of self-efficacy. The research method used in this study was a mixed or combination method. The population in this study were eighth-grade students of Junior High-School 1 Moga in the academic year of 2018/2019, and by using random sampling the class VIII H was chosen as the experimental class. The data collection methods used in this study were documentation, observation, tests, interviews, and self-efficacy scale. The results of this study indicate that (1) The quality of learning with the CPS model on students' PSA is very good; (2) Students' PSA in the CPS learning model achieve learning mastery; (3) Students with high problem-solving ability are able to achieve all indicators of problem-solving ability and self-efficacy perfectly, students with moderate problem-solving ability have not been able to achieve all indicators of problem-solving ability and self-efficacy perfectly, and students with low problem-solving ability has not been able to reach all indicators of problem-solving ability and self-efficacy.

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1. Introduction

Mathematics learning is closely related to efforts to improve students' mathematical abilities. NCTM (2000) defines mathematical abilities as 1) problem-solving ability, 2) reasoning ability, 3) ability to communicate, 4) ability to make connections, and 5) ability to represent. This shows that problem solving is one of the important abilities that must be developed in students since in problem-solving abilities students are emphasized to use processes and strategies in solving mathematical problems.

Problem-solving ability is the most important thing, but there are still many students who have weak problem-solving abilities. Based on the results of the survey by PISA (Program for International Student Assessment) which is held every three years, for 2009. according to the OECD (2010), as many as 43.6% of Indonesian students are able to solve routine problems whose context is still common, 32.7% of students are able to solve mathematical problems using formulas, and 16.4% of students are able to carry out

procedures and strategies in problem-solving. Meanwhile, 5.4% of students can connect problems with real-life and 1.8% of students are able to solve complex problems and are able to formulate and communicate their findings. In this year the score obtained in the field of mathematics was 371. Whereas for the 2015 survey, there was an increase in mathematics with an average score of 386. However, the average score was still below the average score of other countries following the PISA survey.

The importance of problem-solving ability was stated by Hudojo (2003) that problem-solving is a very essential thing in mathematics learning, with the reasons: (1) students become skilled at selecting relevant information, then analyzing it and finally examining the results; (2) intellectual satisfaction will arise from within; (3) the intellectual potential of students increases; (4) students learn how to make discoveries through the process of making discoveries. Based on these things it is clear that problem-solving ability is an important thing that students must have in learning mathematics. However, students often experience

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difficulties in working on math problems due to lack of confidence or pessimism to be able to do so that there is a need for strong self-efficacy in learning.

According to Novianti (2018), self-efficacy is the belief in the ability possessed, factors that affect one's performance in achieving a particular goal, and one's actions in dealing with problems. According to Damaryanti (2017), Self-efficacy itself is related to someone's assessment of their ability to complete a particular task or project. In addition, efforts to improve students' problem-solving abilities are the responsibility of the teacher. Teachers are required to think and implement learning according to their needs and can help students to improve their problem-solving abilities. Therefore, it is necessary to develop learning models based on problem-solving. One of them is the Creative Problem Solving learning model or abbreviated as CPS.

One of the lessons that can be used to achieve optimal problem-solving abilities and skills is the Creative Problem Solving (CPS) learning model (Utami, et.al., (2015). According to Pujiadi et.al (2015), "CPS learning model is a model of learning that focuses on teaching and problem-solving skills." This means that the CPS learning model is a learning model that focuses or centered on learning and problem solving skills, while according to Yuliani et al. (2018) CPS is one of the learning models used in efforts to create problem solutions in creative and imaginative ways so as to encourage students to be more skilled and creative. Students are accustomed to using creative steps in solving problems.

The CPS learning model has developed since it was first introduced by Alex Osborn. According to Treffinger et al. (2006), over its history (more than five decades of research, development, and practical experience with groups), CPS has become a very dynamic model. CPS has grown and changed continuously in an effort to present the strategies and actions as effectively as possible. Many experts have developed CPS from CPS Version 1.0 by Alex Osborn, to the latest CPS Version 6.1 by Treffinger, Isaksen, and Dorval. The CPS used in this study is CPS Version 6.1. The learning syntax of CPS Version 6.1 in Treffinger et al. (2006), are (1) Understanding the Challenge, (2) Generating Ideas, and (3) Preparing for Action.

Based on the description above, as an effort to improve problem-solving skills in terms of self-efficacy in one of the junior high-schools in

Pemalang, the researcher is interested in conducting research with the title of "The Problem Solving Ability in terms of Self Efficacy with Creative Problem Solving Learning Model for Eighth-Grade Students".

2. Method

The method used in this research was mixed or combination research method. The research design used in this study was a sequential explanatory, in which the first stage is collecting and analyzing quantitative data then followed by collecting and analyzing qualitative data that was built based on quantitative initial results. The population in this study was eighth-grade students of Junior High-School 1 Moga. Samples were taken by random sampling technique, so that class VIII H was obtained as an experimental class. The research subjects were taken using a purposive sampling technique, in order to obtain 3 subjects with high PSA, 3 subjects with moderate PSA, and 3 subjects with low PSA for each self-efficacy with high, medium, low categories. The research methods used were the method of documentation, tests, scales, interviews, and observations. The documentation method was used to obtain data on mathematics test scores in the even semester. The test method was used to collect data on students' problem-solving abilities after learning mathematics by applying the Creative Problem Solving learning model. The scale method was used to measure students' self-efficacy which was then used to classify into high, medium, and low groups. The interview method was conducted with the aim of knowing and capturing directly all information from the research subject related to the problem-solving ability in terms of students' self-efficacy. The observation method was used to obtain information about the behavior of the research object. Qualitative data analysis was performed by the stages of data reduction, data presentation, and conclusions.

3. Results and Discussion

3.1. Quality Of Learning

Learning with the Creative Problem Solving model is said to be of quality if, at the planning stage, the implementation stage, and the evaluation stage has good minimal criteria. The planning phase consists of the validation of learning tools consisting of syllabus, lesson plans, and worksheets. The

implementation phase of learning is by using the teacher skills observation sheet. While the learning evaluation stage includes the assessment of quiz results and test results of problem-solving abilities.

Table 1. The results of creative problem solving learning quality assessment

Quality Aspect	Component	Score	Criteria
Planning	Syllabus	90,83	Very good
	Lesson Plan	85,33	Very good
	Student Worksheet	85,83	Very good
	Self Efficacy Questionnaire	83,5	Very good
	Trial Questions	74,67	Good
Implementation	Teacher Skills Observation Sheet	84,21	Very good
	Quiz	74,97	Very good
Average		82,76	Very good

Based on Table 1, it can be seen that each component has very good criteria. So it can be concluded that the quality of Creative Problem Solving learning towards problem-solving ability has very good quality

3.2. Learning Mastery

Mathematical problem-solving ability tests were conducted on Monday, May 13th, 2019 by using questions in the form of descriptions given to students of the class VIII H of Junior High-School 1 Moga as many as 31 students. The problem-solving ability test aimed to find out whether learning with the Creative Problem Solving model achieves learning mastery and the test results were also used as a consideration to determine the research subject.

The stages used for problem-solving were the stages according to Polya with the indicators according to the Regulation of Minister of Education of Indonesian Republic No. 58 of 2014 concerning the Kurikulum 2013 in Junior High-School / MTs in Table 2.

Table 2. Data on test results for problem solving capabilities

Data	
Number of students	31
Highest score	97,14
Lowest score	41,43
Average	74,38
Deviation Standard	12,87
Minimum Achievement Criteria	70
The number of students who passed the criteria	25
The number of students who didn't pass the criteria	6

Based on the results of the problem-solving ability test shows that the data from the problem-solving ability test scores are normally distributed. After that completeness test was done to find out whether learning with the Creative Problem Solving model in statistics material for eighth-grade students can achieve learning mastery. The calculation was done with the right-hand proportion test. The results obtained based on calculations were $z_{count} = 0.72$ and $z_{table} = 1.64$. H_0 is rejected if $z_{count} \leq z_{table}$. Obviously $z_{count} = 0.72 \geq z_{table} = -1.64$, so H_0 is accepted. So the proportion of students who get a value of ≥ 70 is more than equal to 75%. So, students' problem-solving skills in statistical material with Creative Problem Solving learning models reach classical completeness criteria.

3.3. Category Problem Solving Ability in the Terms of Self Efficacy

The selection of subjects in this study was based on the results of the problem-solving abilities test and the results of the self-efficacy questionnaire. In addition, the selection of research subjects is also based on student activity during the learning process and recommendations from observers which is the mathematics teacher of eighth-grade students in Junior High-School 1 Moga. Based on the results of the problem-solving ability test and the results of the mathematics self-efficacy questionnaire of class VIII H, the results of the grouping of the two classifications are given in Table 3.

Table 3. Results of PSA and SE grouping of the class VIII H students

PSA	SE			Total
	H	M	L	
H	E-9, E-15, E-19	E-31	-	4
M	E-8, E-11	E-1, E-3, E-4, E-6, E-7, E-10, E-13, E-14, E-16, E-18, E-20, E-22, E-26, E-28, E-29, E-30,	E-12, E-23, E-24	21
L	-	E-2, E-17, E-25, E-27	E-5, E-21	6
Total	5	21	5	31

Explanation, PSA = Problem Solving Ability, SE = Self Efficacy, H = High, M = Medium, L = Low

Based on Table 3 there were 4 students who have high problem-solving abilities with 3 students having high self-efficacy and 1 student with moderate self-efficacy. For medium category problem-solving abilities, there were 21 students with 1 student having high self-efficacy, 15 students having moderate self-efficacy, and 5 students with low self-efficacy. Whereas for the problem-solving ability of the low category students there were 6 students with 4 students having medium self-efficacy and 2 students having low self-efficacy. The results of grouping in Table 2 were then selected in each classification of problem-solving abilities with self-efficacy of 1 subject each based on the results of identification so that the selected subjects in Table 4 were obtained as follows.

Table 4. Selected research subjects

KPM	SE		
	H	M	L
H	E-15	E-31	-
M	E-8	E-6	E-12
L	-	E-17	E-21

Explanation, PSA = Problem Solving Ability, SE = Self Efficacy, H = High, M = Medium, L = Low

3.3.1. High Category Problem Solving Ability in the Terms of Self Efficacy

In this study, interview subjects for problem-solving skills with high categories were E-15 and E-31. With E-15 having high self-efficacy and E-31 having self-efficacy which was based on the results of the self-efficacy questionnaire. The problem-solving ability of students can be seen from the problem-solving ability test which consists of 5 problem descriptions and then the test results are categorized into high, medium, and low. Subjects E-15 and E-31 were interviewed regarding the results of written work on the problem-solving ability test based on interview guidelines using the dimension on self-efficacy. Saravani et.al (2017: 99) suggested that "Students with higher self-efficacy, in comparisons with students with lower self-efficacy, were much more accurate in mathematical calculations and were more persistent when solving a hard problem". This means that students with higher self-efficacy, compared to students with low self-efficacy, are far more accurate in mathematical calculations and more persistent when solving difficult problems.

The E-15 subject based on the interview results had a high enough dimension of magnitude by being able to overcome various levels of difficulty given for each stage of problem-solving. Almost all items given could be solved well and confidently. In the Strength dimension the subject E-15 was confident that he could determine the right plan for solving the problem and was sure that the answer he wrote was correct. As for the generality dimension, subject E-15 was able to find information that was not known in the problem and was confident of being able to solve problems with various types given for each problem given the problem-solving ability. This is in line with research Yuliyani et.al (2017) stated that self-efficacy has a significant effect on positive thinking, this provides an understanding that the better the students' self-efficacy, the more they able to control the level of abilities and efficacy good self will affect the ability of students to solve mathematical problems.

The E-31 subject was not much different from the E-15 subject even though the questionnaire of the subject E-31 had medium self-efficacy. Based on the results of the interview the subject E-31 had a high magnitude dimension by being able to overcome various levels of difficulty given for each of the stages of problem-solving. Almost all items given can be solved well and confidently. But on the subject E-31 there were more errors in

working on the problems. In the Strength dimension, the subject E-31 was confident that he could determine the right plan for solving the problem and was sure that the answer he wrote was correct. As for the dimension of generality, subject E-31 was able to find information that was unknown in the problem and was confident of being able to solve the problem with various types given for each problem-solving ability problem given.

Both subjects E-15 and E-31 had satisfying results of the problem-solving abilities and interviews of written work results. The results obtained by both subjects showed that they were able to understand the problem, plan problem solving, carry out the problem-solving plan, and check back completely and accordingly (Fajariah, et.al, 2017).

3.3.2. *Medium Category Problem Solving Capability in the Terms of Self Efficacy*

In this study, the interview subjects for the ability to solve problems with the medium category were E-8, E-6, and E-12. With E-8 subjects having high self-efficacy, E-6 subjects had moderate self-efficacy, and E-12 subjects had low self-efficacy based on the results of the self-efficacy questionnaire that was filled out and analyzed. The problem solving ability of students could be seen from the problem solving ability test which consisted of 5 problem descriptions and then the test results were categorized into high, medium, and low. Subjects E-8, E-6, and E-12 were interviewed about the results of the written work on the problem-solving ability test based on interview guidelines using dimensions of self-efficacy at each stage. According to Saravani et.al (2017) "self-efficacy is a key factor affecting students' learning and progress" which means that self-efficacy is a key factor affecting student learning and progress.

The E-8 subject based on the interview results had a high enough dimension of magnitude by being able to overcome the various levels of difficulty given for each of the stages of problem solving. Almost all items given could be solved well and confidently. In the Strength dimension the subject E-8 was confident that he could determine the right plan for solving the problem and was sure that the answer he wrote was correct. As for the generality dimension, the subject E-8 felt confident that he can find information that was not known in the problem but was not sure to be able to solve problems with various types given in

some of the material that had been taught. Positive activities that experienced an increase also became part of an increase in self-efficacy. The impact of increasing self-efficacy and activity was that students' problem solving abilities would also increase.

The E-6 subject was not much different from the E-8 subject even though in the questionnaire the E-6 subject had self-efficacy in the medium category. Based on the results of interviews the subject E-6 had the confidence to be able to overcome the various levels of difficulty given and could overcome them for each of the stages of problem-solving. Almost all items given can be solved well and confidently. But on the subject E-6 there were more errors in working on problems such as miscalculations at the stage of solving problems according to plan so that indicators of problem-solving ability had not been reached. In the strength dimension, the subject of E-6 was confident that he could determine the right solution to solve the problem and was sure that the written answer was correct. However, the results of the written work still could not determine the completion plan. As for the generality dimension, subject E-6 was able to find information that was not known in the problem and was confident of being able to solve the problem with various types given for each problem given the problem-solving ability.

E-12 subjects had low self-efficacy in the results of self-efficacy questionnaire. Based on the results of interviews the subjects E-12 did not have the confidence to be able to overcome the various levels of difficulty given and had not been able to overcome them for each of the stages of problem-solving. Almost all of the items given were still in error. In the strength dimension, the subject of E-12 was confident that he can determine the right solution to solve the problem and believes that the answer written was correct. However, the results of the written work still had a finishing without specifying a finishing plan. As for the generality dimension, subject E-12 was able to find information that was not known in the problem but was not sure that he was able to solve problems with various types given for each problem-solving ability given.

The results of the analysis of interviews of the three subjects are that students with medium problem-solving skills have different self efficacy. Saravani et.al (2017: 99) argues that "it often seems that being good at school might lead to an

increase in students' positive academic self efficacy".

3.3.3. Low Category Problem Solving Ability in the Terms of Self Efficacy

In this study, interview subjects for problem solving skills with low category were E-17 and E-21, with subject E-17 had moderate self-efficacy and subject E-21 had low self-efficacy based on the results of the self-efficacy questionnaire that was filled out and analyzed. The problem-solving ability of students can be seen from the problem-solving ability test which consists of 5 problem descriptions and then the test results were categorized into high, medium, and low. Then the subjects E-17 and E-21 were interviewed about the results of the written work on the test of problem-solving abilities based on interview guidelines by using dimensions on self-efficacy at each stage.

Subject E-17 had self-efficacy in the medium category based on the results of the self-efficacy questionnaire. Based on the results of interviews, the subject E-17 did not have the confidence to be able to overcome the various levels of difficulty given and had not been able to overcome them for each stage of problem-solving. Almost all of the items given were still in error. In the strength dimension, the subject of E-17 was not sure that he can determine the right solution to solve the problem and was not sure that the answer written was correct. In addition, most of the results of the written work had no finishing plan and there was 1 problem that had not been resolved. As for the generality dimension, subject E-17 had not been able to find information that was not known in the problem and was not sure that he can solve the problem with various types given for each problem-solving ability given.

E-21 subject had low self-efficacy in the results of the self-efficacy questionnaire. Based on the results of interviews the subject E-21 did not have the confidence to be able to overcome the various levels of difficulty given and had not been able to overcome them for each stage of problem-solving. Almost all of the items given were still in error. In the strength dimension, the subject of E-17 was not sure that he can determine the right solution to solve the problem and was not sure that the answer written was correct. In addition, the majority of written work results did not have a settlement plan and there were 2 questions that had not been resolved. As for the generality dimension, E-21 subject had not been able to find information that was not known in the problem and was not sure

they can solve problems with various types given for each problem solving ability given so it was clear that the E-21 subject had a low level of self-efficacy and low problem-solving ability.

Both of these subjects had not been able to achieve the indicators of self-efficacy and problem-solving ability. These results are in line with research by Yuliyani et.al (2017) which suggested that the higher the students' self-efficacy, the more positive the results obtained and the lower the self-efficacy the students' positive thinking ability will also be low. In addition, according to Utami & Wutsqa (2017), some factors that are thought to cause low problem-solving abilities among students is that students are not accustomed to non-routine problem solving, students easily give up in solving problems, students are less active to ask questions, and learning methods which are applied by the teacher does not increase the activeness of students in learning.

4. Conclusion

The conclusions obtained in this study are (1) The quality of Creative Problem Solving learning towards problem-solving ability has very good criteria; (2) the problem-solving ability learning with the Creative Problem Solving model reaches the learning mastery; and (3) Students with high problem-solving ability are able to achieve all indicators of problem-solving ability and self-efficacy perfectly, students with medium problem-solving ability have not been able to reach all indicators of problem-solving ability perfectly and self-efficacy perfectly, and students with low problem-solving ability have not been able to reach all indicators of problem-solving ability and self-efficacy.

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