

The Creative Problem Solving (CPS) Learning Model Effect on Students' Mathematics Learning Results at Junior High Schools of Dumai City

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Abstract. This study aims to see the Creative Problem Solving (CPS) learning model's effect on the mathematics learning result of eighth-grade students of State Junior High School 21 (SJHS) Dumai. The quasi-experimental with a non-equivalent control group approach are proposed in this research. Purposive sampling was the correct technique to complete the study. To know which one was the best, two classes were used to compare the learning result. One type used CPS, and others used conventional learning. The data collection instrument was in the form of pretest and posttest questions. The data collection technique in this study was done by using a test technique. Data analysis were normality, homogeneity, t-test. The results showed an effect of CPS on the mathematics learning outcomes of the experimental and control class students. Results showed that a significant difference was acquired between CPS and conventional learning. This can be seen from $t\text{-count} > t\text{-table}$ which is $4.47 > 1.67$. Following the criteria, H_0 is rejected, and H_1 is accepted. The conclusion was a significant effect of the CPS learning model on the mathematics learning results of eighth-grade students of SJHS 21 Dumai.

Keywords: *Creative Problem Solving, Learning Outcomes, Junior High Schools*

1. INTRODUCTION

Education is a dynamic and continuous process and is tasked with meeting the needs of students and educators according to their individual needs. Education also forms intelligent and knowledgeable human beings who are needed now or in the future [1]. Education also has a responsibility to improve, expand, and develop students' knowledge and help students so that you can answer challenges and solve the problem faced in life. Educational goals are a set of educational outcomes achieved by students after implementing educational activities. All educational activities, namely teaching guidance or training, are directed to achieve academic goals. Education in Indonesia aims to develop the potential that exists in him. This potential can be measured from knowledge, skills, attitudes, and values so that students can control themselves in social life and can provide benefits to the community.

One of the learning materials that require innovation in the implementation of the learning process is mathematics. This is because many students have difficulty understanding mathematics learning materials. Whereas mathematics learning is important

to be given to students, because through mathematics learning students will be trained to think critically, creatively, analytically, and systematically [2]. Mathematics is knowledge is important and has a contribution in everyday life. Through learning mathematics, students are trained to be patient, thorough, and more careful in order to increase their knowledge [3].

The factors that cause students to have difficulties in learning mathematics are, (1) the concept of learning mathematics which is considered abstract [2], (2) students tend to read the learning material directly without understanding the concept first [4], (3) students often make calculation errors and do not understand the questions presented [5].

However, when viewed on a micro level, the current educational problems are rooted in problems at the smallest level of education units, namely schools. Schools have not been able to optimally carry out their duties, therefore teachers as the most important element in a school institution must carry out their functions and roles to the fullest. To carry out the functions and roles optimally, teachers must have expertise in their respective fields, one of which is in mathematics. Mathematics is the main subject in the field of science. Mathematics is the study of numbers and their calculations, discussing numerical problems, patterns, ways of thinking, collections of systems, structures and tools.

Learning is something that has been regulated according to procedures which include humans, facilities/tools, and procedures that influence the achievement of learning objectives [6]. There is a two-way interaction involving teachers and students, where there is directed communication to achieve the specified goals [7]. Learning outcomes are characterized by changes in behavior. Changes in behavior as a result of learning can also touch changes in affective aspects, including changes in emotional aspects [8].

The suitable learning model can foster students' enjoyment of the lesson and increase their enthusiasm in doing the exercises, thus making it easier for them to achieve the desired learning outcomes. Solving a problem is the main focus of the problem-solving model, followed by strengthening students' skills. If students are given a question, then students can do problem-solving to solve the question. So that problem solving can expand the thinking process of these students. Therefore, the researchers tried to use the CPS to see the final result, namely the effect on the mathematics learning outcomes of eighth-grade students of SMPN 21 Dumai. CPS is a new creation of the learning process with systematic techniques to solve a problem. CPS is a model that requires high creativity both by teachers and students to find and solve learning problems in the classroom [9].

CPS is a learning type that developed from various creations with the target of solving problems through structured techniques [10]. CPS is creations learning model with a focus on ideas or alternatives the effective and efficient solution to solve a problem using thinking processes of divergent and convergent [11].

Students are trained to find solutions to problems given by the teacher actively, logically, and creatively by following predetermined steps including problem clarification,

idea disclosure, evaluation and selection, and implementation. In the learning process, students use all their thoughts, choose a solution strategy, and process until they find a solution to a problem solving and classroom arrangement in the form of group discussion.

From the observations made by researchers at Junior High School 21 Dumai on October 4, 2017, teachers still use conventional methods, namely questions and answers, lectures, and practice questions in teaching. So that the learning process of students is focused on the front of the class and students tend to be busy with their respective activities and do not pay attention to the teacher. There are many alternatives what can be done to improve the learning process of mathematics in the classroom, so that it will increase the learning outcomes of mathematics. Among them is by making teaching materials and using a learning model that can motivate students to be active both individually and in groups in learning and also develop students' problem solving abilities in solving problems.

Stated that the CPS model can improve the ability in solving a problem. CPS learning is a learning strategy that focuses on teaching students in solving a problem so students can solve various learning problems when learning with teachers. Students are trained to find solutions to problems given by the teacher actively, logically, and creatively by following predetermined steps including problem clarification, idea disclosure, evaluation and selection, and implementation. In the learning process, students use all their thoughts, choose a solution strategy, and process until they find a solution to a problem solving and classroom arrangement in the form of group discussion.

Description above explains the researcher suspects that the CPS model has an effect on student learning outcomes, therefore the researcher wants to conduct a study with the title "The Creative Problem Solving (CPS) Learning Model Effect on Students' Mathematics Learning Results at Junior High Schools of Dumai City".

2. RESEARCH METHOD

This research was implemented at State Junior High School 21 Dumai. The research type was quasi-experimental with the Nonequivalent Control Group Design. The first group is the experimental class and the second group is the control class. The practical class is treated with CPS, and the control class is treated with conventional learning. The research design is described as follows:

Table 1. Research Design

Class	Pretest	Treatment	Posttest
Experiment	Y_1E	X	Y_2E
Control	Y_1K	-	Y_2K

Description:

Y_1E : Pretest given to the experimental class

Y_1K : Pretest given to the control class

X : Treatment with PBL model

- : Treatment with conventional learning
- Y₂E : Posttest given to the experimental class
- Y₂K : Posttest given to the control class

All State Junior High Schools at Dumai City were the population in this research. The sample in this study consisted of two class VIII selected by purposive sampling technique. The variables in this study are the independent variables, the dependent variable. In this case, the independent variable is the Creative Problem Solving (CPS) model, the dependent variable is learning outcomes.

The instrument used in this study was a learning implementation sheet. The test is called the pretest and posttest which consists of five questions in the form of a description. The preparation of questions is used as a tool to measure student learning outcomes, starting with a grid of questions, then continuing with making questions and alternative answers.

The descriptive quantitative analysis techniques are proposed in this research. To compare were the best to increase the learning results, inferential analysis is used to complete this study. Descriptive analysis is used to analyze the learning implementation sheet, to see whether the researcher is successful or not in carrying out the learning process. Inferential analysis was used to analyze students' problem solving abilities using statistical formulas and to determine the effect on the implementation of experimental learning and to see the effect of the Creative Problem Solving (CPS) model on student learning outcomes.

The population in this sample are students of Dumai 21 State Junior High School and the research sample used in this study can pay attention to learning outcomes in two different classes, where class VIII A consists of 31 students and Class VIII B consists of 31 students. In the experimental and control classes, researchers and teachers will discuss by looking at the mathematics learning outcomes of students in class VIII of SMPN 21 Dumai. The procedures for this research are:

Preparation stage

At this stage the teacher prepares:

- a. Learning tools of RPP and Syllabus, and Student Worksheets (LKPD).
- b. The formation of groups from the previous UH Material scores.
- c. Pretest question sheet.

Implementation stage

- a. Pretest Implementation

Before taking action, students are given test questions which are pretest questions to see the initial abilities of students in the experimental and control classes. The pretest question given is a system of linear equations with two variables .

- b. Posttest implementation

After taking the action, students are given test questions which are posttest questions. The results of these questions are used to see the effect of treatment on student learning outcomes.

In this study, the data needed or the type of data collected are data on the implementation of CPS learning model and learning outcomes data, namely:

1. Data on the Implementation of CPS

To find out the implementation of the learning process with the CPS, observations were made using an observation sheet made by the researcher and observations were made by an observer who is a mathematics teacher at school, Ahyar S.Pd. The implementation observation sheet contains the learning steps with the creative Problem Solving (CPS) model.

2. Learning Outcome Data

In this study, the data needed in addition to data on the implementation of learning steps is data on students' mathematics learning outcomes. Data collection techniques are tests and data collected using question papers. Test sheet instruments in research It consists of Pretest and Posttest. The pretest and posttest instruments are useful for measuring student learning abilities both in the early and late stages, by being given questions from the two tests in the form of descriptions.

a. Descriptive Statistical Analysis

The descriptive analysis referred to here aims to describe the data obtained from the measurement results of the dependent variable, namely the students' mathematics learning outcomes.

b. Inferential Statistical Analysis

Is a technique to assess and conclude according to the data obtained from the research sample.

c. Similarity Test of Two Means (t-test)

The t-test was conducted to see the difference in the average learning outcomes in the two groups, namely the average experimental learning outcomes and the control class average learning outcomes.

3. RESULTS AND DISCUSSION

The implementation of learning carried out by researchers in the experimental class using the Creative Problem Solving (CPS) model has generally been carried out well. This can be seen by what researchers did during learning in the experimental class using the Creative Problem Solving (CPS) model, namely learning begins with preparing the class and then the teacher checks student attendance. The teacher conveys the learning objectives and motivates students by relating them in daily life, then the teacher conveys apperception. Then the teacher invites students to repeat the material that has been discussed in the previous meeting. The teacher forms groups of students and asks students

to sit in groups that have been distributed. When students sit in their groups, the situation in the class starts to get noisy, but the teacher can still handle it. During conducting the research, the researcher found several weaknesses in the implementation of the research, including:

- a. Students are still noisy when the learning process takes place.
- b. Not all students discuss in groups, students with low abilities often make noise and chat during direct discussions.
- c. When one group presented the results of their discussion, some students did not pay attention to their friends.
- d. There are still students who are not active in discussions/learning activities for Creative Problem Solving.

From these weaknesses, the researcher hopes that these weaknesses can be overcome by researchers who will conduct the same research so as to obtain better results. The teacher distributes the LKPD and explains the instructions for filling out the LKPD. The teacher directs students to clarify the problems contained in the LKPD. The teacher directs each group to discuss and express opinions or ask questions about the problems given to the LKPD. The teacher assists the group in evaluating and choosing a settlement strategy that is in accordance with the problems given to the LKPD so that the solution can be in accordance with expectations. Furthermore, the teacher helps students implement or apply the solution strategies that have been selected into the problems contained in the LKPD so that these problems can be solved. The core parts of the development of this LKPD include:

Introduction Part

The introduction contains several illustrations of trigonometric problems found in everyday life. Here is the view from the introduction:

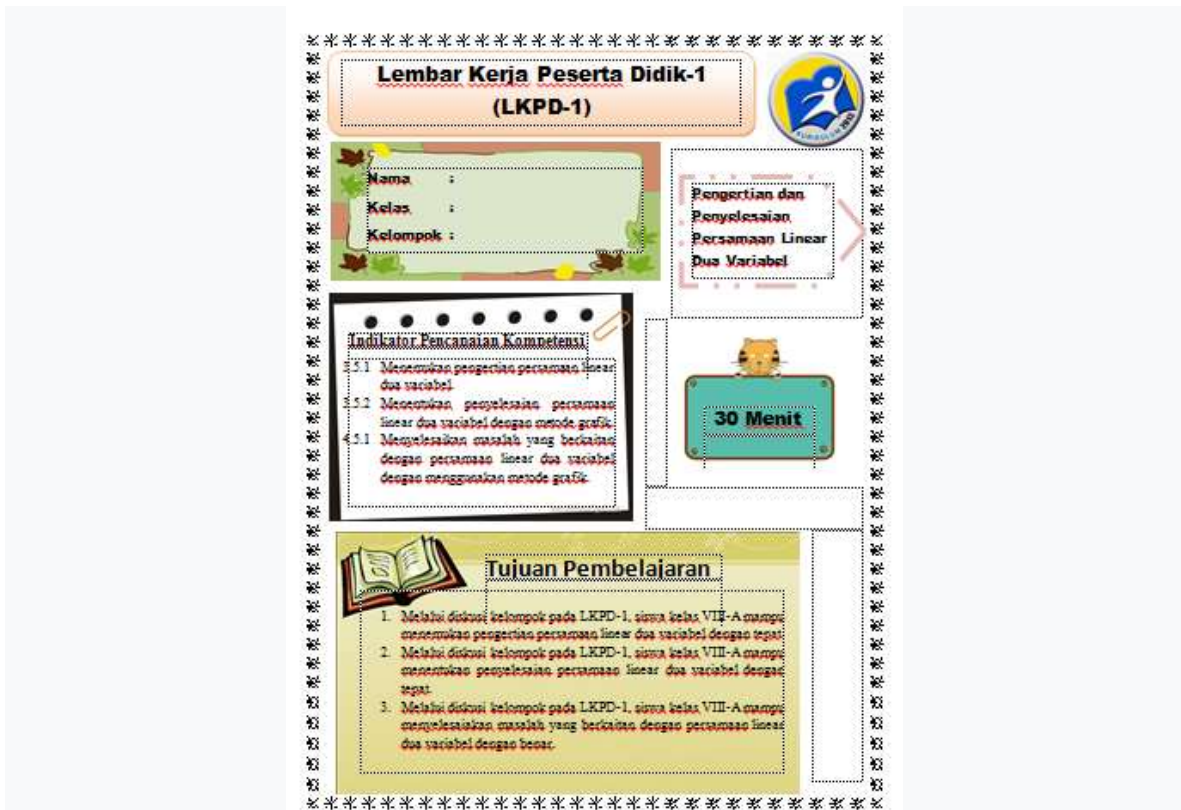


Figure 1. LKPD Introduction Display

Learning Materials

In the learning materials section there are five sub-materials according to basic competencies. In each explanation the material is adjusted to the steps of the PBL model. Here is one part of the display of learning materials.

Perangkat Pengajaran Lembar Kerja Peserta Didik-1 (LKPD-1):
Berilah langkah-langkah yang terdapat pada LKPD-1 ini dengan cermat dan teliti. Kemudian diskusikan bersama teman sekelompokmu, jika mengalami kesulitan dalam kelompokmu tanyakan kepada gurumu!

Kegiatan 1 → **Pengertian Persamaan Linear Dua Variabel**

Ayo Amati 1

Permasalahan 1 → **Klarifikasi Masalah**

Ati pergi ke pasar buah untuk membeli 1 kg Apel dan 3 kg Buah Anggur. Untuk pembelian buah tersebut Ati harus membayar Rp. 105.000. Buatlah persamaan untuk informasi di atas dan Apakah persamaan tersebut merupakan persamaan linear dua variabel, berikan alasannya!

Menamai

Setelah mengamati permasalahan 1, yang ditulis dalam permasalahan 1 tersebut adalah

Mengumpulkan Informasi

Setelah mengamati dan menganalisis permasalahan 1 di atas, marilah kita mengumpulkan informasi yang terkait dengan permasalahan 1 tersebut!

Pengungkapan Gagasan

Diketahui:
Buah Apel yang dibeli = kg
Buah Anggur yang dibeli = 3 kg

Estimasi dan Solusi

Setelah mengungkapkan gagasan serta mengumpulkan gagasan mengenai Permasalahan 1 di atas, marilah kita memilih strategi dalam penyelesaian Permasalahan tersebut!

Kegiatan 2 → **Pengertian Persamaan Linear Dua Variabel dengan Metode Grafik**

Ayo Amati 2

Permasalahan 2 → **Klarifikasi Masalah**

Jumlah himpunan penyelesaian dari grafikya dan persamaan $y + 2x - 8 = 0$ jika $x, y \in R$!

Menamai

Setelah mengamati permasalahan 2, yang ditulis dalam permasalahan 2 tersebut adalah

Mengumpulkan Informasi

Setelah mengamati dan menganalisis permasalahan 2 di atas, marilah kita mengumpulkan informasi yang terkait dengan permasalahan 2 tersebut!

Pengungkapan Gagasan

Diketahui:
Persamaan

Evaluasi dan Solusi

Setelah mengungkapkan gagasan serta mengumpulkan gagasan mengenai Permasalahan 2 di atas, marilah kita memilih strategi dalam penyelesaian Permasalahan tersebut!

Figure 2. The display of one of the discussions on the LKPD material

Mengasosiasikan → **Implementasi**

Setelah memodelkan strategi dalam penyelesaian Permasalahan 1, marilah kita menyelesaikan Permasalahan tersebut dengan mengimplementasikan strategi yang telah kalian pilih.

Penyelesaian:

dimisalkan dengan variabel x
dimisalkan dengan variabel y
Sehingga persamaannya adalah: $2x + 3y = 105.000$

Diagram menunjukkan variabel x dan y berpacu dengan persamaan tersebut.

Persamaan tersebut merupakan persamaan linear dua variabel karena memiliki variabel yaitu dan dimana masing-masing variabelnya berpangkat

Penyelesaian:

Menentukan di antara persamaan berikut yang merupakan persamaan linear dua variabel:

1. $2 + 12y = 8$
2. $3a = 8 - 4b$
3. $8xy + 9z = 18$
4. $x + y + z = 10$
5. $c = 4n - 6$

Mengasosiasikan → **Implementasi**

Setelah memodelkan strategi dalam penyelesaian Permasalahan 1, marilah kita menyelesaikan Permasalahan tersebut dengan mengimplementasikan strategi yang telah kalian pilih.

Penyelesaian:

- $y + 2x - 8 = 0 \Rightarrow y + 2x = 8$
- Ambil nilai $x = 0$ sehingga:
 $y + 2(0) = 8$
 $y = \dots\dots\dots$
- Diperoleh titik $(x, y) = (\dots\dots\dots)$
- Ambil nilai $y = 0$ sehingga:
 $y + 2x = 8$
 $\dots\dots\dots + 2x = 8$
 $x = \dots\dots\dots$
 $x = \dots\dots\dots$
- Diperoleh titik $(x, y) = (\dots\dots\dots)$

Karena dan merupakan penyelesaian tidak terbagu. Oleh karena itu, himpunan penyelesaian berupa garis lurus yang melalui titik dan adalah sebagai berikut:

Salah satu:

Figure 3. Display of an example of a problem and its solution

Examples and Exercises

The examples and exercises contain complete problems and solutions adapted to the four indicators of creative thinking ability and are arranged based on easy to complex problems. So that it can train and develop students' creative thinking skills. The following is an example of a question display with creative thinking indicators, namely fluency and flexibility.

The final activities have been running according to the RPP from the third to the fifth meeting. The researcher conveys the material to be studied at the next meeting and the teacher closes the lesson with prayers and greetings.

In the inferential analysis, both classes are assumed to be normal, then proceed with the homogeneity test. The results of the calculation of the homogeneity of variance test for the experimental class with the Creative Problem Solving learning model and the control class with homogeneous conventional learning. Then the calculation of the t-test which is summarized in Table 2 is as follows.

Table 2. T-test of Pretest and Posttest Values for Experiment Class and Control Class

Data	Class	Number of Samples	t_{count}	t_{table}	Information	Conclusion
Pretest	E	31	-1,83	2,00	$t_{count} < t_{table}$	H_0 accepted
	Control	31				
Posttest	Experiment	31	4,47	1,67	$t_{count} > t_{table}$	H_0 rejected
	Control	31				

Table 2. shows that in the pretest, H_0 is accepted and H_1 is rejected. This means that the average student learning outcomes of the experimental class are the same as the average learning outcomes of the control class students before being treated by the two classes. In the posttest based on Table 1, it can be seen that H_0 is rejected and H_1 is accepted, so there is an influence of the creative problem solving (CPS) learning model on student learning outcomes with conventional learning.

4. CONCLUSION

Based on the results of observations and data analysis that has been carried out, it can be concluded that there is an effect of the Creative Problem Solving (CPS) learning model on the learning outcomes of class VIII students of State Junior High Schools 21 Dumai, from the posttest analysis obtained it can be seen that the average experimental class is 76, 03 and the average control class is 60.16. Based on the results of inferential statistical analysis, the posttest value was obtained that $t_{count} = 4.47 > t_{table} = 1.67$ so that H_0 was rejected and H_1 was accepted. This means that there is a significant effect of the Creative Problem Solving learning model on the mathematics learning outcomes of students of State Junior High Schools 21 Dumai.

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