

# The Effect of Creative Problem Solving Learning Model with Synectics Techniques Toward Student Creative Thinking Ability

Faisal Arif Setiawan, Sugeng Utaya, I Komang Astina

**Abstract**— *This research aims to examine the influence of Creative Problem Solving learning model with synectics technique towards the students' creative thinking abilities. This research is a quasi-experimental with Non-Equivalent Control Group Design as a research design. The research was conducted in MAN 3 Malang. The subjects of this research were the students of XI IIS Class on environment topic. The result shows that an average gains score of the student' creative thinking ability in the experimental class is high score. The calculations result results prove that the models influence the students' ability to think creatively. It happens because in the learning process of Creative Problem Solving learning model with synectics technique gives freedom to the students to express their ideas in each stage. The combination of synectics techniques as a method of discussion can accelerate the students in producing a lot of idea.*

**Index terms**—*creative problem solving; synectics technique; creative thinking.*

## I. INTRODUCTION

Creative Problem Solving is a learning model that stimulates students to think creatively. Creative thinking will provide many choices to solve the problem at hand. The CPS model consists of three parts that direct students to think creatively [1]. The first part Understanding the Problem includes Mess-Finding, Data Finding, and Problem Finding. In the Mess-Finding step, students try to find the general goals that they want to get. Data Finding Steps, students collect various kinds of data available, such as time and location. The Problem Finding step requires students to write down as many possible problems and then choose one of them.

The second part of CPS is Generating Ideas which consists of Idea Finding. Students produce as many different ideas as possible to overcome the chosen problem. Students identify potential alternatives to solve problems. The third part is planning for Action which consists of Solution Finding and Acceptance Finding. In Solution Finding, step students prepare criteria to filter out ideas that have been raised. Criteria made in group discussion with form of criteria tables then the strongest solution is selected. Step Acceptance Finding; students consider who / what can help and who / what is in the way of implementing the solution. The solution given in the form of detailed planning [1].

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Two things distinguish between the Problem Solving and Creative Problem Solving Models. First, the difference lies in the problems that students will solve. Second is that the discussion activity on the problem solving model smart students who will dominate. Problem solving model uses problems that have been prepared by the teacher while the Creative Problem Solving model uses problems that are chosen by students. This will affect the process of discussion in solving problems. Discussion activities in the problem solving model will show the dominance of smart students and students who are less intelligent to be passive as listeners only [2].

There are various ways to help students in the process of finding ideas. One of them is students analogize themselves as part of the problem. Students can choose objects/people to be analogous. The analogy technique is called a synectic technique. According to reference [3], synectic means bringing together various elements, by using figures of speech to get a new perspective. The synectic technique used consists of a personal analogy that requires students to empathize with the object being compared; direct analogy is an effort to distinguish two objects, and the analogy to substantial conflict seeks to contradict what is happening.

The Synectic Technique aims to improve problem solving skills, creative expression, empathy, and insight. Syntactically fosters an open mind to connect elements that seem irrelevant. Students can find new ideas that can be developed into feasible solutions to solve problems. Synectic techniques produce unusual problem solving strategies but can be implemented. Each topic from the field of study can be discussed in small or large discussion groups. Through synectic students can learn important strategies to solve problems [4]. Reference [5] explains that synectic techniques can significantly improve students' creative behavior. All students play an active role contributing ideas in making an analogy. Students are also able to understand the material well through the analogy method.

CPS with synectic techniques is a representation of a natural process, not a forced effort. This unity is a dynamic approach, making students more skilled because they have more internal procedures arranged from the beginning. CPS and synectic techniques stimulate students to choose and develop creative ideas and thoughts.

II. METHOD

This research is Quasi Experiment. The research design chosen was Non Equivalent Control Group Design. It is almost the same as the Pretest-Posttest Control Group Design. The research design can be seen in the following table.

TABLE I. PRETEST-POSTTEST CONTROL GROUP DESIGN (QUASI-EXPERIMENT\*)

Class	Pretest	Treatment	Posttest
Experiment	$O_1$	X	$O_2$
Control	$O_1$	-	$O_2$

(\*Source: reference

[6])

Subjects in this study were students of class XI IIS MAN 3 Malang consisting of two classes, namely XI IS 1 and XI IS 2. Class XI IS 2 as an experimental class that was treated by the CPS model with synectic techniques and XI IIS 1 as a control class with traditional learning (lectures by question and answer). The research activity aims to measure differences in students' creative thinking skills between experimental and control classes. The treatment given to the experimental class is a Creative Problem Solving learning model + Synectic Technique

III. RESULT AND CONCLUSION

The measurement results show the average value of the experimental class pretest of 62.5 out of 29 students. In the control class, the average pre-test score is 63.31 out of 23 students. Both scores are included in the good category. The average posttest experimental class is 74.35, and the control class is 68.75. Both scores are in good category. The treatment of the experimental class using the CPS model with synectic techniques makes the average post test score higher than the control class with traditional learning. Based on the difference in the results of the pre-test and post-test results in the experimental class, the gain score was 11.85 while the control class was 5.43.

TABLE 2. AVERAGE VALUE PRETEST, POSTTEST, AND GAIN SCORE CLASS EXPERIMENT AND CONTROL

Class	Pretest	Posttest	gain score
Experiment	62,5	74,35	11,85
Control	63,31	68,75	5,43

Indicators of creative thinking ability which consists of four indicators, namely: fluency, flexibility, authenticity, and detailing have increased both in the experimental class and in the control class. In the experimental class, the average score of the pretest of the fluency indicator is 68.1; the flexibility is 62.93, the authenticity is 69.83, detailing is 49.14. Posttest score of fluency indicator is 80.17; flexibility is 78.45, authenticity is 74.14, and detailing is 64.66. In the pretest control class, the fluency indicator is 73.91, the flexibility is 51.09, the authenticity is 72.83, and the detailing is 55.44. Post test score of fluency indicator is 73.91; flexibility is 67.39, authenticity is 69.57, and detailing is 64.13. The average rating on each indicator can be seen in the following figures.

steps. First, the student is given an image about the damage to nature then by the LKS (student worksheet) answering the questions of Mess Finding, Data Finding, and Problem Finding. After that student in groups provides as many solutions as possible for the best one then selected (Idea Finding + Synectic Technique, Solution Finding, and Acceptance Finding). The control class using conventional learning models with lecture by question and answer methods.

The instruments used in the study include: Syllabus; Learning Implementation Plan (RPP); Observation sheets are used to assess whether learning is in line with the planned steps of synectic CPS-based learning; and subjective questions contain five questions with indicators of the characteristics of creative thinking abilities. Subjective questions are adapted from the creative thinking test developed by reference [4]. This test consists of 5 questions according to indicators of creative thinking, namely: (1) fluency, (2) flexibility, (3) authenticity (originality), and (4) detail (elaboration) in expressing ideas. Testing the hypothesis in this study uses the t-test with a significance level of 5%. Before conducting the analysis, the prerequisite analysis test (normality and homogeneity test) is carried out.

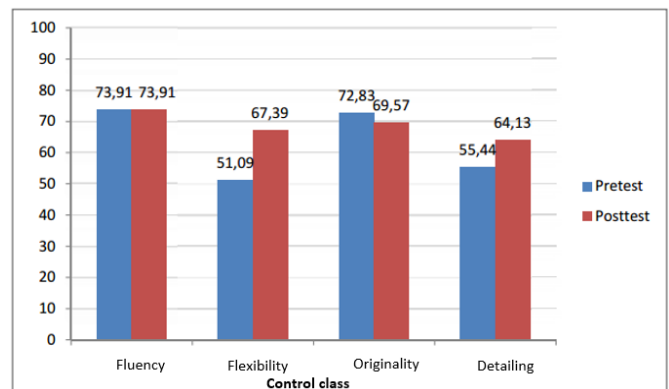


Fig. 1. Average value of creative thinking ability in each indicator at control class

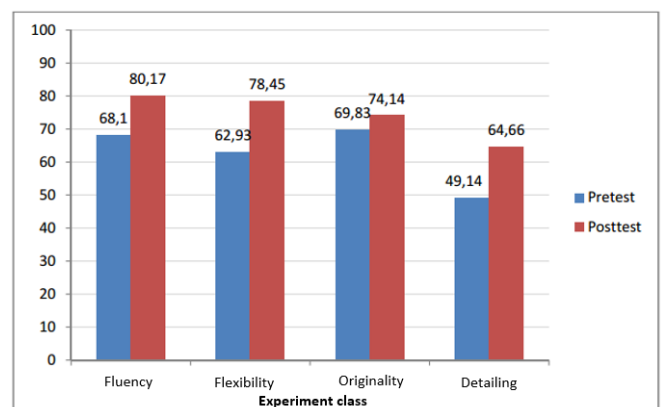


Fig. 2. Average value of creative thinking ability in each indicator at experiment class

The figures shows that there is an increase scores in almost each indicator (except detailing), both experimental and control classes. The posttest scores of experimental class are higher than the control class. The results of data analysis using t test shows that there are differences in students' creative thinking skills between the experimental class and the control class. This can be seen from the value of t count = 3.631 and 2-tailed significance of 0.001. The value of t table in the statistical table is at a significance of 0.05:  $2 = 0.25$  (test 2 sides) and the degree of freedom (df) 50 is 2.009 / -2.009. T table value < t count (2.009 < 3.631), then  $H_0$  is rejected. So it can be concluded that there are differences in students' creative thinking skills between experimental and control classes. The testing step based on significance shows the significance value/probability < 0.05 (0.001 < 0.05), then  $H_0$  is rejected, so it can be concluded that there is an influence of the CPS model with synectic techniques on students' creative thinking ability.

The second hypothesis shows that there is a significant difference between students' creative thinking abilities who are given by CPS learning model with sinetics combination and who in their learning apply conventional learning. This is indicated by the results of the t test of  $14.74685 > 1.67$  based a t table. The average creative thinking ability of students in groups that apply the CPS model with synectic techniques is better than applying learning conventional.

The main finding in CPS model influences students' creative thinking abilities. There is a difference in average gain score of students' creative thinking skills at experimental and control classes. The experimental class score gain is higher than the control class. Step generating ideas or producing ideas is considered to be the biggest contributor to students' creative thinking skills. Generating ideas give students the opportunity to create ideas in large numbers. The idea then became an alternative in solving problems. Producing ideas in the process is supported by synectic techniques that create a broader potential for thinking.

The CPS + synectic technique affects the ability to think creatively allegedly because of two things. First, namely the stages contained in the CPS Model + the synectic technique itself and second, the advantages possessed by the model. Characteristic CPS learning model + Synectic technique has advantages in improving each indicator of creative thinking. These characteristics contain stages that direct students to think creatively. These stages include: understanding the problem (understanding the problem), gathering ideas (generating ideas + synectic techniques), choosing solutions that stimulate students to think and convey new ideas (planning for action). These stages are by reference [7] opinion which suggests that to train creative thinking in learning requires stages that provide opportunities for students to organize ideas into different thoughts make combinations of existing ideas and then evaluate their thoughts.

The first stage understands the problem. Students first get pictures about environmental damage and worksheets. Students then describe the situation by writing down what things are in the picture. As an example of an answer to a group of images of a bridge with rubbish on the river, students write that situation occurs during the day. There are bridges, rivers full of garbage, and dirty water. Students

give a view that the river should be clean and the trash is in the garbage processing area. This stage is a stage for students to understand what they are facing. At this stage, students focus their thoughts on choosing the objects they write. According to reference [7], the purpose of understanding the problem is to emphasize the initial personal orientation of each to understand what he is facing.

This activity proved to be able to change the thinking patterns of students (who previously tended to think narrowed by seeing just one point of view) being open by looking for many points of view. The number of answers that arise from students indicates indicators of creative thinking; it is the fluency in thinking. This indicates the beginning of habituating students to patterns or ways of creative thinking. Reference [8] states that creative thinking patterns are imaginative, multiple answers, divergent, and lateral.

The second stage is generating ideas. Generating ideas provide opportunities for students to think openly. Students are divided into eight groups. After that, each student expresses ideas to overcome the problems being faced. The ideas expressed without thinking about considerations fell prey. One student in the group records all group ideas.

Revealing many ideas as possible is a step that encourages students to think divergently. Reference [7] states that in Generating ideas are divergent because they focus on finding ideas. During this stage, many students bring diverse and unusual ideas. If it is associated with creative thinking skills, generating ideas are by several indicators of creative thinking ability, there are: thinking fluency, flexibility, and original. However, judging from the processes is more inclined to the development of fluency thinking ability which is the ability to produce many answers and ideas [4], [9].

At these generating ideas, synectic technique is added to facilitate the birth of many ideas. The synectic technique contains three activities of analogy (personal, direct analogy, and solid conflict). First, the personal analogy is that students analogize the object with themselves. The benefit of recognizing this level of personal analogy is not to recognize forms of metaphoric activity, but to provide guidance on how to establish a good concept. By analogy it will soon be able to create large distances and more allow students to get new ideas.

Second, the direct analogy is students provide simple comparisons between two objects. The aims to transform the condition of real problem situations for a new perspective. Comparisons do not have to be identical in everything. This analogy is to transpose the conditions of the topic or the original problem situation in other situations to present a new view of ideas or problems. Third, the analogy of compressed conflict. Students combine points of view that are opposite to an object so they disclosure the solution. Giving opposition to conflicts generally takes the form of two conflicting words, for example: sluggish-aggressive; friends-enemies; etc. These conflicts provide a broad understanding of a new object. This can reflect students' skills to connect the two frameworks of thought to an object

The analogy of developing creative thinking trains students to view things in new ways. According to the brain hemisphere theory by Springer reference [4], that the right brain is identified with creative functions, one of them is the function of metaphoric and imagination. The theory emphasizes if the analogy trains students' creative thinking by developing students' right brain function, especially in the metaphoric mental process and imagination. This is also by reference [11] who found that students who were given the treatment of imagination activities scored higher regarding creative thinking ability. If it is associated with the ability to think creatively, the analogy activities are by the indicators of flexibility and originality. The analogy activities teach students to see things from an unusual or different perspective to produce various alternative ideas from various approaches. In originality thinking, analogies build parable relationships and comparison of objects with other objects and introduce conceptual distance between people and objects to encourage original thinking [3].

The third stage is planning for action which consists of solutions finding and acceptance finding. It provides opportunities for students to design the chosen solution. Students in groups formulate solutions to the problems that have been raised. Each group disseminates all the ideas that have been expressed by each group member. Then the group creates a matrix table which is filled with consideration of the obstacles that will be faced by each solution. The chosen solution is based on the strongest value. Students in this step have difficulty determining the indicators that will be used to filter all the ideas. This form of difficulty can be seen when the time given for the discussion will be completed; several groups have not written down the consideration.

In the planning of action stage, students conduct evaluation activities on ideas that have been obtained based on certain criteria so that they train students to think based on consideration. Reference [12] states that evaluation is an important ability in high-level thinking, to separate the relevant from the suitability of an idea, product, or solution. The purpose of this evaluation is to determine the best idea which is the original answer from each group by reasons. Reference [4] states that evaluation activities train fundamental thinking skills, namely the ability to produce answers, ideas, original ideas or a combination of various elements.

Preparation of a settlement plan is an activity of creative thinking indicators of thinking in detailing. This can be interpreted as this stage to train students' particular thinking skills in realizing ideas. According to reference [4] that detailing ability can enrich and develop an idea or product according to reference [13] that detailing or planning is part of creating which is the ability to combine parts to form something coherent. Based on the creative process theory this stage has reached verification, that is exploring the solution that can be implemented, then the solution must be made in detail and operational steps [12].

Students in the experimental class showed more number of ideas than the control class. In the CPS + Synectic class tends to provide a more varied solution. The written ideas in control class has the same each other. It is suspected that the CPS Model + synectic technique has advantages; first, students can obtain their knowledge independently. Each student can express their ideas and

creativity individually or during discussions. Students also try to be independent and do not wait for an explanation from the teacher to find the right solution to the problems. This provides an opportunity for students to actively in building their knowledge so that it affects the ability to think creatively.

Second, students are actively involved in learning. Student activity can be seen when they discuss and make presentations. When discussing each student has the task of conveying ideas in solving problems of environmental damage in his group. At the time of presentation the students seemed enthusiastic to try to convey their group's ideas. Student enthusiasm is also evident from their efforts to provide questions and responses to groups that are presenting. Group division is done heterogeneously. Students who have high abilities are not collected in one group, but mix with students with low abilities.

Third, students are directly involved in developing their learning experiences. Students not only gain knowledge by listening to the teacher's explanation but linking their personal experience with the new information they have gained from learning. Steps of CPS + The synectic technique use more knowledge possessed by students. Knowledge sharing activities between students occur more often during discussions and presentations. This proves that the learning model has included problem solving abilities. CPS + synectic which can improve problem solving are also proven by Reference [14]. Reference [14] study of class X students concluded that the problem-solving ability between students who participated in learning with the CPS model with students who followed learning with conventional models differed significantly.

The findings of this study are supported by previous research which states that the CPS learning model with effective synectic techniques gives a real influence on the ability to think negatively [14], [15], and [16]. This is because the learning model is a dynamic approach, students become more skilled because students have more internal procedures arranged from the beginning. Students can choose and develop their ideas and thoughts, not like memorization that uses a little thought.

The most important aspect of creative thinking is the ability to create something new. The ability to create something new requires clear thinking or called divergence. Divergent thinking skills obtained by students are estimated to come from how students connect the knowledge they have. Various knowledge of student directs their answers to writing many solutions. The results of the answer sheet prove students write various solutions in their efforts to solve problems in the picture. Reference [17] states that the creative process starts from divergent thinking to create many ideas and possible solutions, then turns to thinking to choose the most effective idea. Divergent thinking means mentioning as many ideas as possible without first considering the possibilities. Convergent thinking means focusing on one choice that is considered appropriate after analyzing the idea mentioned. CPS provides a step to think divergently and converge at each step continuously.

Based on the CPS + synectic techniques, the most influential effect on creative thinking ability is the generating ideas stage, which is to bring up many ideas. This stage is the core of this learning model. At this stage, students reveal as many ideas as possible. It will be chosen as the most appropriate solution. Student knowledge is used as first knowledge. Steps in CPS + Synectic techniques have the function as the facilitation and development students' creative thinking skills naturally. The divergent and convergent thinking is trained repeatedly to form like a cycle. First, students have diverse, deep, and divergent thoughts, and then students are required to classify their views to choose one (convergent) answer. The creative process naturally is a process that is carried out non-linear, complex, random, and continuously [1].

Conventional learning in the control class places the teacher as the primary source of information that plays a dominant role in the learning process. The teacher transfers knowledge to students so that students become passive. Students tend to learn to memorize and not build their knowledge so that students' creativity is less developed. This condition does not support students in improving problem solving skills. But based on the observations of researchers in the control class, it appears that students feel still paying attention in following the learning process. Although occasionally accompanied by question and answer, and question and answer is less helpful for students in finding concepts because previously students have been given the concept of material by the teacher.

#### IV. CONCLUSIONS AND RECOMMENDATIONS

The results of research using the Creative Problem Solving learning model with synectic techniques have a significant influence on students' creative thinking skills. The gain score found in the experimental class is higher than the control class. This is because in the learning process it gives students the freedom to come up with ideas at each stage. Students choose the problems to be resolved, choose a problem-solving strategy, and it process to find problem solving. The combination of synectic techniques as a technique for discussing accelerates students in generating many ideas.

CPS Model + Synectic technique is an alternative step to capture the concepts that exist in students. The application of the Creative Problem Solving learning model + synectic techniques should pay attention to the following: (a) mastering and being able to provide examples of the use of synectic techniques in the form of analogies in the CPS learning model; (b) accepting all ideas from students during learning so that students' thinking skills are not limited. This case would be better if there were three classes. The classes are the control class, the class with the cps + synectic model, and the class with the cps model only. This will provide a lot of discussion and reviews for discussion

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