

The Effectiveness of the Application of Learning Models Creative Problem Solving and Problem Based Instruction: The Impact on Students Mathematics Learning Interest

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ABSTRACT

This study aimed to find out the effectiveness of the learning model implementation in the interest in mathematics learning of 5th-grade elementary school students, between the class using CPS (Creative Problem Solving) learning model and the class using PBI (Problem Based Instruction) learning model. The type of this study was quasi-experimental research using post-test only no treatment control design. The population of this study was all 5th-grade elementary school students at the Jenderal Sudirman cluster in South Denpasar in the academic year 2019/2020. The sample was determined using a random sampling technique. The data obtained was the interest in learning mathematics using a questionnaire. The result of this study showed that there was a difference in the interest of students learning between the two classes, seen from the result of the t-test, namely $t_{count} > t_{table}$. The result of the effect size test was 0,74, with moderate criteria. This is in accordance with the theory and previous research that has been carried out which states that interest in learning is one of the intrinsic factors that affect learning outcomes, this interest in learning is strongly influenced by various factors including the application of learning models. According to the results of research conducted, the CPS learning model is more effectively applied than PBI to increase students' interest in learning mathematics.

Keywords: *Effectiveness of Learning Model, Learning Interest, CPS Learning Model, PBI Learning Model*

1. INTRODUCTION

This time, the problems that occur in elementary school students, particularly in mathematics, are the students who are less able to deepen the understanding of the subject matter of mathematics and the lack of variant of learning model choices that is effective in the mathematics learning process. It has been attempted to be overcome by government policies regarding mathematics subjects that are no longer integrated with the high class, namely grades in the 4th, 5th, and 6th grade at the elementary school level. The reason is that mathematics subjects are not entirely able to be integrated into other subjects.

Mathematics is global learning (international), and even at the university level, it is studied [1]. Mathematics itself is closely related to solving problems both in the world of work and daily life, which involves the ability to think and analyze a person [2]. Mathematics is a

science consisting of problems, notations, rules, frameworks of thinking, opinions, and a set of theories [3]. Meanwhile, according to Isrokaton and Amelia [4], mathematics is the stage of human thinking that makes sense, causing humans to acquire a concept. Based on this explanation, in the process of learning mathematics, joint efforts are needed between teachers and students in optimizing each achievement of the objectives of learning mathematics. The achievement of each learning objective can be viewed from students learning outcomes.

The factors that influence learning outcomes are external and internal factors [5]. External factors are the outside factors that can affect student learning outcomes. The external factors are such as environmental as well as instrumental. Internal factors are factors that exist and come from the students, namely, the students' physiological and psychological factors. The physiological condition is referred to as a good health

condition. On the other hand, one of the psychological conditions is interest. According to Wulan [6], interest is a psychological sign that appears in a person that causes pleasure, attention, and is involved in an activity without external coercion. In line with Agustina [7], interest is a feeling of liking something that causes someone to take part in it to result in the achievement of a particular goal. Interest is a desire within a person to prefer particular things [8]. Meanwhile, according to Doni [9], interest is the tendency to appear in humans, including liking, earnestness, and ideas to achieve particular goals. Based on the explanation, it can be concluded that interest is pleasure, curiosity, attention, and student involvement in something that arises within us without any forces, resulting in an emerging interest in the students themselves.

After observation, the learning process in the elementary school had run following the learning implementation plan (LIP). The teacher seems to have implemented several learning models, but due to the number of the students in the class that consists of 38-40 students in one class caused some students cannot focus. They look daydreaming so that they are not active in the discussion process. It is proven during the group discussion process, which is only a few group members contributed to delivering their opinion and sharing their creative ideas. Besides, students are also less enthusiastic in raising their hand to answer the questions given by the teacher in the mathematics learning process. Along with the development of science, a teacher needs to obtain alternative solutions and choices of learning models so that they can make the students participate in the mathematics learning process.

There is an objective of various learning models, namely the teacher can choose a learning model that is in accordance with the characteristics of the material to be taught [10]. One of the examples of a learning model that attracts the students' interest is Creative Problem Solving (CPS). Both CPS and Problem Based Instruction (PBI) learning models emphasize active students. Therefore, students feel more valued and interested in participating in the mathematics learning process.

CPS is a learning model that prioritizes solutions to a problem. It also has creative thinking by going through the divergent and convergent thinking process. The divergent thinking process produces creative thinking for students to solve problems. It produces an appropriate problem-solving agreement [4]. The CPS learning model is based on the solutions obtained by the creative thinking process of students in solving a problem [11]. The Creative Problem Solving (CPS) learning model is a learning model that focuses on teaching in solving the problem creatively and skilled [12]. CPS is a variation of the problem-solving learning model and a learning model that focuses on problem-solving skills, followed by strengthening skills [13].

In practice, the CPS (Creative Problem Solving) learning model has a syntax, namely, clarifying problems, expressing ideas, evaluating and selecting, as well as implementing. Thus, it is expected that the students can be trained in reasoning, constructing, and being able to think creatively in solving problems [14]. It is explained as follows; 1) starting with the introduction, the teacher gives students the actual problems. In this case, the students have been previously grouped heterogeneously. 2) In the core activities, the teacher supervises and appreciates students' creative ideas. Here, the students carry out sorting problems in group worksheets and find out creative ideas for the solution to these problems. 3) At the final stage, the students presented the results of the finding of the problems' solution. Then, it is confirmed by the teacher, and the students concluded the learning outcomes that had been determined together [15]. Work in groups and give students the freedom to determine creative ideas will result in students becoming more confident and interested in the mathematics learning process.

The Problem Based Instruction learning model is a learning model based on a constructivist understanding that accommodates student involvement in learning and authentic problem solving [16]. In line with this, [17] considers that Problem Based Instruction is not far from everyday life where the problem is the main point. In the learning process using the PBI model, the students can share their knowledge and try to gain information independently. Also, the students are considered as learning subject while the teachers only act as a facilitator and motivator [18]. There is a specific characteristic in the PBI learning model, namely the teamwork between the students. In this case, teamwork will encourage the students to develop their thinking ability by sharing their ideas and various discoveries that were found together [19]. Learning activities will be more meaningful if they are assisted by learning models that are appropriate to the learning objectives [20]. Problem Based Instruction begins with real-life problems, then students are allowed to carry out investigations, both inside and outside the classroom as far as it is needed for problem-solving [21]. Problem Based Instruction Learning is a learning model that provides interaction between interaction and response that connects two learning directions and the environment [22]. The syntax for the PBI learning model is as follows. 1) Student orientation to the problem is the teacher explains the learning objectives and motivates students to be involved in solving the selected problem. 2) The teachers organize the students to study. 3) The teacher guides individual and group investigations. 4) Students develop and present their work. 5) The teacher helps students analyze and evaluate the problem-solving process [23].

The application of the Creative Problem Solving (CPS) and the Problem Based Instruction (PBI) learning model in learning has been widely studied by previous

researchers. The results of the research obtained by [24] conclude that there is a significant effect of the Creative Problem Solving (CPS) learning model based on reinforcement on the learning outcomes of Pkn in the 5th-grade students of SD N 18 Dangin Puri. The results of the study by [25] conclude that there is a significant effect of the Creative Problem Solving (CPS) learning model on students' critical thinking skills in science subjects of the 5th-grade elementary school students. Furthermore, the results of the study by Puspitasari conclude that there is a significant effect of the Problem Based Instruction (PBI) learning model assisted by audio-visual media on the social studies learning outcomes of 5th-grade students of the Srikandi cluster of Denpasar. The results of the study by Rahmadani and Acesta conclude that there is a significant effect of the Problem Based Instruction (PBI) learning model on students' conceptual understanding.

The results of these studies indicate that the CPS and PBI learning models affect learning outcomes, critical thinking skills, and understanding of students' concepts. However, no research explains which of these two models are more effective in-class learning towards students' interest in learning mathematics. Based on this, the researcher considers that it is necessary to research "Comparison of the Effectiveness of the Application of the CPS (Creative Problem Solving) Learning Model and the PBI (Problem Based Instruction) Learning Model: The Impact on Students' Interest in Learning Mathematics.

2. RESEARCH METHOD

This research was experimental research caused by the attempt to reveal a cause and effect relationship (causal). In the research conducted, it was impossible to control all existing variables. Therefore, quasi-experimental research was applied in this study. It used a static group pre-test - post-test design (The Static Group Pre-test – Post-test Design) with its research design [26]. The research design can be seen in Table 1 below.

Table 1. Research Design

Group	Pre-test	Treatment	Post-test
A	0	X1	0
B	0	X2	0

This study used two experimental classes. The sample was conducted using simple random sampling because the population was considered homogeneous [27]. There were three variables, namely one dependent variable and two independent variables. The dependent variable was the students' interest. One dependent variable was the CPS learning model, and two independent variables were the PBI learning model. The factor researched in this study was the mathematics learning interest in the 5th-grade of elementary school.

The technique of collecting the data in this study was a non-test of students' learning interests. The non-test used had passed a test with construct validity, content validity, and reliability, namely a questionnaire with 27 statements with a composition of 14 positive statements and 13 negative statements. The result of students learning data was analyzed using a normality test and homogeneity test as a prerequisite test. The normality test used was the Chi-Square formula. The data obtained were distributed normally. Furthermore, it was tested for homogeneity using the two variance homogeneity test or Fisher test. After the data were distributed normally and homogeneous, then a hypothesis test was carried out using a t-test with Polled Variance formula. This test was carried out to find out whether there was a significant difference in learning outcomes between the two models or not.

With the 5% significant level criteria, namely $dk = n1 + n2 - 2$. If the value of $t_{count} \leq t_{table}$, it meant that H_0 was accepted and H_a was rejected. If the value of $t_{count} > t_{table}$, it meant that H_0 was rejected, and H_a was accepted.

The data was analyzed using the Effect Size test, with equations [28], and then described in more detail by (Hake, 2002) to find out the effectiveness of the CPS and PBI learning models on learning interest.

$$d = \frac{M_A - M_B}{\left[\left(\frac{Sd_A^2 + Sd_B^2}{2} \right) \right]^{\frac{1}{2}}} \tag{1}$$

Description:

d = Effect Size

M_A = Mean gain of experimental class 1

M_B = Mean gain of experimental class 2

Sd_A = standard deviation of the experimental class 1

Sd_B = standard deviation of the experimental class 2

3. RESULTS AND DISCUSSION

Table 2. Recapitulation of Post-test Values for Experiment Class in Classes A and B

Experiment 1 (CPS Learning Model)			Experiment 2 (Learning Model 2)		
Description	Pre-test	Post-test	Description	Pre-test	Post-test
Highest Score	68	108	Highest Score	68	108
Lowest Score	22	60	Lowest Score	22	38
Mean	41.82	84.68	Mean	42.45	79.86

Based on the Table 2, it can be seen that there was an increase in students' learning outcomes after being taught with both learning models.

3.1. Normality Test

The normality test was carried out to find out the frequency distribution of the scores on each variable, whether it was distributed normally or not. Therefore, the Chi-Square analysis was used. Based on the result of the normality test, it showed that both samples were distributed normally because both were $< X^2_{count} < X^2_{table}$.

3.2. Homogeneity Test

This test was carried out based on the data of the mathematics learning interest in experimental class and control class. It was carried out to show the difference in the hypothesis test was right as the result of the different variances between the groups. Not due to the difference in the group itself. The homogeneity test of variance used the F test. The result of the homogeneity test showed that the value of $F_{count} < F_{table}$ so that the data of both groups had a homogeneous variance.

3.3. Hypothesis Test

The hypothesis test was carried out following the results of the normality test and the homogeneity of variance. It obtained the data that the experimental group and control group were distributed normally and homogeneous, following the previous explanation so that the statistic test was t-test using a pooled variance. With the criteria, if $t_{count} \leq t_{table}$, it meant that H_0 was accepted and H_a was rejected. Also, if $t_{count} > t_{table}$ meant that H_0 was rejected and H_a was accepted. At the 5% significant level with $dk = n_1 + n_2 - 2$.

Table 3. The results of hypothesis test

Class	tcount	Ttable	Description
X1			$t_{hitung} > t_{tabel}$
X2	3.291	2.000	

Based on the calculation of Table 3, so $t_{count} > t_{table}$ was $3,291 > 2,000$. It meant H_1 was accepted, and H_0 was rejected. Thus, it can be concluded that there were differences in student learning outcomes between the

CPS (Creative Problem Solving) and PBI (Problem Based Instruction) learning model.

3.4. Effect Size

After counting the hypothesis test using a t-test, then the effect size was counted. It can be seen in Table 4 below.

Table 4. The results of hypothesis test

Class	Gain	Deviation Standard	Effect Size	Criteria
X1	61.75	10.06	0.74	Moderate
X2	54.41	9.58		

Table 4 showed that the result of the effect size test was 0,74 with moderate criteria for the effectiveness of both experimental classes that applied CPS (Creative Problem Solving) and PBI (Problem Based Instruction) learning model. In this study, the learning process was following each syntax of each learning model. The students' learning interest can be seen from the pre-test scores. A pre-test was given in the first meeting. Based on the result of the study, experimental class 1 showed that the lowest score was 22, and the highest score was 68, with a mean score was 41,82. The result of the pre-test score in the experimental class 2 showed that the lowest score was 22, and the highest score was 68, with a mean score was 42,45. Based on the mean scores of the pre-test, both the experimental classes 1 and 2 showed that the students' interest in learning mathematics was still low. Also, both classes had the same initial ability.

At the end of learning, the students were given a post-test. The post-test score in experimental class 1 showed that the lowest score was 60, and the highest score was 108, with the mean score was 84,68. Meanwhile, the post-test score in experimental class 2 showed that the lowest score was 38, and the highest score was 108, with the mean score was 79,86. Considering the post-test score, so both experimental classes 1 and 2 showed that there were differences in the students' learning interest.

Based on the Effect Size test (Table 4), it obtained the value of effect size was 0,74, with moderate criteria. The effect size value was positive. Therefore, it can be concluded that the CPS learning model was more effective compare to the PBI learning model. The

superiority of the CPS learning model in the effectiveness of the PBI model was due to a positive difference in the critical thinking skills of students being taught using the CPS learning model [25]. According to Sukaningsih [24], there was an influence on the students who taughtn using the CPS learning models on their learning outcomes. Rusman [5] stated that solving ability, critical thinking, and interest were the internal factors that influence the learning outcomes. The CPS (Creative Problem Solving) can increase the ability to think critically and creatively in solving the problem faced. By increasing the ability to think critically and creatively on the problem studied, it allowed students to be easier in solving a problem [29]. Internal factors were the factors that came from the students themselves. It was like the students' physiological and psychological factors. A physiological condition in most people, such as excellent health condition, while one of the psychological conditions was their interests.

A person's high interest in learning can be seen from indicators such as pleasure, interest, attention, and involvement. If a student has shown these indicators, it can be said that he has a high interest in learning. This certainly affects learning outcomes, the higher the student's interest in learning, the higher the learning outcomes. The results of this study further strengthen this theory, especially with the emphasis on the CPS learning model which is more superior to students' interest in learning than those taught by PBI. The CPS learning model greatly outperforms PBI because the CPS model emphasizes student creativity in solving problems, the CPS model can be applied to all students classically because this model contains problems that can be solved with various solutions views. The two reasons are Southeasti superior so that students' interest in learning mathematics with the application of CPS is better than PBI.

4. CONCLUSION

Based on the result of the research, data analysis, and discussions that had been carried out at SD Negeri 6 Sesetan and SD Negeri 13 Sesetan, it can be concluded that 1) there was a difference between the CPS (Creative Problem Solving) and PBI (Problem Based Instruction) learning model. 2) The effect size test showed that the CPS learning model was more effective applied to increase the interest of students' mathematics learning compared to the PBI learning model.

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