*International Journal of Latest Research in Humanities and Social Science (IJLRHSS)*
*Volume 06 - Issue 01, 2023*
*www.ijlrhss.com || PP. 66-70*

# The Effectiveness of the *Creative Problem Solving* (CPS) Model-Based E-Module Assisted by Comics on Temperature, Expansion, and Heat Materials to Improve the Creative Thinking Ability of Grade VII Junior High School Students

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**Abstract:** The ability to think creatively is part of the learning concept that must be improved and trained continuously in students. Improving the ability to think creatively in students aims to make students better understand and interpret learning concepts. This study aims to determine the effectiveness of e-modules based on creative *problem solving* (CPS) models assisted by comics on temperature, expansion and heat materials to improve the creative thinking ability of grade VII students of SMP Negeri 1 Perhentian Raja. The research was conducted on class VII students of SMP Negeri 1 Perhentian Raja on temperature, expansion, and heat materials, the classes taken were class VII 1 which amounted to 26 students and class VII 3 which amounted to 26 students where the two classes consisted of experimental classes and control classes. The data collection instrument is in the form of a test of the results of the creative thinking ability of class VII temperature, expansion, and heat material consisting of 10 essay questions. The type of research is quasi-experiment with a *Posstest Only Non-equivalent Control Group Design*design. The independent sample t-test with the help of SPSS version 26 shows that the *creative problem solving* (CPS) model affects the creative thinking ability of students. The creative thinking ability of experimental class students is better than that of control class. Furthermore, the average score of the experimental class was 73.88 and the control class was 62.9. These results show that *the creative problem solving* (CPS) learning model is effective in students' creative thinking ability

**Keywords:** Creative Problem Solving (CPS) model, creative thinking ability, temperature, expansion, and heat.

## 1. Introduction

The essence of education is a conscious and planned effort to create a learning atmosphere and learning process, so that students actively develop their potential to have the strength of religious skills, self-control, intellectual personality, noble character, as well as the skills necessary for themselves, society, nation and state (Ri Law Number 20 of 2003, article 1 paragraph 1) [1] says that "education is a human investment gaining recognition from many circles expert". Education can also be interpreted as a series of activities for better change.

Science learning consists of four main elements, namely scientific attitudes, scientific products, scientific processes, and their applications. One form of product that must have the four elements of the nature of science is in the form of teaching materials that are used as learning guidelines in schools. Broadly speaking, teaching materials contain aspects of knowledge, skills, and attitudes in order to achieve predetermined graduate competency standards [2]. Then the existence of teaching materials in learning activities has a very important role because teaching materials are basically the content of the curriculum in which there are learning materials, learning activities, and evaluations [3]. One of the teaching materials that are often used in learning is modules.

The development of science today has an impact on the form of presentation of teaching modules. Previously, teaching modules were packaged in printed form only, but currently there are many non-printed teaching modules circulating by utilizing ICT. There are several advantages of ICT modules over print modules. [4] Saluky stated that printed teaching materials cost more and cost a lot of paper. Therefore, nowadays many teaching modules are turning into the form of ICT, or what is commonly called E-modules.

In science learning, especially physics in temperature, expansion, and heat materials, students still feel learning difficulties which results in low student learning outcomes. One of the reasons is the learning process that does not involve students actively, this is the student only as a listener while the teacher is more dominant which is commonly referred to as teacher-centered learning [5]. This can be seen based on the results of research

conducted by [6] which shows as many as 96% of students say that classroom learning is explained by the teacher which causes students to become passive in learning [7].

One of the useful skills for learning physics related to natural phenomena is the ability to think creatively. Creativity is the ability to give new ideas and apply them in problem solving [8]. The creative aspect can help explain and interpret abstract concepts, thus allowing students to achieve greater mastery, although not all students become scientists, but creative thinking is needed by students in order to face their lives in the future.

The *Creative Problem Solving* (CPS) learning model is one of the learning models that can improve students' creative thinking skills. The CPS learning model is a learning model that concentrates on teaching and problem-solving skills followed by strengthening problem-solving skills and strengthening skills and creatively setting solutions [9].

The comic-assisted e-module by integrating the *creative problem solving* (CPS) learning model through comic stories will help students to understand the competencies to be achieved and present important information and subject matter. In the e-module, there are also learning activities. Important information, essential materials, and learning activities are packaged in the form of comic stories. So indirectly by reading comics it means that students have read the subject matter.

Based on the problems that have been described, researchers have conducted a learning research entitled "The Effectiveness of *Creative Problem Solving* (CPS) Model-Based E-Modules Assisted by Comics on Temperature, Expansion, and Heat Materials to Improve the Creative Thinking Ability of Grade VII Junior High School Students."

## 2. Research Methods

This research was conducted at SMP Negeri 1 Perhentian Raja in October-November 2022. This type of research is *Quasi Experiment*, with a *Posttest Only Design* design that uses one experimental class and one control class as seen in Table 1.

Table 1. Research Design according to Punaji [10]

| Group | Treatment | Posttest |
|---|---|---|
| Experiment | X | $O_1$ |
| Control | - | $O_2$ |

The population in this study was all students of class VII science at SMP Negeri 1 Perhentian Raja for the 2022/2023 school year, totaling 4 classes, namely 105 students. (Class VII 1, VII 2, VII 3, and VII 4). Sampling in this study used *a simple random sampling* technique and the sample was determined through normality tests and homogeneity tests in populations using SPSS 26 based on the replay values of the previous material, namely motion and force. The samples in this study were VII 1 as an experimental class and class VII 3 as a control class. The data collected through *the Posttest* questions after applying the learning model. This *Posttest* question consists of 10 essay questions arranged based on indicators of creative thinking ability, namely *fluency, flexibility, originality, and elaboration* [11]

The data analysis techniques used in this study are descriptive analysis and inferential analysis. The descriptive analysis referred to in this study looked at the creative thinking ability of students which was assessed from the *posttest* results. To calculate the score of creative thinking ability obtained by students, provisions are used:

$$\text{KBK value} = \frac{\text{Skor yang diperoleh siswa}}{\text{Skor maksimum}} \times 100$$

The criteria for students' creative thinking ability according to Riduwan [12] are presented in Table 2.

Table 2. Criteria for Creative Thinking Ability

| **Score/Value Interval** | **Kategory** |
|---|---|
| 81-100 | Excellent |
| 61-80 | Good |
| 41-60 | Enough |
| 21-40 | Less |
| 0-20 | Very Less |

Inferential analysis in this study was carried out to determine the difference in creative thinking ability after the *Creative Problem Solving* (CPS) model in experimental classes and the application of conventional learning in control classes through hypothesis testing.

## 3. Results and Discussion

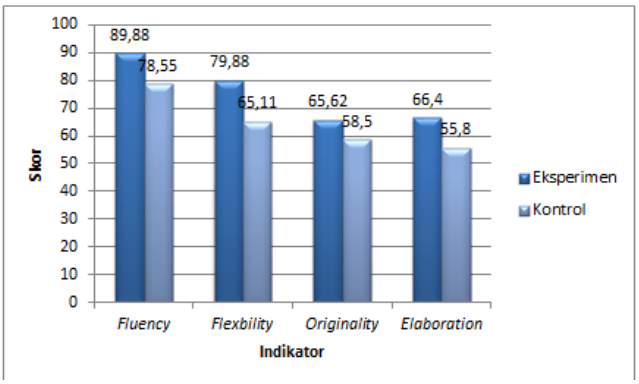
Data on the results of students' creative thinking ability were obtained from the posttest results after the *Creative Problem Solving* (CPS) model in class VII 1 as an experimental class and conventional learning in class VII 3 as a control class at SMP Negeri 1 Perhentian Raja. The results of the *posttest* score analysis of students' creative thinking ability for each indicator on the temperature, expansion, and heat of the two class samples can be seen in Table 3.

Table 3 Posttest score results for each indicator of creative thinking ability

| Indikator kemampuan KBK | Kelas Eksperimen | | Kelas Kontrol | |
|---|---|---|---|---|
| | Skor *posttest* % | kategori | Skor *posttest* % | kategori |
| *Fluency* | 89,88 | Sangat Baik | 78,55 | Baik |
| *Flexibility* | 79,88 | Baik | 65,11 | Baik |
| *Originality* | 65,62 | Baik | 58,5 | Cukup |
| *Elaboration* | 66,4 | Baik | 55,8 | Cukup |
| Rata-Rata | 73,88 | Baik | 62,90 | Baik |

Based on Table 3, it can be seen that each indicator of creative thinking ability in the experimental class is higher than the control class. The average obtained by the experimental class was 73.88 while the control class was 62.9. From the scores obtained, it can be said that the experimental class is superior to the control class.

The results of data analysis of creative thinking ability from each indicator through the *Creative Problem Solving* (CPS model in experimental classes and conventional learning in the control class are shown in Figure 1.




Based on Figure 1, it can be seen that the average score of each indicator of the posttest results of students ' creative thinking ability there is a difference where for the experimental class is higher than the control class, the highest *posttest* average score interval in the experimental class and the control class is at *fluency* . In particular, based on the explanation of each indicator of creative thinking ability, the four indicators of creative thinking ability can be explained as follows:

### 1. Fluency

In the *fluency* indicator, there is a question of creative thinking ability at numbers 1,2,3,4,5,6,7,9, and 10. Where what is measured in this study is the ability of students to express many ideas or ideas based on the knowledge they have in solving problems. In the matter of *fluency* indicators, it triggers many ideas, solving problems or relevant answers. It can be seen in Figure 4.1. That the average value for the *fluency* indicator in the control class is lower than that of the experimental class. In the control class, the average score for the *fluency* indicator was 78.55% which was in the good category while in the experimental class it obtained an average score of 89.88% and was in the excellent category. These results show that in this indicator the experimental class is better than the control class.

**2. Flexibility**

In the *flexbility* indicator, there is a question of creative thinking ability at numbers 1,2,3,4,5,6,7,9, and 10. Where what is measured in this study is the ability of students to see problems from various points of view. In the matter of *flexibility* indicators, it is able to provide interpretation of the picture or problem. It can be seen in Figure 4.1. That in this indicator the control class has a lower average value than the experimental class. In the control class, the average score for the *flexibility* indicator was 65.11% which was in the good category while in the experimental class it obtained an average score of 79.88% and was in the good category as well. These results show that experimental classes using *Creative Problem Solving* (CPS) learning models and control classes using conventional methods have provided ideas from various points of view.

**3. Originality**

In the *originality* indicator, there is a question of creative thinking ability at numbers 1,2,3,4,5,8,9, and 10. Where what is measured in this study is the ability of students to be able to give birth to new and unique expressions. It can be seen in Figure 4.1. That the acquisition of the average value on the experimental class *originality* indicator is higher than that of the control class. In the control class, it obtained an average score of 58.5% which was in the sufficient category while in the experimental class it obtained an average score of 65.62% and was in the good category. This shows that more than half of the learners of experimental classes and control classes have not been able to come up with unusual or unique answer strategies in solving problems. Based on the averages and categories shows that in the originality indicators the experimental class is better than the control class.

**4. Elaboration**

In the *elaboration* indicator, there is a question of creative thinking ability at numbers 4,5,8,9, and 10. Where what is measured in this study is the ability of students to add or detail the details of an object, idea, or situation so that it becomes more interesting. It can be seen in Figure 4.1. That the acquisition of the average value of the *experimental class elaboration* indicator is higher than that of the control class. In the control class, it obtained an average score of 55.8% which was in the sufficient category while in the experimental class it obtained an average score of 66.4% which was in the good category. The results of this study show the ability of experimental class students to develop an idea based on existing information in solving problems better than the control class.

Inferential analysis in this study used the help of SPSS 26. Inferential analysis consists of a normality test, a homogeneity test, and a hypothesis test. Before the hypothesis test is carried out, it is necessary to do a prerequisite test first, namely the normality test and the homogeneity test. The normality test was carried out with the *Kolmogrov Smirnov* test to find out whether the data were spread normally or not, the signification result in the control class was 0.200 while in the experimental class the signification result was 0.135. Both classes have a signification result of $\geq 0.05$ which means that the control and experimental classes are normally distributed. The homogeneity test was carried out with the *One-way anova* test, the result of the signification value obtained was 0.090 ( $0.090 \geq 0.05$) which means that data from the control class and experimental class have been distributed normally and homogeneously. The hypothesis test was carried out with the *Independent sample t-test* to find out whether there was a significant improvement in the creative thinking ability of students between the control class and the experimental class on temperature, expansion, and heat materials. The independent *sample t-test* has a condition, namely if the signification value (sig.) $< 0.05$ then Ho is rejected and Ha is accepted. Based on the *output of the independent sample t-test* carried out, a signification value (*2-tailed*) of 0.000 ($0.000 < 0.05$) was obtained, which means Ho was rejected and Ha was accepted, so it was concluded that there was a significant difference in the creative thinking ability of students between classes that applied the *creative problem solving* learning model. (CPS) with classes that apply conventional learning. Classes that apply the *creative problem solving* (CPS) learning model get more results than classes that apply conventional learning.

Based on the results of the study, the application of the creative problem solving (CPS) learning model can be a solution to improve the creative thinking ability of students, because the creative problem solving (CPS) learning model applied causes students to be able to solve problems creatively because this learning model consists of four stages that are able to grow students' *creative problem solving* ability, namely classification problems, disclosure of opinions, evaluation and selection, implementation. These results are supported by similar findings from previous studies thatlearning by applying the *Creative Problem Solving* (CPS) model can improve creative thinking skills [13]. In experimental classes that use *the Creative Problem Solving* (CPS) model, it is higher than classes that use conventional methods [14].

## 4. Conclusions and Recommendations

Based on the results of data analysis regarding the creative thinking ability of students at SMP Negeri 1 Perhentian Raja, the conclusion was obtained, namely the ability to think creatively in science in experimental class students who apply the *Creative Problem Solving* (CPS) learning model both from control classes that apply conventional learning and there are significant differences in the creative thinking ability of experimental class students who apply the learning model Creative Problem Solving (CPS) with control classes that apply conventional learning, where classes that apply the *Creative Problem Solving* (CPS) learning model obtain higher *posttest* results than classes that apply conventional learning. Then it can be said that the SSCS learning model is effective against the ability to think creatively.

Based on the conclusions above, researchers recommend that teachers apply the *Creative Problem Solving* (CPS) model as an alternative to improve the creative thinking ability of students used in the science learning process at school, and also teachers are expected to be able to use the learning model to improve creative thinking skills, so that students can get good learning outcomes. In addition, researchers also advise readers or other researchers to carry out the same research on different materials.

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