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A Development Module to Teach Creative Thinking Ability Based on Creative Problem Solving and Design Thinking Models

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Abstract

This study aims to examine the effectiveness and practicality of modules used to teach students to think creatively, based on creative problem solving and design thinking models. By adopting a 4D development model, which consists of four stages: *define, design, develop,* and *disseminate*, surveys and interviews were conducted at the *define* process stage which proved that the students who used modules that contain conventional learning models do not help in improving creative thinking skills. The stages of module development have gone through validation tests, and revised, based on suggestions from experts and small group test results. The use of modules shows a significant increase in improving students' creative thinking skills (91.63%) for students in fourth semester in the Primary School Teacher Education study program. The future of this research is expected to be used empirically so that it can investigate the influence of modules related to higher-order thinking skills of students.

Keywords*:* creative thinking skill, creative problem solving, design thinking, 4d model

Introduction

Creativity is a complex construction; it is performed in linguistics, music, maths, spatial kinesthetics, and interpersonal and intrapersonal relations (Gardner, 2006). Creative thinking skills in higher-order thinking skills are the key in teaching and learning activity (Heong, Yunos, & Hassan, 2011), but due to complexity, it is not discussed well. A learner having creative

thinking skills can solve a problem in many ways. Creative thinking in other words, is a process of knowing the problems, the deficiencies, the gaps, the knowledge, the lost elements, the disharmony, etc, then finding problems, solving problems, making assumptions or formulating hypotheses, testing and retesting hypotheses and probably modifying and repeating it and finally presenting results (Torrance, 1996).

To boost creative thinking skills of students, we need a proper teaching model, it is related to situational study and then good expectations will be achieved. The teaching method used is related to cognitive skills where this model encourages students to reflect on their experiences then conduct the test from their experiences. The result of this test will help students construct knowledge and develop understanding (Eggen & Kauchak, 2012). The construction found depends on knowledge proceeded by the learner, then it will be used as a solution and learning activity.

Creative thinking skills are one of the skills that learners must have, as it will support learners to solve problems found. This skill is considered to produce an original idea or answers (ÜLGER, 2016). One of the problems that students found to think creatively, including Nusa Cendana University particularly in PGSD (Elementary School Teacher Study Program) is that creative thinking has not been taught in detail for them. Observations in 2017/2018 showed that students did not have the capability to think creatively in solving problems, because the process of giving the task to students is still in knowing the problems, besides that, students had not been taught how to think creatively and given a proper guideline used in creative thinking skills.

Improvements conducted in the 21st century has made learners, including students, have good capabilities in creative thinking skills (Gipps & Stobart, 2009; Piirto, 2011). Expanding capability to think creatively needs a proper study method, and it will be variable related to different methods to differently achieved conditions (Degeng, 2013). Thus, the study method in use is connected to the situation and expected results. Creative Problem Solving and Design

Thinking are two methods used to expand creative thinking skills for students (Swestyani et al., 2014). The Research of Bhatnagar & Badke-Schaub (2017) (Bhatnagar & Badke-Schaub, 2017), showed that by using creative problem solving, students of the technic faculty in India had problems solved. Dealing with creative problem solving and the design thinking model was developed to solve problems creatively (Cornet & Elsen, 2010; Rauth, Köppen, Jobst, & Meinel, 2010), and it is used to improve cognitive capability (Dewey, 1910; S, 2015). Design thinking skills can increase the students' capability to solve problems and creative problem solving can stimulate students to think and act creatively (Luthifa & Nur, 2018). Based on the data above, it can be concluded that communication between Creative Problem Solving and Design Thinking can improve the cognitive capability related to creative thinking.

One capability that students must have in the 21st century study is capability to think of creativity in problem solving (Funke, 2017). This capability will make students become problem solvers for each problem found. By using instructional models' lecturers can organise the topics discussed. The main component for creative problem solving can be seen in figure 1.

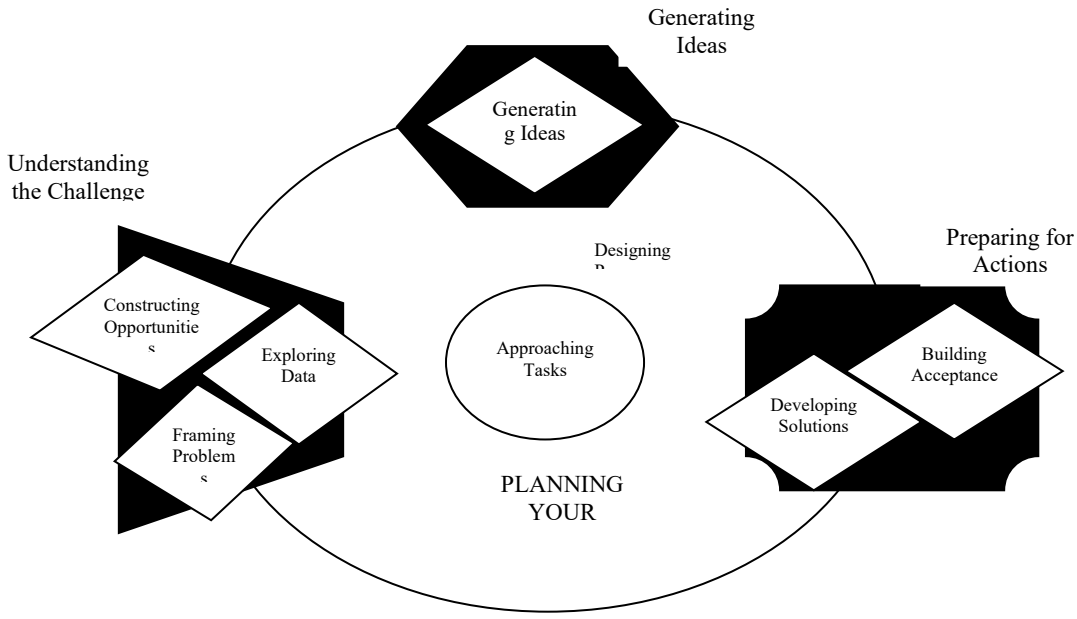

Figure 1. Creative Problem-Solving Framework (Treffinger, Isaksen, & Dorval, 2010)

Design thinking main component can be seen in Figure 2.

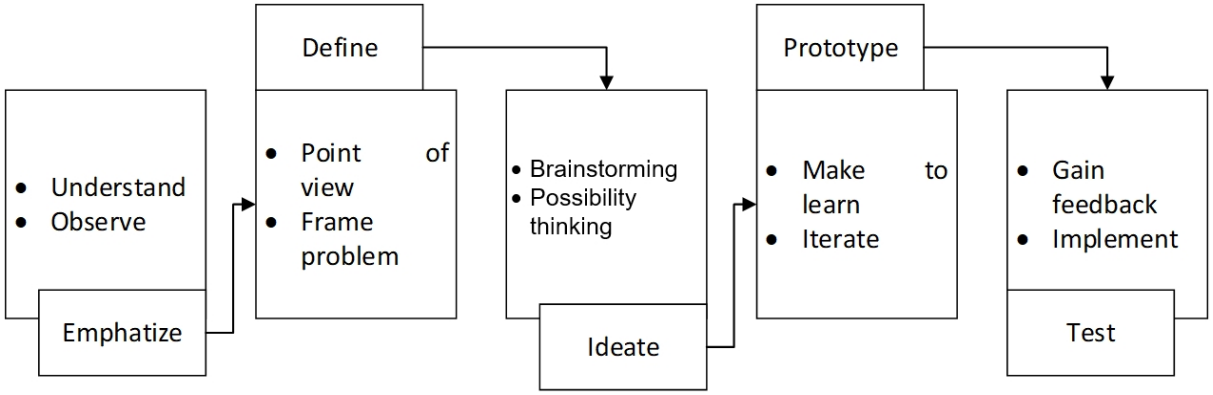

Figure 2. Process Design Thinking (Carroll et al., 2010)

The use of creative problem solving and design thinking in the developed module is expected to help students increase their creative and capability skills, and solve problems given in topics and as a result this use increases capability in creative thinking. The module is a written book aimed to help students study independently (Smaldino. S. E., Russell. J. D., Heinich. R., 2002); it can be studied anywhere and everywhere. The module is designed systematically and shows students how to solve problems that help them study by themselves (Ike Festiana; Sarwanto; Sukarmin, 2014). The module contains topics to study that have students study and practise independently. This helps students find it easier and increases their creative thinking skills as well.

Aim

This study aims to: (a) design a module based on creative problem solving and design thinking models, that can improve a student's creative thinking skills; (b) examines the effectiveness and practicality of modules used to teach students to think creatively based on creative problem solving and design thinking models.

Materials and Method

The Development Model

This study belonged to *development* and *research* (Setyosari, 2013); it's aim is to develop a module for students in the fourth semester at PGSD (Elementary School Teacher Study Program) Faculty of Teacher Training and Education. Based on the 4D that this module is developed, which consists of four stages: define, design, develop and disseminate (Thiagarajaan, S., Semmel, D.S., 1974). *Define* means how to consider the aim of the study and topics in the module. There are five steps in this stage: a) front-end analysis, b) learner analysis, c) task analysis, d) concept analysis, and e) aim of the study analysis (Leasa, Talakua, & Batlolona, 2016).

Design stages: they are intended to put creative problem solving and design thinking into study the process. In this module, students will find information about the topics to study, achievements, basic competence, aims of the study, lessons and tasks. In the *development* stage, the design expert and content expert will validate the module. In the *disseminate* stage, the module will be given to students who use it.

Population and Sample

The population in this research is students in semester four in PGSD, (Elementary School Teacher Study Program) Faculty of Teacher Training and Education. In the define stage, are ten students to gather some information related to students' creative thinking capability. Besides that, they gather suggestions related to the aim of the study; students must achieve this. At the develop stage, twenty-five students are gathered for a small group try-out. In the disseminate stage, fifty students were selected.

Instrument

The instruments used in this research are a questionnaire, validation sheets, and a cognitive skill test. The instruments were developed by the researchers and evaluated by experts before they were used.

Findings

In the define stage, the researcher conducted the survey, observation, and interview of students. As a result, most of the students did not have the skills to think creatively to solve the problem. The low ability of students to think creatively is because learning resources (modules) that are used have not been able to help them have the ability to think creatively. It was also found that modules designed for use by students still use lower-order thinking skills (C1-C3) at the cognitive level.

In the *design* stage, this module is developed for subject of a natural science study for elementary school (*IPA SD*). In this stage, students are expected to have the capability to develop an instructional ability for the natural science subjects in elementary school. In this developed study in elementary school, students in universities are expected to have creative thinking skills. There are steps to design the module, as follows:

a. Analysing achievement of study, topics, and competence that should be obtained
b. Organising the syllabus
c. Arranging lectures based on the designed syllabus, and all of the component study planned must be in module, subject identity, achievement of students, basic competence, learning activity, source and assessment methods.
d. A writing module based on creative problem solving and design thinking.
e. A printing module for students.

In this development, the module needs validating by both a content expert and design expert. Validation can be seen in table one.

Table 1. Experts Validation Result

No	Validator	Average Score	Annotation
1.	Content expert	87.00	Very Valid
2.	Design expert	85.00	Very Valid
Final Score		86.00	Very Valid

Based on information in table 1, it can be concluded that the results of the experts' validation reached the average score of 86, which showed that the module belonged to the very valid category. It proves that the module had met the requirements of a good module.

The next step was conducting an individual try-out and a group try-out. In the individual test are nine students, each of whom has different academic knowledge, and fifteen students, each of whom has different cognitive knowledge in the small group tests. The purpose of this test is to know how interesting and meaningful the module is and to identify any errors in writing, to avoid misunderstanding by the students, when they are asked to answer questions. The results can be seen in Table 2.

Table 2. Try-out results

Category	Average Score	Annotation
Individual	82.75	Good
Small group	85.50	Good

A large-scale try-out was conducted for fifty students. They use the module to study individually. The lecturer attended to lead the study process. Class activity was based on creative problem solving and design thinking. The chart below displays the results of the test.

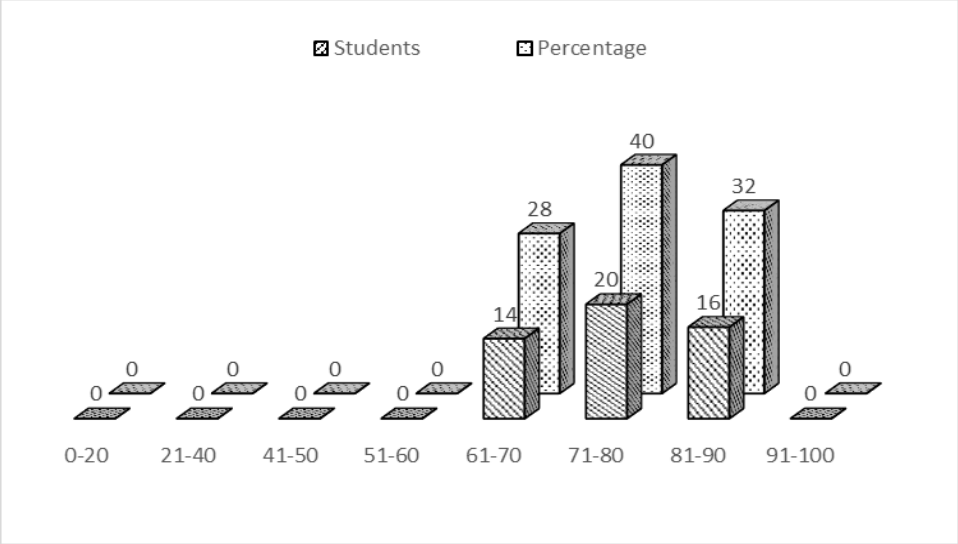

Figure 3. Students Achievements

Figure 3 shows the results after the students used the module to increase creative thinking based on creative problem solving and design thinking. There were 40% of the students with a better score (71-80), 32% students with the best score (81-90), and other students with a good score (61-70). Results gathered shows that the module is effective to improve students' creative thinking. The module provides a guideline to solve problems creatively through the good knowledge building that students must have. Knowledge capacity construction is conducted in varied learning activities, such as requirements analysis, finding problems, observation, reading, calculation, experiment and brainstorming.

In the dissemination stage, the module is given to 50 students in the learning process. The results show that the creative thinking capability of students is rising to 91.63% as in Table 3.

Table 3. Student Response

No	Evaluated Aspect	Score
1	Is the material provided in the module understandable?	200
2	Is each learning activity interesting to do?	198
3	Does every learning activity contained in the module encourage you to think about solving problems?	190
4	Does every learning activity contained in the module encourage you to think more creatively in solving problems?	186
5	Are learning steps easy to follow?	183
6	Is every activity contained in the module easy to practise or work on?	180
7	Does every activity contained in the module encourage you to create new possibilities for problem solving?	172
Total score		**1309**
Percentage		**91.63%**

Discussion

The developed module is one of the ways to improve how students think creatively; the use of it is to lead students to follow steps to creative problem solving and design thinking, and to help students give the best result in solving problems by using creative thinking in the subject of natural science (*IPA*) in elementary school. Besides that, having the student's study either individually or cooperatively in solving problems in the learning activity, the students can build knowledge and gather meaningful study. It is achieved because students in their process of learning activity understand the concept in the module and learn how to cope with stages related to one another.

Use of design thinking encourages students to have creative, critical and practical thinking, because they have awareness to think creatively through critical thinking (Cross, 2007; Burnette & Norman, 1997). Through design thinking and creative problem solving, the students have the capability to think creatively in solving problems.

Creative problem solving and design thinking in it's stages make students think creatively and critically as well; the reason is that in these two models are stages used to understand the problem and solve the problem. Understanding problems are analysed and problem construction is written. The result of problem construction will used for ideas to solve the problem. Each idea found will be analysed according to which ideas will be the best solution, and it will be developed to have a product or procedure to solve the problem.

Conclusion

The results of this research shows that module development using creative problem solving and design thinking can improve creative thinking capability. Continued research on this topic proves that this model is effective in improving students' capability in higher-order thinking skills.

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