

**Analysis of Mathematical Creative Thinking Skills in Terms of Self-efficacy in Creative Problem Solving Learning Models with an Open-ended Approach and Mind Mapping Assisted by Google Classroom**

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## **Abstract**

This study aims to analyze mathematical creative thinking ability using creative problem solving learning model with open-ended approach and mind mapping assisted by google classroom. This research uses a qualitative approach with a descriptive research design. The population in this study is 8th grade students of SMP Negeri 10 Semarang. Based on self-efficacy levels, there are three kinds of subjects employed in this study: high, medium, and low. According to the findings, students who fell into the high self-efficacy category were capable of meeting the criteria for fluency, flexibility, originality, and elaboration. It was possible for students in the moderate self-efficacy category to meet the indicators for fluency, adaptability, and creativity. The only indication that could be met by students in the low self-efficacy category was the fluency indicator.

**Keywords:** Creative Thinking, Creative Problem Solving, Self-efficacy, Open-ended, Mind Mapping, Google Classroom

## **1. Introduction**

Qualified human resources are required to be able to keep up with the times, one of which is the development of science and technology. Along with the development of science and technology, each individual is required to have good communication skills, be able to think critically, systematically and creatively (Sudianto, Dwijanto & Adhi, 2018).

In order to enable pupils to think critically, logically, analytically, systematically, and creatively, mathematics can be employed as a reference when exploring information (Akhdijat &

Hidayat, 2018). By concentrating more on the development of innovative solutions rather than producing knowledge acquired, creativity in mathematics learning is essential for acquiring mathematical knowledge. (Chesimet, Githua & ng'eno, 2016). When students solve a mathematical problem, they are using the creative thinking method, which emphasizes the process of coming up with a variety of fresh, original answers. (Triwibowo, Dwiyanti & Sugiman, 2017; Octaviani, Dwijanto & Ahmadi, 2019; Purwasih, 2019).

However, the fact shows that Indonesian students have a hard time developing their critical thinking skills. (Happy & Widjajanti, 2014). According to the research conducted by Rasnawati et al., (2019), the average percentage of creative thinking skill indicators, including *fluency*, *flexibility*, *flexibility*, and *elaboration* is 39%. In line with (Sulistiyawati, Dwijanto & Walid, 2018; Susanti, Waluya & Masrukan, 2020; Setianingsih, Waluya & Dwijanto, 2020) states that students' mathematical creative thinking skills are still low. One of the causes for the low mathematical creative thinking ability is that some students are unable to solve problems using various methods, strategies, or approaches (Sudianto, Dwijanto & Adhi, 2018). The affective factor is another element that can enhance one's capacity for creative thinking skills. Self-efficacy is one of the affective factors that might enhance it. (Wahyu, Rosmansyah & Sholahhudin, 2017; Sawitri, Suyono & Hakim, 2020). Students' self-efficacy is their capacity to plan and resolve problems for the best outcomes in a certain task. (Bandura, 1997; Subaidi, 2016; Simamora et al., 2019). Low self-efficacy will limit one's ability to come up with creative solutions to problems (Sawitri, Suyono & Hakim, 2020).

Students need to be given learning opportunities that can help them develop their mathematical creative thinking skills in problem solving. The researcher uses the Creative Problem Solving Model to boost student creativity. The CPS model is a learning model that focuses on teaching and problem solving skills followed by strengthening creativity (Sari & Sri, 2017). The open-ended approach is one method that can help students in developing their problem-solving creativity. Open-ended learning involves giving a question to students with more than one correct answer method (Winardi & Dwijanto, 2017). The method used by teachers in learning is the mind mapping method since it helps students explore creative ideas in the learning process (Fatmawati, 2016). E-learning based on a learning management system is one of the technology applications that can be employed nowadays (LMS). Google Classroom is one of the LMSs that may be used for education.

### **1.1 Research Problem**

Based on the background of the study above, the researcher formulates the research question. It is how the description of mathematical creative thinking of 8th grade students of SMP Negeri 10 Semarang with a creative problem solving learning model with an open-ended approach and mind mapping assisted by google classroom in terms of self-efficacy.

### **1.2 The Objek of the Study**

This research aims to describe the description of mathematical creative thinking of 8th grade students of SMP Negeri 10 Semarang with a creative problem solving learning model with an open-ended approach and mind mapping assisted by google classroom in terms of self-efficacy.

## **2. Review of Related Theories**

This study includes various relevant theoretical studies that function as a theoretical foundation, including (1) Mathematical creative thinking ability, (2) self-efficacy, (3) Creative

problem solving learning model, (4) Open-ended approach,(5) Mind mapping (6) Google classroom.

### **2.1 Mathematical creative thinking ability**

Creativity in mathematics learning is crucial for acquiring mathematical knowledge because it focuses more on the development of innovative solutions than producing knowledge acquired. (Chesimet, Githua & ng'eno, 2016). One of the skills that must be developed in learning mathematics is creative thinking skills. Students use the creative thinking approach, which emphasizes the process of coming up with a variety of fresh, new solutions, when they solve a mathematical problem (Purwasih, 2019). According to (Hendriana & Sumarmo, 2014), students with creative thinking skills can think quickly (fluency), which entails producing a variety of ideas and solutions for problems; flexible thinking (flexibility), which involves producing a variety of answers; original thinking (originality), which entails producing original solutions and the ability to think in creatively; and elaboration thinking (elaboration), which entails expanding an idea by including new information or providing more detail ideas.

### **2.2 self-efficacy**

Self-efficacy is a person's capacity to organize and solve problems in order to complete a certain task successfully (Subaidi, 2016). Self-efficacy is crucial for learning mathematics since it can automatically influence a person's decision-making regarding how much effort to put forth in order to solve issues (Indrawati, Wardono & Junaedi, 2021). Based on Bandura (Fauziah, Muhamad & Hendri, 2019) self-efficacy indicators are divided into three dimensions, namely the magnitude, strength, and generality dimension.

### **2.3 Creative Problem Solving Model**

The creative problem solving model is a teaching strategy that emphasizes problem solving abilities before fostering creativity (Pepkin, 2014). Since there is a close connection between mathematical creativity and problem solving, the most fundamental definition of mathematical creativity comprises flexible thinking, applying and constructing different methods, and generalizing original answers. (Silver, 1997; Kirisci, sak, & Karabacak, 2020). According to Isro'atun (2018) the syntax of the CPS learning model process based on the OFPISA criteria of the Osbon-Parnes model can be seen as follows: (a) Objective Finding (b) Fact Finding (c) Problem Finding (d) Idea Finding (e) Solution finding (f) Acceptance Finding.

### **2.4 Open-ended Approach**

The open-ended approach in mathematics instruction learning encourages students to engage in creative problem solving activities (Nurlita, 2015). Meanwhile, according to (Winardi & Dwijanto (2017) In order to encourage students to engage actively and creatively in problem solving, the open-ended approach is a teaching strategy that places a strong emphasis on the interaction between mathematics and students.. Students are presented with challenges during the learning process using an open-ended approach in the classroom, allowing them to expand their knowledge by applying methods, strategies, or approaches to get appropriate solutions.

## 2.5 Mind Mapping

A technique for learning concepts based on how the brain stores information, mind mapping or mind maps were created by Tony Buzan (Aprilia & Diarta, 2016). Concept maps will naturally link newly learned material to previously retained knowledge. Information in the form of symbols, images, forms, sounds, and sensations will be remembered by the brain (Buzan, 2010). Mind maps can help students improve their thinking abilities, making them one of the best tools for both measuring and expressing ideas freely and creatively (Dewi & Riandi, 2016). Furthermore, because the concepts that students are taught during the learning process are presented in the form of mind maps, using mind mapping may also have an impact on students' understanding abilities. (Agustin, Syahbana & Paradesa, 2018).

## 2.6 Google Classroom

Google Classroom is a program created with education in mind that makes it easier for teachers and students to communicate online (Kurniawati, Harja & Elli, 2019). Google Classroom offers teachers the chance to facilitate virtual learning by sharing online and developing curriculum while giving students individual tasks. (Savitri, 2019).

## 3. Research Method

The research method employed was descriptive research. The population was VIII grade students of SMP Negeri 10 Semarang consisting of 7 classes. In this study, the population was sampled using the random sampling technique, which involves selecting samples at random from two classes. In this study, class VIII G performed as the experimental class (which used a creative problem-solving model with an open-ended approach and mind mapping with Google Classroom assistance) and class VIII H served as the control class (taught by using PBL Scientific learning). Each student in the class is equally competent. Self-efficacy is used to categorize research participants into high, medium, and low categories. In this study, self-efficacy questionnaires, tests of creative thinking aptitude, and interviews were used to collect data.

## 4. Discussion

Student self-efficacy is categorized using questionnaires into three categories: high, medium, and low. The self-efficacy questionnaire consists of magnitude, strength and generality. Table 1 below shows the findings of the student self-efficacy grouping.

**Tabel 1. Student Grouping based on Self-Efficacy**

Self-efficacy Category	Students Number	Percentage
High	5	17,24%
Medium	18	62,07%
Low	6	20,69%
Total	29	100%

Six students two from the high self-efficacy category, two from the medium self-efficacy category, and two from the low category will perform as the research subjects based on these categories. Subjects E-5 and E-12, both from the high self-efficacy group, Subjects E-7 and E-17, both from the medium self-efficacy category, and Subjects E-14 and E-1, both from the low self-efficacy category, were chosen as research subjects.

Subjects E-5 and E-12 students who fall into the high self-efficacy category are capable of meeting all aspects for high creative thinking ability. Moreover, Supandi, Suyitno, Sukestiyarno & Dwijanto (2021) states that students' creativity is influenced by self-efficacy. On the other hand, Suciawati (2019) defines that, pupils who have high levels of self-efficacy will be more persistent and attentive in solving problems. They will also be more able to deal with difficulties and solve math tasks (Subaidi, 2016).

Students with medium self-efficacy category, specifically subjects E-7 and E-17, were able to complete the fluency aspect. Subjects E-7 and E-17 were also able to complete the flexibility aspect, but subject E-7 was only able to complete one solution method properly. However, subject E-17 made a few mistakes while trying to solve the mathematical problem. Subjects E-7 and E-17 attempted to use the solution in their own ways in the originality indicator. The correct answer was produced by Subject E-7. Subject E-17 did not provide the complete answer, however. This shows that subject E-17 was unable to complete the originality aspect. In the elaboration indicator, subjects E-7 and E-17 were able to solve the problem. Subject E-7 has been able to elaborate ideas, however, subject E-17 still unable to get detailed ideas. Therefore, Subject E-7 can meet the elaboration criteria. Subject E-17 complete can the elaboration aspects but with some limitations. In addition to this research, Ningrum, Mulyono & Isnarto (2020) states that students with low self-efficacy have difficulty relating mathematical concepts to other mathematical concepts.

Students with low self-efficacy category are subject E-14 and subject E-1. Subjects E-14 and E-1 can both identify problems in the fluency indicator, but E-1 makes an error in identifying the intersection line. As a result, incorrect reaction is produced. Subject E-14 was able to provide the correct answer in the flexibility indicator, but subject E-14 did not provide a different response. Subject 1 was able to provide a new approach to solving the mathematical problem than subject E, however the solution was less accurate. In the originality aspect, subject E-14 simply provided a generic response to the question, and subject E-14 provided the incorrect conclusion for the result. Unlike subject E-1 who merely provided an answer without a solution, This indicates that subjects E-14 and E-1 were unable to fulfill the originality criteria. Subjects E-14 and E-1 were unable to specify ideas for answering some questions in the elaboration indicator. Subjects E-14 and E-1 have not answered the question with a definitive conclusion. Therefore, subjects E-14 and E-1 were unable to meet the elaboration indicator criteria. Moreover, Sawitri, Suyono & Hakim (2020) defined that The ability to think critically about a subject will be limited if students lack self-efficacy. When faced with obstacles in their studies or problem-solving, students who typically persevere quickly give up. Thus, students often lack confidence in their ability to understand it or even in their ability to solve problems. (Subaidi, 2016).

## **5. CONCLUSION**

According to the analysis of the research's findings, students who fall into the high self-efficacy groups are able to meet the criteria for fluency, flexibility, originality, and elaboration. Students who fall within the moderate self-efficacy category can meet the indicators for fluency, adaptability, and originality. Only the efficacy indicator was met by students in the low self-efficacy category.

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