Creative Thinking Skills based on Self-efficacy in Creative Problem Solving Learning with Scaffolding

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ABSTRACT

Keywords:
Creative Thinking Ability;
Creative Problem Solving Learning;
Scaffolding;
Self-efficacy.

This research aimed to discuss creative mathematical thinking ability based on self-efficacy in CPS learning with scaffolding. This research employed qualitative descriptive design. The subjects of the research were 6 students of class XI of junior high school selected based on three categories of self-efficacy, they were: high, medium, and low. Two students were found in the high self-efficacy category, two students from the medium self-efficacy category and two students from the low self-efficacy category. The results of this research showed that students with high self-efficacy level were able to complete the four qualifications of creative thinking abilities, they were fluency, flexibility, originality, and elaboration. Students with the medium self-efficacy level were still having difficulty showing up ideas to determine the unusual way of being used. Students with low self-efficacy level had difficulty in understanding the problem so that it is only able to meet one qualification of creative thinking ability that is fluency. Based on the explanation of the results of this research, it can be concluded that no student with low self-efficacy level has a high score of creative thinking ability.

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A. INTRODUCTION

Mathematics is aspect important for measure progress of a country's (Pratama & Retnawati, 2018)(Pratama & Retnawati, 2018). Mathematics given to each level education in Indonesia with destination for grow and develop ability think logical, analytical, systematic, critical, and creative as well as ability work same participant educate (Firdausi & Asikin, 2018; Maftukhah et al., 2017). Through activity learning, students facilitated by the teacher to involved by active develop potency herself (Hidayat & Widjajanti, 2018). However, the facts show that students experience difficulties in mathematics (H. D. Putra et al., 2020; Saironi & Sukestiyarno, 2017; Wijaya et al., 2019).

Creative thinking is a habit of thinking that is trained by paying attention to intuition, turn on imagination, express the possibilities new (Firdaus et al., 2018; Suripah & Sthephani, 2017). Creative thinking skills need to be developed by training students to think fluency, flexibility, originality and elaboration (Mawaddah et al., 2015; Sari et al., 2017; Ulinnuha et al., 2021). Creative thinking is an ability that a person needs, especially in mathematics, creative thinking and self-efficacy are interrelated (Febrianti et al., 2018; Qadri et al., 2019). Basically, self-efficacy is one component from self-regulated or independence in it load aspect ability control self (Rahayu & Zanthy, 2019). Self-efficacy is one of the key characteristics that determine the success of students' learning (Kuswidyanarko, 2017; Sariningsih & Purwasih, 2017; Wahyu et al., 2017).

Self-efficacy is one of the important characteristics that determine student learning success (Razzaq et al., 2018; Shahzad & Naureen, 2017).

Based on the description above, to find out what problems are related to mathematical creative thinking skills in terms of self-efficacy, researchers have conducted a preliminary study. The following is one of the questions given, a parking lot can only be occupied by 300 vehicles consisting of cars and buses. If the average area of the car is 18 m² and the bus is 50 m², while the parking area is 10,200 m². Determine the linear inequality of the two variables of the problem and determine the number of cars and buses that can be parked, as shown in Figure 1.

Figure 1. One Student's Answer

Figure 1 shows that students are able to turn story problems into mathematical sentences correctly. However, the student's creative thinking ability is not good because it can only determine one answer from the many possible answers available, especially if the student does not use the right way to find the answer. In addition, students' creative thinking skills have not been trained. This is evidenced by the student's lack of skill in writing information and what is stated in the question and the student's lack of skill in verifying the answers obtained.

This is in accordance with the results of previous studies which concluded that students' creative thinking skills were still low so they needed to be optimized (Hidayat & Widjajanti, 2018; Lutviana et al., 2020; Sholihah et al., 2020; Susanti et al., 2020). In line with this study, the results of other studies also show that self-efficacy has a positive influence on mathematical creative thinking skills (Masitoh & Hartono, 2017; Ningsih & Hayati, 2020).

Learning models and strategies that should be chosen in learning is the one that can construct and develop ability think creative student (Atikasari et al., 2018; Melianingsih & Utami, 2019). The CPS model is one of the learning models that can be used increase ability think creative student (Malisa et al., 2018; Y. P. Putra, 2018). Scaffolding in learning is a strategy for help student build understanding new (Nurhayati, 2017).

Based on the background discussed, then the formulation of the research problem is how students' creative thinking ability in terms of self-efficacy in CPS learning with scaffolding. Researchers want to analyze students' creative thinking ability in terms of self-efficacy. So, in this case it can provide a description of students' creative ability in terms of self-efficacy towards research subjects in three category, namely high, medium, and low. This study will also provide an overview of students' self-efficacy at high, medium, and low which includes four aspects of creative thinking ability, namely fluency, flexibility, originality, and elaboration. This study is different from previous research which has not described the four aspects of students' creative thinking ability to the three category of students' self-efficacy.

B. METHODS

This research employed descriptive design. The research sample was taken by random sampling, two classes were obtained as samples, namely class A and B. Class B as the experimental class which was treated CPS learning with scaffolding and class A as the control class which was taught by problem based learning. The determination of the research subject was collected based on the self-efficacy level, then 2 students were selected from the high self-efficacy level, 2 students from the medium self-efficacy level, and 2 students from the low self-efficacy category. The data collected techniques used in this research were creative thinking ability tests, they were self-efficacy questionnaires and interviews. The qualitative data analyzed in this research were the results of the students' creative thinking ability tests and the results of interviews with students in answering creative thinking ability test questions.

C. RESULTS AND DISCUSSION

After the CPS learning with scaffolding was complete, students were given a creative thinking ability test and a self-efficacy questionnaire. Giving the test of this research aims to determine the ability to think creatively and the self-efficacy questionnaire aims to categorize students based on self-efficacy scores. The results of grouping the self-efficacy scores of class B students are displayed as shown in Table 1.

Table 1. Grouping of Students Based on Self-efficacy

Self-efficacy Category	Students	Percentage
High	8	2 6 %
Medium	16	5 2 %
Low	7	2 2 %
Total	31	100%

Analysis of creative thinking ability based on self-efficacy was divided into three groups based on the self-efficacy category, namely high, medium, and low. Based on the results in Table 1, 6 students were selected as research subjects. The selection of research subjects was taken from students with the highest self-efficacy score taken by 2 students, students with a self-efficacy score in the medium were taken by 2 students, and students with the lowest self-efficacy score were taken by 2 students. The research subjects selected were S-29 and S-09 from the high self-efficacy category, S-30 and S-26 from the medium self-efficacy category, and S-02 and S-16 from the low self-efficacy category. Analysis of creative thinking ability in students with high self-efficacy categories was carried out on subjects S-29 and S-09. The results 1a of the work of the S-29 subject are presented as shown in Figure 2.
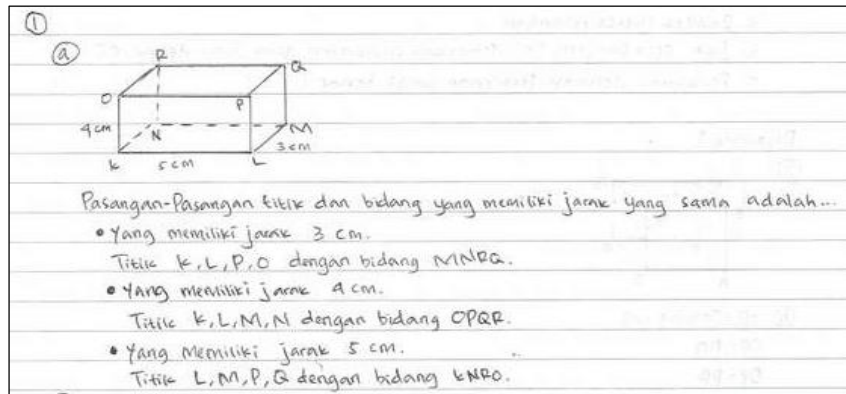
Figure 2 . Subject Work Results 1a of S-29

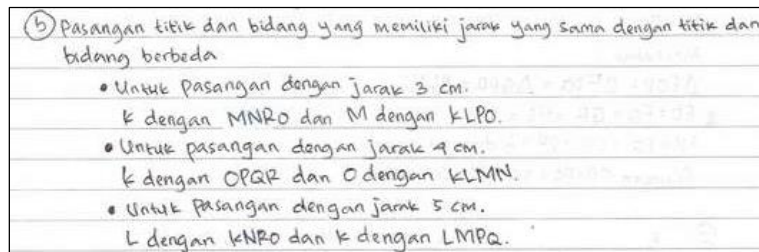The results 1b of the work of the S-29 subject are presented as shown in Figure 3.

Figure 3. Subject Work Result 1b of S-29

The results 1c of the work of the S-29 subject are presented as shown in Figure 4.
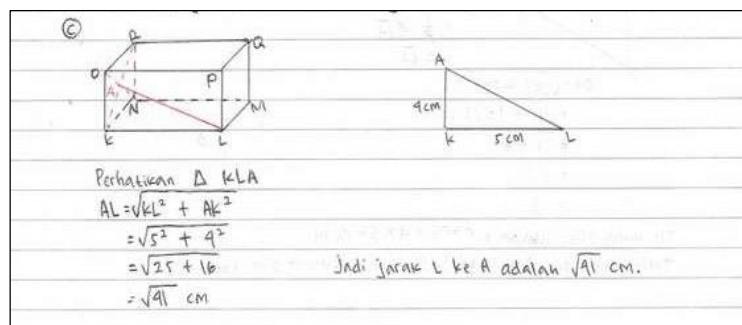

Figure 4. Subject Work Result 1c of S-29

Figure 2, 3, and 4 shows that S-29 is able to understand the problem, so that it can solve all aspects of creative thinking ability. This is supported by the results of interviews which show that S-29 is able to provide an explanation of the answers written on the question sheet. In addition, the S-29 can also explain solution to the given problem. This can be seen in the following interview excerpt.
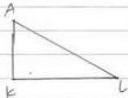
P   :   Have you answered it in detail?
S-29   :   InshAllah Mrs.
P   :   Are you sure that in this solution no steps have been skipped?
S-29   :   No Mrs.
The results of the work of the S-09 subject of are presented as shown in Figure 5.

Figure 5 . Subject Work Results of S-09

Figure 5 shows that the subject of S-09 is able to understand the information contained in the question so that it can determine solution problem related dimensions three according to the question request. But the fluency aspect cannot be answered perfectly, because students only mention for one the same distance . In addition, the subject of S-09 was able to write in two different ways than usual so that he was able to fulfill the aspects of flexibility and originality . And can detail the explanation of the method used in determining the solution problem dimensions three . This is in accordance with the following interview excerpt.

P : Can you use another point and plane?
S-09 : Yes Mrs.
P : Why don't you write it on your answer sheet?
S-09 : I think several points with the same plane are enough to represent Mrs.

The results of the work of the S-30 subject are presented as shown in Figure 6.
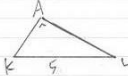
Figure 6 . Subject Work Results of S-30

Figure 6 shows that the S-30 subject in the medium self-efficacy category still feels confused in determining distance among two point. Students can only Fulfill three aspects of creative thinking skills, namely fluency, flexibility, and originality. This is supported by the following interview results.

P   :   The method you use to solve c1 is it correct?
S-30 :   Yes, Mrs. right.
P   :   What are you confused?
S-30 :   Build the space that will form.
P   :   Is the position of the elbows right?
S-30 :   Sorry Mrs., the elbows are wrong.

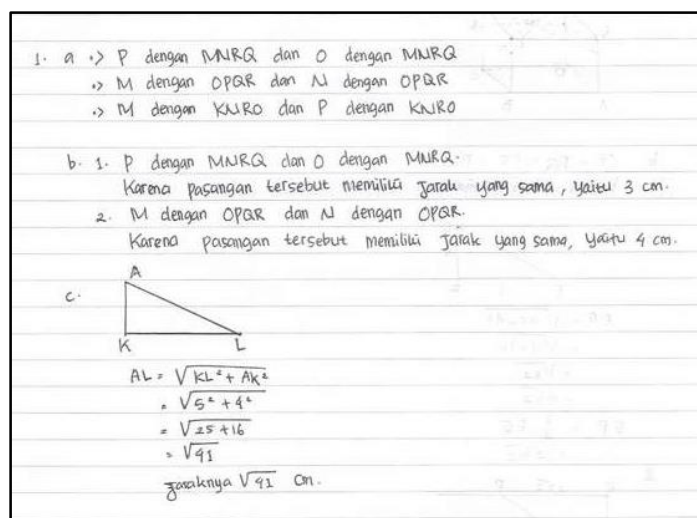The results of the work of the S-26 subject are presented as shown in Figure 7.

Figure 7 . Subject Work Results of S-26

Figure 7 shows that the subject of S-26 with medium self-efficacy category has not been able to fulfill the four aspects of creative thinking ability. The fluency aspect can be solved by students by providing two pairs of points and a plane that has distance same . But in the aspect of flexibility, students have not mentioned pairs of the same distance with different points and planes. In addition, on the aspects of originality and elaboration students can write down their answers. This is because students feel unsure of the ideas that arise in their minds so that some aspects are not answered. This is in accordance with the following interview excerpt.

P   :   Why don't you name pairs of equidistant distances with different points and planes?
S-26 :   Haven't thought of Mrs.
P   :   Have you tried different planes with the same distance?
S-26 :   No, Mrs.
P   :   Why?
S-26 :   The important thing is that I just answer Mrs.

The results of the work of the S-02 subject are presented as shown in Figure 8.
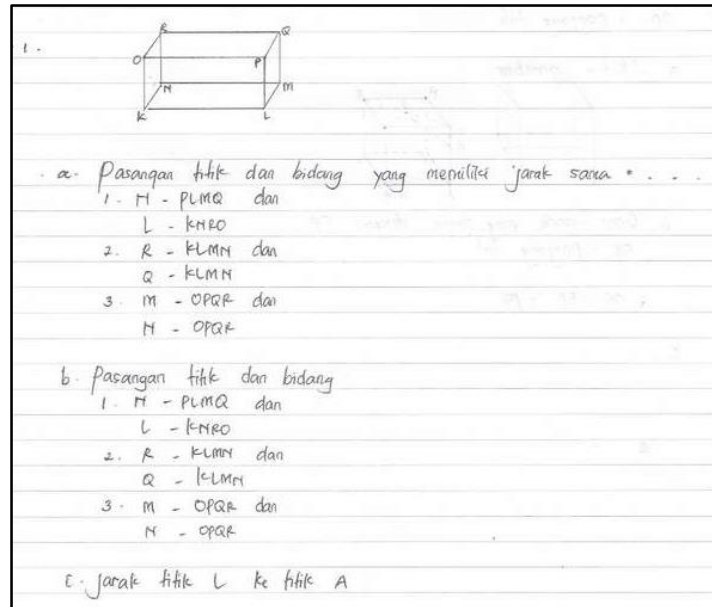
Figure 8 . Subject Work Results of S-02

Figure 8 shows that students with low self-efficacy category are only able to fulfill the aspect of creative thinking ability, namely fluency . Students find it difficult to understand the problems in the questions so that there are unanswered problems. The flexibility aspect has not been fulfilled because students have not been able to write down two pairs that have the same distance with different points and planes. Students only mention pairs of points and planes arbitrarily without paying attention to the command. In the elaboration aspect, students have not been able to detail the answers asked by the questions. This is supported by the following interview.

P : Why didn't you answer question number 1c?
S-02 : I can't Mrs.
P : Which part can you not?
S-02 : All Mrs.
P : Why can't everyone. Don't you try to understand the order?
S-02 : I'm confused Mrs.

The results of the work of the S-16 subject are presented as in Figure 9.
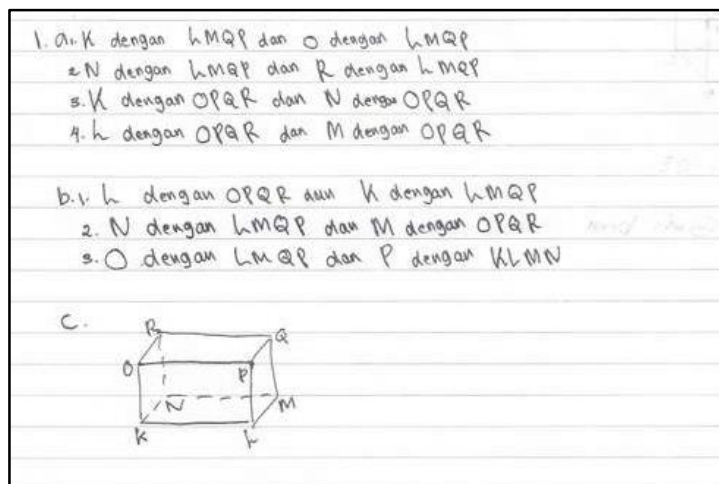
Figure 9 . Subject Work Results of S-16

Figure 9 shows that the creative thinking ability of the S-16 subject is not much different from that of the S-02 subject. This can be seen in the results of the work of the S-16 subject that is only able to complete the fluency aspect smoothly. The other three aspects of thinking ability have not been fulfilled by the subject of S-16. This is supported by the following interview.

P   :   Why didn't you answer all the questions?
S-16 :   No, Mrs.
P   :   You didn't try to understand the command because?
S-16 :   Confused ma'am.
P   :   Why don't you try to answer?
S-16 :   Lazy to try Mrs.

Based on Figures 2 to 9 and the interview results show that self-efficacy has an important role in determining students' creative thinking abilities. Subjects S-29 and S-09 with the category high self efficacy has great self-confidence and does not give up easily when faced with problems. So that students more easily understand the problems contained in the problem and have no difficulty in generating new ideas and can find many solutions to a problem. Students with high self-efficacy category are able to fulfill all aspects of creative thinking skills, namely fluency, flexibility, originality and elaboration. Although S-29 and S-09 there are still a few shortcomings of students in writing explanations of written answers. This is in line with Arifin's (2017) statement that someone who has high self-efficacy will be very easy to do difficult tasks better as something that must be mastered not to be avoided. The existence of high self-efficacy in mathematics lessons encourages students to be diligent and try really to pay attention and look for learning strategies to learn and do mathematics tasks (Sunaryo, 2017).

Subjects S-30 and S-26 with the category of medium self-efficacy have not been able to fulfill all indicators of creative thinking ability perfectly. Based on the research, it is known that students with the category of medium self-efficacy have difficulty in detailing the details of objects, ideas for solutions to mathematical problems so that the elaboration aspect has not been fulfilled. Besides that, there are also students who still have difficulty coming up with new ideas in determining different ways appropriately, so that the originality aspect cannot be fulfilled. Meanwhile, in the flexibility aspect, students in the medium self-efficacy category were able to provide answers using one method commonly used before so that the solutions given were still incomplete. The use of self-efficacy is to help a person in making choices, efforts to move forward, persistence and perseverance in the face of difficulties, and the degree of anxiety or calmness and maintaining tasks (Sunaryo, 2017). If students do not have good self-efficacy, students will have difficulty in determining how to solve problems.

According to Nadia (2017), students with medium self-efficacy can solve problems, although there are still a few errors. Medium self-efficacy students can express their mathematical ideas in the form of pictures completely and correctly. When solving problems involving mathematical equations, medium self-efficacy students can find mathematical models. Medium self efficacy students can also answer correctly, although it is incomplete but medium self efficacy students can apply the concept of mathematical equations involving line and angle problems correctly, then perform calculations to get a correct and complete solution. And when solving problems in the form of written texts, medium self-efficacy students can explain mathematically and make sense and are arranged logically and systematically. Thus, medium self-efficacy students do not experience significant difficulties in solving a problem by expressing their abstract ideas.

Meanwhile, subjects S-02 and S-16 with low self-efficacy tend to be less confident, lazy, and give up easily in facing a problem. In addition, students with low self-efficacy categories have difficulty understanding the problems contained in the questions, so that students have not been able to solve the existing problems optimally. Based on this, S-02 and S-16 with low self-efficacy category have not been able to complete the aspect of creative thinking ability to the maximum. Aspects of creative thinking skills that can be achieved by students with low self-efficacy categories are fluency.

Students who have low self-efficacy still have difficulty in solving a problem by expressing their ideas (Nadia et al., 2017). Students are only at the stage of using it, not maximal, especially when solving problems using words or written texts, students with low self-efficacy have not been able to maximize previous knowledge. This is in accordance with Pasandaran's research (2016) which found that subjects with low self-efficacy showed that subjects could not change their way of thinking to a more abstract level by assuming a concept as algebraic variables. Students with low self-efficacy tend to choose lesson assignments and activities related to the material they like and find it easy for them.

The results of the research show that there are differences in students' creative thinking abilities in terms of self-efficacy (high, medium, low). Students with high self-efficacy do not feel afraid, doubtful, and embarrassed to have an opinion (Arifin et al., 2018). In addition, students with high self-efficacy believe that they can solve the problems given (Ahmad et al., 2013; Wulansari et al., 2019). Students with medium self-efficacy can solve problems and have no difficulty in expressing abstract ideas, although there are still errors (Nadia et al., 2017; Ratnaningsih, 2019). Meanwhile, students with low self-efficacy category have difficulty in coming up with abstract ideas (Pasandaran & Rusli, 2016). This means that self-efficacy has a positive influence on the achievement of mathematics achievement that can be achieved by students (Sunaryo, 2017; Vally et al., 2019). Self efficacy has a strong influence on success in solving mathematical problems (Özcan & Eren Gümüş, 2019). High students' mathematical abilities tend to have high self-efficacy (Lestari, 2015). If students do not have good self-efficacy, students will feel hesitant in working on problems in mathematics (Sunaryo, 2017).

In this study, students with high self-efficacy were able to fulfill all aspects of creative thinking skills, while students with low self-efficacy only achieved the fluency aspect. This is because students with high self-efficacy are more confident and enthusiastic in doing the mathematical creative thinking ability test. In line with this research from Arifin (2018) students who have high self-efficacy do not feel afraid, hesitate and are ashamed to submit opinions while those who have low self-efficacy do not have the enthusiasm to work on questions.

Based on the explanation of the results of this study, it can be concluded that there are no students with low levels of self-efficacy who have high mathematical creative thinking abilities. This is because students with low self-efficacy categories are lazy to try to do the exercises given by the teacher so that students have difficulty understanding non-routine questions because they are not accustomed to working on questions that are in accordance with aspects of mathematical creative thinking skills. This is in line with the opinion of Nadia (2017) which concludes that students with high self-efficacy do not experience difficulties in generating abstract ideas. Students with high self-efficacy have self-confidence, work hard, dare to appear in outlining their ideas, are creative and critical in solving various problems they face, and do not give up easily, and

will grow and develop their confidence in their abilities (Ahmad et al., 2013; Arifin et al., 2018; Faozi et al., 2020).

This is in line with the opinion of Sunaryo (2017) regarding the use of self-efficacy, which is helping someone in making choices, efforts to move forward, perseverance and persistence in the face of difficulties, the degree of anxiety or calmness, and maintaining tasks. Wulansari (2019) states that self-efficacy has a positive effect on the achievement of mathematics learning achievement that can be achieved by students. If students do not have good self-efficacy, students will feel hesitant in working on problems in mathematics. In addition, research from Nadia (2017) shows that students with low self-efficacy still have difficulty in solving a problem by expressing their abstract ideas.

D. CONCLUSION AND SUGGESTIONS

According the results and discussions, it showed that students of the high self efficacy level were capable of fulfilling all four qualifications of creative ability, they were fluency, flexibility, originality, and elaboration. Students at the medium self efficacy level were capable of fulfilling qualifications of creative thinking, they were fluency, flexibility, and originality or aspect fluency, flexibility, and elaboration. Even though they were writing down the student's answers, there were still deficiencies that are not perfect. Meanwhile, students with low self efficacy level was only capable of fulfilling the qualification of creativethinking ability, namely fluency.

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