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# Creative Thinking Ability With Open-Ended Problems Based on Self-Efficacy in Gnomio Blended Learning

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**Abstract**

This study aims to describe the mathematical creative thinking abilities based on mathematics self-efficacy of 8th grade students. The type of this study was a mixed method. The design of this study was sequential explanatory. The population of this study was 8th grade of SMPN 3 Temanggung which consisted of six classes. The data collecting techniques based on self-efficacy were taken 2 subjects for each category in a purposive manner. The result showed that the description learning of mathematical creative thinking abilities based on mathematics self-efficacy varied. This was showed from 3 students with high self-efficacy, 2 students obtained mathematical creative thinking abilities in the high category and 1 student in the moderate category. From 24 students with moderate self-efficacy, 6 students obtained mathematical creative thinking abilities in the high category, 13 students in the moderate category, and 5 students in the low category. From 5 students with low self-efficacy, 1 student obtained mathematical creative thinking abilities in the high category, 2 students in the moderate category, and 2 students in the low category.



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## INTRODUCTION

Vygotsky mentioned that creativity is one of the important mechanical activities in constructing students' new knowledge (Akgul et al., 2016). Meanwhile according to Dewi & Masrukhan (2018) creativity is a product of creative thinking activities that can come up and produce new ideas. To emerge new ideas, the ability to think creatively is one of the things students must have in the 21st century. The ability to think creatively is a fundamental ability that every person needs to have in facing technological challenges. Creative adaptation is the only possibility to be able to follow the changes that occur (Mawwadah et al., 2015). In mathematics, students must also have the ability to think creatively, especially in geometrical material because it is widely used in everyday life. The issue of highly order thinking skills (HOTS) is also the basis of many students who do not want mathematics because they consider mathematics to be a complicated thing especially in geometry because there are many drawings and formulas. This is similar to Saironi & Sukestiyarno (2017) & Kuswidyanarko et al (2017) who stated that most students consider mathematics to be a difficult and burdensome subject.

TIMSS in 2015 explained, Indonesian students were weak in all aspects of mathematical content, one of them was the ability in geometry. Therefore students must be trained to express their own ideas bravely. It is the same as stated by Najiha et al. (2017) during the process of learning mathematics the ability to express ideas / mathematical ideas is something that must be done by everyone who is studying them. Students are said to have been able to think creatively if they can answer questions with aspects (1) fluency, that is, they can work on problems, (2) flexibility, which has many ways to answer, (3) originality that is able to answer with answers that has never been taught and (4) elaboration that can specify the answer (Utami et al, 2014; Aziz et al, 2017 & Intan et al, 2018).

According to Sternberg and Wiliams as quoted by Chuang et al, (2010) argued that to maximize and develop creativity requires self-efficacy. Bandura (2008) defined self-efficacy as a belief held by a person in the ability to produce or show the level of ability to do an exercise that affects events that occur in life. Self-efficacy is very important, because it can be related to motivation, thought processes and behavior (Liu, 2009; Santrock, 2011; Motlagh, 2011; Mc.Coach, 2013 & Martalyna et al, 2018).

The learning process undertaken by the teacher is very influential on the ability to think creatively and students' self-efficacy, so we need a learning model that has coherent stages in solving problems so that students can gradually discover new ideas in mathematical problems and their self-efficacy can be better. In line with that Rochmad & Masrukhan (2016) stated the success of learning conducted in the classroom is because the teacher uses a learning model that is appropriate, varied, teaching well (good teaching).

Discovery learning (DL) which is a learning done through supervision and problem solving processes in accordance with the scientific method of investigation so that students are encouraged to learn concepts and principles from their own explanations (Sani, 2014 & Moore, 2014). But along with era's development, to utilize information, communication and technology (ICT) can be made into learning media (Salma, 2013; Edorgan, 2016 & Wardono et al., 2018). The ICT used is the gnomio website. Gnomio is an open source LMS (Learning Management System) that can be obtained free from moodle without using a server. The term blended learning was originally used to describe subjects that try to combine face-to-face learning with online learning (Husamah, 2014 & Sulistyoningsih et al., 2015). Therefore, blended learning in this study is to combine DL with the help of the gnomio website.

In addition to the learning model for achieving HOTS the problems students must face to practice their creative thinking skills and students' problematic self-efficacy use open-ended problems. According to Becker, Shimada, and Nohda in Nurlita (2015) the use of open questions in learning mathematics is to encourage students' creative activities in solving problems, stimulate students to think original, and innovate

in mathematics. Open-ended questions can improve students' ability and creative thinking process because open-ended questions have many alternative answers or ways of solving (Fardah et al, 2013).

The formulation problem in this study is how students' mathematical creative thinking ability were viewed from students' self-efficacy. The objective to be achieved are to analize students' creative tinking abilities in terms of students' mathematical self-efficacy. The quality of learning in this study was measured using theree stages, namely palnning and preparation, classrom environment and evaluating learning outcomes.

## METHODS

The research method used in this study was a mixed method that combines quantitative and qualitative research. In the first stage, quantitative data was collected and analysed, then followed by the collection and analysis of qualitative data, which was built from the initial results of quantitative data.

The study was conducted at Temanggung Middle School 3 in the even semester of 2018/2019 school year. The population in this study was 8th grade students in 2018/2019 school year. The research samples were two classes of 8th grade. The research subjects were selected from the experimental class based on the results of the self-efficacy questionnaire which were classified into high, moderate, and low groups. Subjects in the high self-efficacy study group were selected by two students who had the highest and lowest scores in the group, subjects in the moderate self-efficacy group were selected by two students who had the highest and lowest scores in the group, and research subjects in the low self-efficacy group were selected by two students who had the highest and lowest scores in the group.

Quantitative data were obtained from the results of the students' mathematical creative thinking ability tests twice, namely the initial test (pretest) using prerequisite material namely triangles and rectangles and the final test (posttest) with material of flat line solids. While qualitative data were obtained through observation, questionnaires, and interviews.

The quality of learning in this study includes the stages of planning, implementation, and assessment. In the planning stage, it is said that the quality if the learning tools and research instruments are tested for validity by obtaining the minimum good criteria. At the implementation stage it is said that the quality if the results of the assessment of the implementation of learning is minimal good. And at the assessment stage, learning is said to be of quality if the positive response of students reaches more than 75%, the average mathematical creative thinking abilities test scored more than KKM that was equal to 61, the students' mathematical creative thinking abilities reached classical completion, the average thinking ability test Mathematical creative learning in Gnomio Blended Learning was more than the average conventional mathematical creative thinking abilities test and the proportion of completeness mathematical creative thinking abilities test in gnomio blended learning was more than the proportion of mathematical creative thinking abilities test in control class.

## RESULTS AND DISCUSSION

The quality of learning includes the stages of planning, implementation, and assessment of gnomio blended learning. At the planning stage of assessment, this study used a 5 scale rating scale.

At the planning stage, the results of syllabus validation, RPP, LKS, Mathematical creative thinking abilities test questions, self-efficacy questionnaire, gnomio media obtained an average score of 4.1 with good categories to use. The highest score is the RPP and mathematical creative thinking abilities test questions which obtained a score of 4.3 while the lowest is the gnomio media with a score of 3.9. Therefore, devices and instruments were appropriate to use because they were in the minimal good category. For the test results of the mathematical thinking ability test instrument of 6 questions, 4 questions were selected for the posttest for creative thinking ability, the selection was based on the results of

validity, difficulty, differentiation, reliability and indicators that could contain the ability to think creatively.

At the implementation stage, learning is said to be on high quality if the assessment of learning implementation gets a minimum good score. This assessment used a 5 scale rating scale, which wa filled by an observer. The observer who assessed was a teacher in the research school. The implementation of learning in this study were 6 meetings. The minimum score obtained was 4 in the first meeting with a good category and the maximum score obtained was 4.6 with a very good category at the sixth meeting. Therefore, the implementation of learning is in the minimal good category.

Based on research that has been done the results of mathematical creative thinking abilities tests in the experimental class obtained 70 in average and for the control class obtained 66 in average. Completeness achievement for the experimental class was 90.6% while the completeness achievement in the control class only reached 80%. Based on the test results of students' mathematical creative thinking abilities and the standard normal list with $\alpha = 5\%$ obtained $t_{count} = 7.164$ and $t_{table} = 1.698$, so $3.79 = t_{count} > t1-\alpha = 1.698$, then H0 was rejected. So, the average score of mathematical creative thinking abilities of the students who were taught using gnomio blended learning exceeded the minimum criteria. While the proportion test was obtained by $Z_{table} = 1.64$. From the calculation, it was obtained that $Z_{count} = 2.04$ and this was located in the rejection area H0 so that H1 was accepted. This means that the percentage of students who reached a minimum completeness of 61 in gnomio blended learning were more than 75%. Based on the t test using experimental and control classes obtained t count = 2.109 and t table = 1.669, so 2.109 = t count> t1-α = 1.669, then H0 was rejected. So, the average scores of mathematical creative thinking abilities of the students who were taught using gnomio blended learning was higher than control class students. Proportion test obtained value of 2.07 = z> z_ (0.5-α) = 0.4808 with α = 5%, then H0 was rejected. So, the proportion of students' mathematical creative thinking abilities taught using gnomio blended learning was higher than the control class students.

The average score of the students who were taught using the gnomio blended learning was completing KKM, the classical completeness test results obtained that the proportion of experimental class students who scored more than 61 had exceeded 75%. In addition, researchers also tested the average difference between the experimental class and the control class. Based on the average difference test results obtained that the average mathematical creative thinking ability of experimental class students in solving problems was better than the mathematical creative thinking abilities of control class students. The proportion of completeness of the experimental class was higher than the proportion of the control class. These statements indicate that gnomio blended learning can be said to be qualified. This is also due to the syntax that was carried out during learning will lead students into the habit of creative thinking in solving problems, while the initial goal of the open-ended problem strategy is to give students the freedom to solve problems in accordance with students' own ideas. This learning model and supporting strategy will certainly develop students' creative thinking power with the freedom students have.

This quality of gnomio blended learning was also supported by Sulistyoningsih (2015) showing that in her research the use of blended learning in the mathematics learning process contributed substantially in solving mathematical problems in which more than 75% of students could solve problems. Meanwhile, the research from Li & Tsai (2013) online learning produces obtained better results than using technology but offline. Meanwhile, open-ended problems can enable students to hone their mathematical creative thinking abilities (Fatah et al, 2016).

Next is a qualitative analysis of students' mathematical creative thinking in terms of self-efficacy. Students in the experimental class were given a self-efficacy questionnaire classified into high, moderate, and low self-efficacy groups. Following are the results of the self-efficacy questionnaire of 32 students presented in Table 1.

**Table 1.** Self-efficacy Classification Result.

| Category | Total of the students |
|---|---|
| High | 3 |
| Moderate | 24 |
| Low | 5 |

The results showed that the description learning of mathematical creative thinking abilities in terms of students' self-efficacy varied. This was showed from 3 students with high self-efficacy, 2 students obtained mathematical creative thinking abilities in the high category and 1 student in the moderate category. From 24 students with moderate self-efficacy, 6 students obtained mathematical creative thinking abilities in the high category, 13 students in the moderate category, and 5 students in the low category. From 5 students with low self-efficacy, 1 student obtained mathematical creative thinking abilities in the high category, 2 students in the moderate category, and 2 students in the low category.

The results of creative thinking skills seen from self-efficacy showed that students who had high self-efficacy did not necessarily get high creative thinking scores. But there were students with low self-efficacy categories who got high creative thinking abilities than students with high self-efficacy. That was because the learning model provided can stimulate students to learn, according to research from Pasandaran & Rusli (2016) students with low self-efficacy showed a tendency to think at a relational level, showing the characteristics of thinking that were relatively the same as high efficacy subjects. However, only one student with low self-efficacy got high creative thinking abilities, it could be said that students with low self-efficacy still hesitate in answering questions about creative thinking abilities. According to Najiha, Waluya & Isnarto (2017) research, in line with that, research from Arifin, Nawa & Fajaruddin (2017) showed that students who had high self-efficacy did not feel afraid or hesitant or ashamed to submit opinions while those who had low efficacy did not have the passion to do it.

## CONCLUSION

Based on the description results of the analysis and discussion, the students' mathematical creative thinking abilities in terms of self-efficacy showed a mixed result. This means that students' self-efficacy did not affect students' mathematical creative thinking abilities absolutely. Therefore, the quality of learning remained on the focus of learning activities.

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