Creative Thinking Ability in Mathematics Learning

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Abstract.

The ability to think creatively in learning is needed, especially in learning mathematics. The purpose of this study was to examine students' creative thinking skills in learning mathematics. Data is collected through related journals for review. The research method chosen in this study is the SLR (Systematic Literature Review) method. Data collection was carried out by documenting and reviewing all articles on creative thinking skills published in 2018-2019. The articles used in this study were 10 articles from accredited international and nationally accredited journals obtained from the Google Scholar and Scopus databases. The results show that learning with open-ended learning has an important role in building creative thinking skills, to build students' creative thinking skills in mathematics lessons in the future need to be considered as a broader collective learning process and design through a learning approach that can build creative thinking skills and also increase the role of teachers in the student learning process. Creative thinking ability is very closely related to students, especially in learning mathematics because creative thinking can bring many benefits to students.

Keywords: creative thinking; mathematics; learning.

1. Introduction

Mathematics is one of the educational sciences that has an important role in everyday life. The rapid development of science and technology has a positive role in human life and one of the sciences in charge is mathematics [1]. Therefore, mathematics is taught in formal and non-formal schools from basic education to higher education, even from an early age child have been taught about calculations and introduced to numbers. Mathematics plays an important role in the learning process in schools because through mathematics students are trained to think critically, creatively, logically, analytically, and systematically. The ability to think creatively is very much needed by students because now science and technology are developing rapidly so it allows anyone to get information quickly and easily from various sources.

Creative thinking is the ability to think consistently and continuously to produces something creative. Creative thinking skills can be developed in the learning process and cannot be created by itself. In math, the teacher provides routine matters that have one correct answer in the textbooks, and learning more emphasis on the provision of formulas and application of the formula is directly in solving the problems [2]. So that students tend to only memorize formulas and difficulties when faced with complex questions. This shows that students' ability to think creatively is not optimal.

The 2013 curriculum prioritizes learning that encourages students' physical and mental activity optimally. Such learning practices support the growth of active learning (active

learning). This learning moves all physical and mental activities of students so that students have a lot of learning experiences through empowering their activities. This learning also trains students to be able to think critically, creatively, and communicatively which is needed in the life of the 21st century. Although creativity has become the focus of mathematics learning stated in the curriculum, the implementation of classroom learning that leads to student creativity is still far from what is expected [3].

The development of creative thinking skills is one of the goals of learning mathematics. Through learning mathematics, students are expected to have the ability to think logically, creatively, and critically and can work together [4]. The purpose of this study is to examine students' creative thinking skills in learning mathematics.

2. Method

Researchers do this by identifying, reviewing, evaluating, and interpreting all available research. Based on the stages above, to support this research, the researchers collected journal articles on the Google Scholar and Scopus databases. the keywords are creative thinking skills, learning, mathematics, and their combination. The articles collected are only articles published in 2018-2019. From various articles, the researcher selected 10 articles with 5 international journals and 5 national journals, which can be seen in Table 1.

Table 1. Percentage of Journals

Journal	*Percentage*
Q2	2%
Q3	1%
Q4	2%
S2	2%
S3	1%
S4	2%
Amount	10

3. Result and Discussion

The results of the research data included in this literature review are tabulations of documented article data related to creative thinking skills in as many as 10 articles. For more details see Table 2.

Table 2. Ability to think creatively

Researcher	**Learning Type**	**Grade**	**Journal**	**Methods**
Nuha M. A, Waluya S. B and Junaedi I. (2018)	Problem Posing dengan pendekatan lesson study	8th grade	International Journal of instruction	36 students Observations, test, and interview
Ndiung S., Dantes N, Ardana M, Marhaeni (2019)	Treffinger Creative Learning dengan RME	5th grade	International Journal of instruction	101 students
Puspitasari L., In'am A, & Syaifuddin M. (2018)	-	7th grade	International Electronic Journal ofMathematics Education	test and interviews

F Nurdyani, I Slamet and I Sujadi (2018)	Problem-based learning	8th grade	Journal Of Physics: Conference series	36 students Observation, test, and interview
Damayanti H. T & Sumari (2018)	Open-Ended Problem	7th grade	Journal Of Physics: Conference series	
Nursofah, Kumala R, & Rusdi (2018)	Research-Based Learning	11th grade	Journal of Research and Advances In Mathematics Education	
Nufus H, Duskri M., Bahrun (2019)	Challenge-Based Learning	7th grade	Journal of Research and Advances in Mathematics Education	21 students Test, interview, quisioner.
Dewi & Marsigit (2018)	Problem posing	15-17 years old	Indonesian Journal of Science and Education	interview
Febriani S & Ratu N. (2018)	Open-Ended Problem		Mosharafa:Jurnal Pendidikan Matematika	
Lestari R, Rahmi D, & Risnawati (2019)	Open-Ended	8th grade	Journal for Research in Mathematics Learning	

In this study, creative thinking skills are defined as ideas or concepts given by students to solve mathematical problems and also how these ideas are applied in solving problems. Creative thinking is a process that produces various kinds of solutions that can be used as answers to problems at hand [5]. Therefore, aspects of creative thinking skills are fluency, flexibility, originality, and elaboration [6][7][8][9][10][11][12][13]. Fluency leads to solutions, flexibility leads to problem-solving that has more than one different way or perspective, originality leads to ways or ideas that are purely derived from original ways of thinking, and elaboration leads to demands of one step by another.

3.1 Math lesson approach

In this section, it will be reviewed how the influence of students' creative thinking abilities. A learning approach that builds creative thinking skills with STEM, Realistic, problem-posing, open-ended problems. In research [13] the learning approach is to combine the stages in Trefffinger's creative learning model and the RME principle. The merger will collaborate to produce the following integration: the basic tools stage using the principles and reality activities that will guide students in developing creative thinking skills in the fluency aspect. The practice and process stages use the principle of interaction and the principle of reality that direct students to develop creative thinking skills in the aspect of originality. The problem-solving stage uses the guiding principle, the principle of hierarchy, and the principle of interconnection which is assumed to be oriented to the development of creative thinking skills in the aspect of flexibility. Procedure research-based learning research consists of three main stages, each learning stage must hone, and develop four aspects of creative thinking skills (fluency, flexibility, originality, and detail) [14]. There are 3 stages in problem-posing learning, namely the stage planning, implementation, and evaluation stages [6]. Problem posing with a lesson study approach in a digital classroom setting has been effective.

3.2 Students' ability in mathematics

In the section on students' abilities in mathematics with articles, they are analyzed by quantitative methods that measure changes in scores or test results conducted by students. In the articles analyzed, the average student learning outcomes increased with the concept of creative thinking ability being applied. In Research-Based Learning learning, students' abilities are classified as good with evidence of intermediate math test results that formulate more than one way to complete the test. The components of creativity that can be absorbed

are fluency, flexibility, originality, and elaboration [14]. Creative thinking skills absorbed by students can be obtained, one of which is by posing problems [15] and open-ended problems, and in line with the practice of problems created with open problems, it is a fairly informative way to complete learning by fulfilling three indicators of creative thinking [8].

4. Conclusion

Based on the results and discussion described above, it can be concluded that learning with open-ended learning has a role in building creative thinking skills. creative thinking skills in learning mathematics can be improved by providing opportunities for students to develop their creative thinking skills by fulfilling the indicators of creative thinking itself. Thus students' creative thinking skills are no longer in the low category in solving mathematical problems. Furthermore, regarding pedagogical practice in the classroom, the role and abilities of teachers must be considered carefully because mathematics teachers will be required to have creative thinking skills to build a mindset that extends to the students being taught. given to students well and smoothly. Therefore, to build students' creative thinking skills in future mathematics lessons, it is necessary to consider the process and design of collective learning problems that are widespread through learning approaches that can build creative thinking, and also increase the role of teachers in the student learning process.

5. References

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