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MATHEMATICAL CREATIVE THINKING STUDENT PROFILE BASED ON STUDENT'S LEARNING INDEPENDENCE

Siti Nur Rohmawati[1*], Sumartono[2], Lusiana Prastiwi[3]

[1,2,3]Mathematics Education Study Program, Faculty of Teacher Training and Education, Dr. Soetomo University, Jl. Semolowaru No.84, Surabaya, East Java 60118

ABSTRACT

The ability to think mathematically creatively is an ability that a person has to solve problems or find different ideas to unite with things in mathematics. The aim of this study is to determine the profile of students' mathematical creative thinking in terms of student learning independence. This research is a type of descriptive qualitative research carried out at MA Darul Ulum Kureksari Waru Sidoarjo for the 2021/2022 school year, with the research subject of class XI-2 social studies consisting of 3 students. Find the description of students' mathematical creative thinking ability, is carried out by giving a test that there are four indicators of mathematical-creative thinking, namely fluency, flexibility, originality, and elaboration. There are two stages in this study, namely: providing a questionnaire for learning independence and providing mathematical creative thinking test questions. The results of the study using triangulation, namely by comparing the results of the written test with the first and second interviews showed: that students with a high level of learning independence meet all indicators of mathematical-creative thinking, while medium-level learning independence meets only three indicators, and low-level learning independence does not meet all.

Keywords: Creative thinking, Learning Independence, Profile.

1. Introduction

In developing and realizing in each individual education has a very important role, especially to develop a nation and state. According to Law No. 20 of 2003 concerning the National Education System Article 3, that the purpose of national education is to build the ability of students to become human beings who have faith and devotion to God Almighty, and have noble, healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens. The purpose of learning mathematics in the 2013 curriculum is that Indonesian students are prepared to have the ability to live as individuals and creative citizens (Permendikbud 2013). From the learning objectives and educational system, students must be given something with mathematics learning to improve students' creative thinking.

In accordance with a survey that has been carried out in 2015 by the Martin Prosperty Institute in Florida, et al that Indonesia ranks 115th out of 139 countries regarding the Global Creatvity Index (GCI) where the survey was carried out to assess the country's creativity index in accordance with 3 indicators, namely talent, technology and tolerance. So Indonesia is one of the countries that has the worst creativity in the world. In accordance with the situation today, the development of education in Indonesia, especially in mathematics learning, can be said to be very low. Based on the observations of Gita et al (2021) that at the time of observation at Sudirman Banyubiru Islamic Junior High School in class VII, it was seen that mathematics learning was carried out by teachers in the classroom where the teacher only emphasized the assignment of basic calculation skills. Researchers reviewed from student learning outcomes, most students did not show that they were thinking creatively in completing the assignment. Students find it difficult to relate mathematics to real situations

and also have difficulty in connecting between pre-existing mathematical knowledge and what is learned in school.

To follow up on problems in mathematics and problems in the real world, students must be taught a high level of mathematical abilities, one of which is the ability to think creatively (Maulana & Djuanda, 2017). The ability to think mathematically creatively is closely related to creativity. according to Supriadi (1994) Creativity is the ability of a person to give birth to something new, both in the form of ideas and real works that are relatively different from what has existed. Csikzentmihalyi (in Munandar 1995) elaborates that Creativity as a product has to do with the discovery of something, producing something new, rather than accumulating skills or practicing knowledge and studying books.

Knowing with creative thinking, according to Maulana (2011) creative thinking has the same meaning as divergent thinking. The results of his research suggest that the ability to think creatively in general is related to the ability to produce or develop something new, that is, something unusual that is different from the ideas produced by many people. Susanto (2013) argues that creative thinking is a process that involves elements of originality, smoothness, flexibility, and elaboration. Meanwhile, according to Hurlock (in Siswono, 2004) Creative thinking is the ability that a person has to get a composition, product or idea of anything that is new and previously unknown to the creator. Meanwhile, according to Krisnawati (2012) divergent mathematical problems are mathematical questions / problems whose solving procedures cannot be directly used to find the answer to the problem and allow having different ways of solving it and having various answers.

The ability to think creatively is very important for students, as for aspects of creative thinking ability including fluency, flexibility, novelty and elaboration needed by students in the process of solving problems (Masitoh, 2015). This is in line with what was stated by Suryani (2015) that the ability to think mathematically creatively is a person's thinking ability in developing ideas or ideas that are fluency, flexibility, originality, and elaboration. The behavioral form of creative thinking ability in each indicator according to Putri, et al (2018) is as follows:

Table 1 Criteria/Indicators of Creative Thinking Ability (Putri, et al 2018)

Indicators of Creative Thinking Ability	Behaviour
Fluency	Ability to answer mathematical problems correctly, sparking many ideas or ways of solving problems.
Indicators of Creative Thinking Ability	Behaviour
Elaboration	Ability to detail, amplify and expand problem answers
Fleksibilitas	Ability to answer mathematical problems with several different solution methods or answers.
Originality	Ability to answer mathematical problems by using new and unique ideas.

Mathematical ability at the level of creative thinking is one of the higher-order thinking abilities that there are several stages to master, it requires the integration of various other mathematical abilities such as comprehension ability, comprehension ability, problem solving ability, communication ability, and reasoning ability. The ability to think mathematically creatively is an ability that a person has to solve problems or find different ideas to unite with things in mathematics. Thus, mathematical creative thinking is very important in mathematics learning to increase students' creative power to the problems faced and solve them with their abilities.

In order for the mathematical ability of learning mathematics to grow well, students must have a special behavior in learning called learning independence. According to Isnaniah (2017) that high independence, students will try to be responsible for the progress of their achievements, self-regulate, have high initiative, and have a strong drive to continuously make achievements.

So in line with research from Nanang (2016) that a person who has learning independence will not rely on others and will always face and solve existing problems and will be relatively better able to face all the problems that exist in his life. From the explanation above, learning independence is when a person can face and solve learning problems himself without relying on others so that there can be progress in achievements and achieve the desired goals with reference to the knowledge / or competencies he has.

There are two things that are interrelated, namely the independence of learning and the ability to think mathematically creatively by students. Learning independence is an effective aspect as well as the ability to think mathematically creatively as a cognitive aspect which is an aspect that must be achieved and obtained in learning (Gita, et al, 2021). In accordance with the research of Al-Kreimeen (2014) in (Gita, et al, 2021) says that creative cognition results from a system of self-organization, while the system of self-organization is part of the component of self-independence.

This qualitative research aims to find out how the profile of students' mathematical creative thinking ability is viewed from high, medium, and low learning independence.

2. Research Metods

The research method used in this study is descriptive with a qualitative approach, with purposive sampling of subjects as many as 3 students of class XI IPS 2 MA Darul Ulum Kureksari Waru Sidoarjo. The instruments in this study are in the form of a questionnaire on student learning independence, and also a test of mathematical creative thinking ability. The initial stage carried out by the researchers was to compile a questionnaire on student learning independence sourced from (Mulyana, 2016) (Hendriana, Rohaeti, & Sumarmo, 2017, p. 237) consisting of 30 questions from 8 indicators.

Each question has 5 alternative answers, namely Strongly Agree (SS), Agree (S), Hesitate (R), Disagree (TS), Strongly Disagree (STS). The score of each positive statement is 4,3,2,1 and vice versa for statements that are negative . The results of filling in the questionnaire in table 2 will be processed using the Correction Presentation formula according to Purwanto (2013: 102) as follows.

$$NP = \frac{R}{SM} \times 100$$

Where,

NP : Nlai percent sought or expected

R : Raw score obtained by learners

SM : Ideal maximum score of 120

100 : Fixed number.

After the results of the questionnaire calculations were found using the percentage correction formula, the researcher could measure the level of student learning independence stated by Pophan and Sintronik (in Sari, 2013: 7) (in Thoken, 2014) as stated in table 3.

Table 2 Benchmarks for Questionnaire Result Categories (Pophan and Sintronics)

Presentase	Information
66,68% - 100%	Tall
33,34% - 66,67%	Keep
0,00% - 33,33%	Low

After testing the level of student learning independence, researchers selected 3 students consisting of 1 student of high learning independence, 1 student of medium learning independence, and 1 student of low learning independence. Then the researcher tested students' creative thinking skills consisting of 4 questions consisting of 4 indicators of creative thinking ability. This study used a type of Triangulation Method because it was more suitable for the research that the researcher took. Triangulation of methods is carried out by means of comparing information or data from written tests and interviews.

3. Results and Discussion

The results of measuring the level of learning independence in 31 students of class XI ips 2 resulted in high learning independence with a total of 5 students. Students with moderate learning independence with a total of 25 students and students with low learning independence with a total of 1 student. Furthermore, the researchers chose purposive sampling of 1 student in the category of high, medium and low learning independence which will then be given a written test and an interview test as a research subject. This selection is also based on the teacher's consideration by paying attention to students in expressing opinions. The selected subjects can be seen in table 4 below.

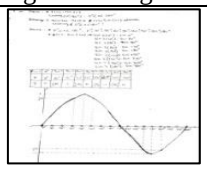
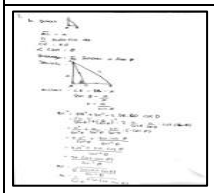
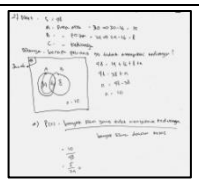
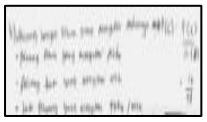
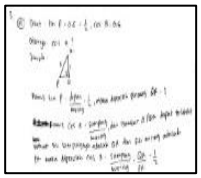
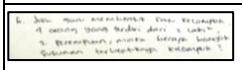
Table 3 Selected Subjects with a Level of Learning Independence

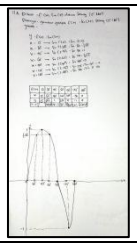
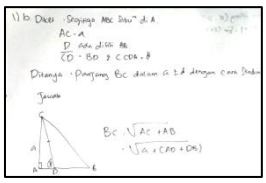
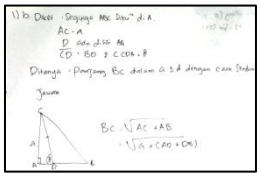
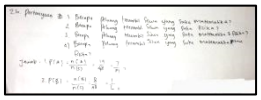
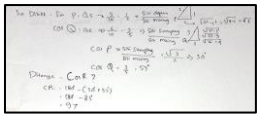
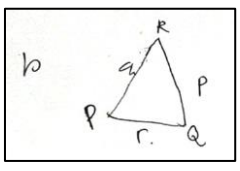
No.	Subject Code	Level of Learning Independence
1.	T	Tall
2.	S	Keep
3.	R	Low

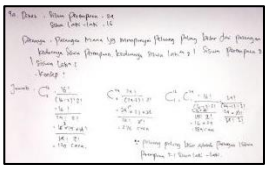
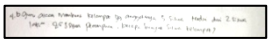
Of the three subjects above, a written test was carried out in the form of a creative thinking

ability test which will later be followed by an interview test. This test aims to describe the profile of students' mathematical creative thinking based on the grouping of high learning independence. Here are the results of the creative thinking test subjects T, S, R.

Tabel 4 Mathematical Creative Thinking Test Answers

Subject T High Learning Independence		
Orisinality		Subject T is capable of drawing graphics in its own way
		Subject T is capable of expressing the length of a triangle in its own way
Flexibility		Subject T is able to solve problems based on different information and find opportunities
		Subject T is able to give an idea of more than one question and is able to solve the problem
Elaboration		Subject T is able to develop ways to solve problems and is able to calculate the value of cos R
		Subject T was able to complete the data to solve the problem and was able to calculate the area of the PQR triangle area from the data contained in the problem
Fluency		Subject T is able to use alternative steps as well as being able to provide concepts for solving
		Subject T is capable of giving questions

Subject R Medium Learning Independence		
Orisinality		Subject S is capable of drawing graphics in its own way
		Subject S is able to figure out the formula for how to find the length of the side of a triangle
Flexibility		Subject T can find opportunities (P(x)) on a given question by looking for questions from different points of view
		Subject S is able to give an idea of more than one question and is able to solve the problem
Elaboration		Subject S is capable of finding an R angle.
		Subject S is capable of drawing a PQR triangle illustrated in the problem.

Fluency		The subject is able to provide alternative steps to solve the problem
		Subject S is able to make questions according to the question

Subject R Low Learning Independence		
Flexibility		Subject R tried to work on but the answer was wrong
Fluency		

Subject T can identify the problem well, subject S can only identify a few questions well, and Subject R is not able to identify the problem well. In general, subject T has met all four indicators of mathematical creative thinking ability, subject S has only 3 indicators while subject R does not meet all four indicators. Subject T and subject S seem to have ideas and ways to solve mathematical problems according to the information and ideas they get. Subject T and subject S can understand, solve and explain problems well while subject R cannot understand, solve and explain problems well.

In the first indicator, namely fluency, subject T with high independence is able to use alternative steps, is able to provide concepts for solving, and is able to provide questions that are relevant to the information he gets on the questions. Subjects of S with moderate independence are able to provide alternative steps to solve the problem and make questions according to the problem. Whereas subject R with low independence has tried to work on but the answer is wrong. Because in learning students are always given stimuli to be able to understand mathematical concepts such as looking for ideas in solving problems, developing concepts, looking for problems and presenting problem results with the ideas they get (Akhdiyat & Hidayat, The Influence of Students' Mathematical Learning Independence on The Mathematical Creative Thinking Ability of High School Students, 2018). This is one of the indicators of mathematical creative thinking ability where students are directed to spark many ideas towards problem solving which are then developed so as to create ideas that have been accepted and students have steady independence and tend to communicate well so as to be able to provide a meaningful picture of value (BsY, 2010) (in Akhdiyat & Hidayat, 2018). In solving the problems in this indicator, subject T and subject S can write the question well and subject R cannot answer the question. What distinguishes the subject Tdengan subjek S, angka dalam soal tersebut.

In the second indicator, namely flexibility, subject T with high independence is able to solve problems based on different information and find opportunities (P(n)) on the questions given as relevant answer ideas in solving. Subjects of S with moderate independence are able to find opportunities (P(x)) on the given questions by looking for questions from different points of view. Whereas subject R with low independence has tried to work on but the answer is wrong. Subject T and subject S are capable of giving ideas, answers/questions from different points of view whereas subject R is not able to give ideas, answers/questions from different points of view. Subject T and subject S are also able to give different directions of thought in solving problems while subject R is not able to give different directions of thought in solving problems.

In the third indicator, namely originality, subject T with high independence and subject S with moderate independence are able to draw charts in their own way while subjects with low independence are not able to draw charts in their own way. Subject T and subject S are also able to provide many variations in different directions of thought in solving problems. Subject T draws a graph by writing down the dots on the X-axis from an angle of 0° to 360° while subject S draws a graph by writing down the dots on the X-axis only a privileged angle from 0° to 180°. Subject T and subject S are able to figure out the formula for how to find the side length of a triangle but subject T is able to solve from different points of view so as to express the length of the triangle with a and θ whereas subjects S and R cannot solve the problem.

In the fourth indicator, namely elaboration, T subjects with high independence are able to develop ways to solve problems, calculate the cos R value, complete data to solve problems and calculate the area of the PQR triangle area from the data contained in the problem. Subjects with moderate independence are capable of finding the angle R and drawing a PQR triangle illustrated in the problem. Meanwhile, subject R is incapable of

solving the problem. Subject T is able to provide a broad idea in solving problems so that he is able to give several answers in various ways (varied). In addition, the subject is also able to write down the answer by detailing the details of the completion steps in sequence with a clear and complete explanation with the correct results. Subject S and subject R are incapable of providing a broad idea in solving problems.

Based on the description above, it can be concluded that learning independence affects the profile of students' mathematical creative thinking ability. this is in line with the opinion of Astuti (2019) which states that learning independence has a positive effect on creative thinking ability, with the higher the independence of learning, the higher the student's mathematical creative thinking ability. This is supported by the opinion of Taher and Pratama (2013) (in Akhdiyat & Hidayat, 2018) which suggests that the success of cognitive and psychomotor learning is influenced by affective activities. In line with the results of research from Al-kreimeen (2014) in his research which stated that it is clear that creative cognition results from a self-organizing system, while the self-organizing system is part of the self-independence component, finding that the creative type of scholar is high in the component of self-independence such as risk taking and is able to generate many ideas when faced with problems.

4. Conclusions

Based on the results of research and discussion, the mathematical creative thinking profile of subjects with a high level of learning independence is more complete than that of subjects with moderate and low levels of learning independence. Subjects with high learning independence have a mathematical creative thinking profile: able to provide many ideas in solving problems, provide answers in different ways of thinking and point of view, are able to give unusual answers, and are able to give answers in detail with broad ideas. Subjects with learning independence have a mathematical creative thinking profile: able to provide many ideas in solving problems, provide answers in different ways of thinking and point of view, are unable to give unusual answers, and are unable to provide answers in detail with broad ideas. Meanwhile, subjects with low learning independence have a mathematical creative thinking profile: unable to provide many ideas in solving problems, unable to give answers in different ways of thinking and point of view, unable to give unusual answers, and unable to give answers in detail with broad ideas.

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