

## Analysis Of Mathematical Thinking Ability Of Independent Program Students Learn Independent Campus On Analytic Geometry Courses

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### **Abstract**

*This study aims to describe and analyze the mathematical creative thinking skills of student exchange program students who take Analytical Geometry courses in the Mathematics Education study program, Prof. Muhammadiyah University. DR. HAMKA. The research approach used is descriptive qualitative. Subjects were taken by purposive sampling technique. The subjects of this study were 5 students of the non-mathematics education study program who took the analytical geometry course in the mathematics study program. The instrument used in the form of a test description which contains indicators of creative thinking, observation and interviews. Based on the research results, it is known that the average score of students' mathematical creative thinking abilities (non-mathematical) is in the criteria of being quite creative (moderate). The error factor in solving the problem of creative thinking skills in analytic geometry material is that students do not understand the problem well. This shows that students are not used to answering questions that contain indicators of creative thinking*

**Keywords:** Mathematical Creative Thinking Ability, Student Exchange Merdeka Belajar - Kampus Merdeka, Analytical Geometry.

## **INTRODUCTION**

In 2020, the government through the Ministry of Education and Culture launched the Merdeka Learning Campus Merdeka (MB-KM) policy. This policy is intended to provide freedom and autonomy to educational institutions, lecturers, and students from the convoluted bureaucratization. This program is also intended to motivate students to master various disciplines, especially skills to enter the world of work. Universities, including Prof. Muhammadiyah University Dr. HAMKA has started implementing the MB-KM program. One form of learning activity (BKP) that has been implemented is student exchange outside the study program within the same tertiary institution.

The Mathematics Education study program is one of the study programs that has implemented this student exchange program. In the mathematics education study program, there are analytical geometry courses that can be taken by students from outside the mathematics education study program. As it is known that mathematics has an important role in the world of education from an early age to the highest level with the ability to think logically, analytically, systematically, critically, creatively and collaboratively in developing its mindset (Fahmy et al., 2018). These abilities must be possessed and developed by students, especially the ability to think creatively in order to create ideas or alternative solutions as an effort to solve problems that occur in everyday life.

The ability to think creatively in mathematics is a student's effort to be able to find solutions through alternative ideas or ideas in solving problems related to mathematics. Ismaimuza (2013) states that the success of creative thinking efforts in terms of overall, for example, uses contextual problem-based learning that is in accordance with the facts of a situation or situation that has potential in terms of

cognitive problems (Akhdiyat & Hidayat, 2018) . This shows that creative thinking leads to components that can spur students to understand, master, and solve the problems they are facing and have the courage to solve mathematical problems using their own way. (Rahmazatullaili et al., 2017) The ability to think creatively can be measured based on indicators of *fluency* , *flexibility* , *originality* , and *elaboration* . Fluency is the ability to answer mathematical problem solving appropriately. Flexibility is the ability to answer problem solving, through non-standard ways. Authenticity is the ability to solve mathematical problem solving using one's own language, method, or idea. Elaboration is the ability to expand answers to problems, as well as generate new problems or new ideas (Dilla et al., 2018) .

In addition, in the context of mathematics education , the ability to understand mathematics is not only knowledge (cognitive) but also in the aspects of attitudes and skills as well as independent learning (Ningsih, 2016) . Learning independence has an impact on the results he gets, it does not mean learning alone without any guidance or facilitator from a teacher or lecturer, but students are trained to make learning initiatives by looking for ideas that he is looking for from various sources and formulating a de- ideas (Rachmayani, 2014) (Akhdiyat & Hidayat, 2018) .

With the existence of the Freedom of Learning - Free Campus policy in accordance with Permendikbud Number 3 of 2020 concerning National Higher Education Standards, Article 15 paragraph (1) states that this form of learning can be carried out within the study program and outside the study program. Then in Article 18 paragraph (1) it is stated that the fulfillment of the period and study load for undergraduate or applied undergraduate students can be carried out: 1) following the entire learning process in a study program at a tertiary institution according to the period and study load; and 2) following the learning process in the study program to fulfill part of the study period and load and the rest following the learning process outside the study program. Merdeka Belajar - Merdeka Campus, provides an opportunity for students to choose the courses they will take. So that students outside the mathematics (non-mathematics) department can take the courses they want, one of which is the Analytical Geometry subject with the help of Geogebra in a contextual manner which can hone mathematical creative thinking skills and is required to build knowledge with their own abilities (in this case , students) are very necessary, and must be able to evaluate the process and their learning outcomes (Kusuma, 2020). In this matter, the context of the questions related to the student faculty is just that these questions are converted into the concept of a geometrical analytic formula . Independent learning is currently one of the values that is the focus in the world of education and requires special attention from the educator and also prospective educators. Especially the problems that occur at this time, namely precisely in the world of education, starting from the elementary, junior high, high school and tertiary levels, is being implemented by distance learning or also known as online learning.

Online learning is currently widely used for teaching and learning activities due to conditions in the midst of the Covid-19 epidemic which requires online learning or studying at home through web blogs: *OLU (Online Learning Uhamka)* , *Zoom* or *Google Meet* and even *Whatapps* . Learning online or not face to face with the teacher or penny is a new thing experienced by students and university students in Indonesia. Even with the application of online learning, students are very much needed to be skilled in independent learning and enthusiasm in discussion and question and answer, more flexibility in finding insights and learning resources online. Online learning has several advantages, including: (1) students can study anywhere, anytime, and in any situation; (2) lectures can be conducted not only through face-to-face processes between lecturers and students; and (3) students can still study even though they are in a remote location from the lecturer (Kusuma, 2020) . Learning independence has a positive correlation with the achievement of learning outcomes obtained (Darr & Fisher) (Supianti, 2016). This opinion is also supported by Umar & Sulo (2005) (Kusuma, 2020) , which states that independent learning is a learning activity that is driven by self-will, self-choice, and accompanied by a sense of responsibility, it is a learning process that occurs due to the influence of thinking. , feelings, strategies, and behaviors that are oriented towards achieving goals. This can spur students' mathematical creative thinking skills to find various solutions or ideas in solving mathematical problems. This shows that the ability to think creatively is very important for students. This competence is needed so that students can have the ability to manage and develop information in real life creatively so that they can survive in a competitive situation.

## **METHODS**

The method that is used in this study is a descriptive qualitative method. This method aims to analyze the ability to think creatively in non-mathematics students. The subject of this research is the 5th semester students of Prof. Muhammadiyah University. DR. HAMKA who took part in a student exchange program outside the study program in 1 university. The students consist of 1 accounting study program student, 3 informatics engineering study program student, and 1 public health study program student so that the sample is 5 students. Subjects were taken by purposive sampling technique and data validation using triangulation method. The instrument in this study consisted of a mathematical creative thinking ability test and online interviews. The mathematical creative thinking ability test instrument consists of 5 items of analytic geometry.

## **RESULTS AND DISCUSSION**

This research was conducted on students of the Merdeka Belajar program - Merdeka Campus at one of the Prof. Muhammadiyah Universities. DR. HAMKA in East Jakarta. The data from the results of this study are in the form of student learning outcomes in which data collection uses a test question instrument in the form of descriptions of 5 questions online. The test data was obtained from the analysis of student answers based on the guideline for scoring the mathematical creative thinking ability. The following is a rubric for scoring instruments for mathematical creative thinking which includes indicators of fluency, flexibility, originality, and elaboration.

### **Fluent Creative Thinking Ability (FLUENCY)**

We know  $\triangle ABC$  with points A (-1,5), B (-1,1), and C (2,1). Is triangle ABC a right triangle? Describe and write a picture formed by geogebra. Subject S5 in answering TKBM tends to be more thorough. Subject S5 provides a written answer in a concise and quite complete manner along with an explanation. Written answer data for subject S5 is presented in Figure 1 and Figure 2, and the interview excerpt on question number 1 for subject S5 is presented in Figure 3

From the results of the interview that the subject S5 understands working on this problem, it's just that this S5 subject to solve the problem is first carried out in the geogebra to find out whether the triangle is right-angled or not, then tested it analytically using the proof of the Pythagorean formula.

A product, if the price is Rp. 100, will sell 10 units and if the price drops to Rp. 75, 20 units will be sold. Determine the function of the equation and plot the graph (geogebra)!

In answering TKBM, it appears that the S1 subject has given more than one idea that is relevant and examines the existing problems, for example x and y on problem number 3. S1 subjects provide written answers in a decomposed manner. Written answer data for S1 subjects are presented in Figure 4 and Figure 5, and an interview excerpt on question number 3 for S1 subjects is presented in Figure 6.

From the results of the interview that the S1 subject understood in doing this problem. S1 subjects are able to find points to create a graph that will be applied to the geogebra.

### **Flexible Creative Thinking Ability (FLEXIBILITY)**

The S2 subject in answering the TKBM shows that it has provided answers in more than one way (various), the calculation process and the results are correct. Written answer data for S2 subjects are presented in Figure 7, and interview excerpts on question number 5 for S2 subjects are presented in figure 8. From the results of the interview that the S2 subject did not understand in working on question number 5. He tends to only follow the steps in the reference and does not pay attention to the concept of the problem formula. On the question (flexibility) indicator, the average percentage reaches 55%.

### **Original Creative Thinking Ability (ORIGINALITY)**

Draw a graph of the equation and . Find the vertex of the triangle formed from the line represented by the equation on the X axis. Draw a triangle formed using geogebra. The S3 subject in answering TKBM shows that students give answers in their own way of calculating and the results are correct, the calculation process can be understood, but the information is less clear. Written answer data for S3 subjects is presented in Figure 9 and Figure 10, and an interview excerpt on question number 2 for subject S3 is presented in Figure 11. From the results of the interview, it was found that the S3 subject did not understand enough in working on question number 2. It tends to just follow the steps in

the reference to determine the angles to apply to the geogebra. In the question indicator (originality), the average percentage reaches 45%.

### **Creative Thinking Ability ELABORATION**

A radar is positioned at coordinates (2,3) and is capable of detecting up to 50 km in any direction. Construct an equation that describes the radar's detection capability, If an object is at coordinates (40,20) can the radar detect it? Give the reason, Graph it using geogebra. Subject S4 in answering TKBM was seen giving correct and detailed answers. Written answer data for subject S4 is presented in Figure 12 and Figure 13, and interview excerpts on question number 4 for subject S4 are presented in Figure 14. From the results of the interview, the S4 subject was able to answer comprehensively in doing these questions. Subject S4 is able to apply it to geography. It is evident from the results of interviews that subject S4 calculates analytically first to determine whether objects on the radar can be detected or not. In the question indicator (elaboration), the average percentage reaches 75%. From the analysis above error is most students in solving ability to think creatively mathematically, it looks great students are less careful in understanding the given problem, just answer one way of completion and wrong in the calculation. This shows that the Most students are not used to work on the problems -soal which train the ability to think creatively.

### **Conclusions and suggestions**

Based on research, students' mathematical creative thinking abilities (Non-Mathematical) on Analytical Geometry material are mostly in the criteria of being quite creative (moderate) with an average percentage of 61.87%. The percentage of the indicators is as follows for the flexibility indicator, which is 55%, indicating that some students are able to think flexibly in solving questions, the fluency indicator, which is 72.5%, shows that some students are able to think fluently in solving questions, elaboration indicators. ) is the highest percentage, which is 75% and the lowest percentage is the originality indicator, which is 45%. At about indikat or originality is maha students are not able to provide answers to what diingikan, this is caused because the Most students are less precise in determining the corner points, and each child they can find various references from various sources.

Judging from the analysis that has been carried out by the researcher, it is hoped that educators will provide many questions related to creative thinking to students because by using this question it will show how to think creatively and it is expected that educators need to provide appropriate treatment by paying attention to the level of ability so that the ability to think creative mathematical students will develop.

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