

Analysis of The Difficulties of the Mathematical Creative Thinking Process in Problem Based Learning

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Abstract—The purpose of this study was to analyze and find out the difficulties of mathematical creative thinking processes in problem-based learning. This research is a descriptive qualitative study. The subjects of this study were students of SMP Negeri 13 Medan in class VIII-5 totaling 32 students. The data analysis method used is the Miles and Huberman Method. The results of this study indicate that the analysis of the difficulties of mathematical creative thinking processes in problem based learning, namely: 1) In the very high category, students have no difficulties. 2) In the high category, students experience difficulties in applying ideas to the elaboration indicator. 3) In the medium category, students have difficulty planning the application of ideas and applying ideas to indicators of flexibility, authenticity and elaboration. 4) At the level of students' ability, students have difficulty planning the application of ideas and the difficulty of applying ideas to the indicators of fluency, having difficulty synthesizing ideas, planning the application of ideas and applying ideas to indicators of flexibility, authenticity and elaboration. 5) In the very low category, students have difficulty synthesizing ideas, planning the application of ideas and applying ideas to indicators of fluency, flexibility, authenticity and elaboration.

Keywords—*creative thinking in mathematics, creative thinking processes, problem based learning model*

I. INTRODUCTION

Mathematics is one of the subjects taught at every level of education, starting from early childhood education to the tertiary level. Mathematics is also very important in everyday life. Mathematics with its various roles makes it a very important science and one of the roles of mathematics is as a thinking tool to deliver students to understand the mathematical concepts that are being studied. There are many reasons for the need to study mathematics. [1] The reason for the need to learn mathematics because mathematics is (1) a means of thinking that is clear and logical, (2) a means to solve everyday life problems, (3) a means of recognizing

patterns of relations and generalization of experience, (4) means to develop creativity, and (5) means to increase awareness of cultural developments.

The importance of mathematics because it is one of the main concerns, but students' mathematical interest is still low because most feel that mathematics is very difficult, boring, not too practical and has many abstract theorems that are very difficult to understand [3].

One of the causes of students' low mathematical creative thinking skills is because many students consider mathematics difficult to learn and mathematical characteristics are abstract so students feel afraid and tend to think of lessons that are difficult for some students to understand. The results of the study of [8] state that students' mathematical creative thinking skills are still low with an average of 41.19 and a standard deviation of 9.30. In line with the results of the study [16] states that students' thinking skills are still low, the average first indicator is 28.5, the average of the second indicator is 30.5, the average of the third indicator is 14, and the average of the fourth indicator is 9.

One effort that can foster students' creative thinking ability is to use the problem based learning model. Problem-based learning is learning that uses real world problems as a context for students to learn creative thinking and problem solving skills, as well as to obtain essential knowledge and concepts from the subject matter. In line with the opinion of [20] states that "problem based learning is a learning approach that uses real world problems as a context for students to learn about critical thinking and problem solving skills as well as to obtain essential knowledge and concepts from subject matter.

The reason why choosing PBL model in improving mathematical problem solving and understanding students' concepts is because PBL builds constructivism while students focus more on developing thinking skills, as well as skills in communication, and skills in communication and calibration

and organizing that requires reflection from various perspectives. Students can also take advantage to get as much expertise as possible within their group members. The teacher's role is as a facilitator and provide assistance to students.

This study discusses dictating the difficulties of the creative thinking process required by students in the learning process, so that teachers can understand and improve the factors that cause difficulties in the learning process. This is also agreed with the research that has been done, "can describe the analysis of difficulties in the process of creative thinking in solving problems that count with the help of students' mathematical improvement" [18].

II. THEORETICAL FRAMEWORK

A. Creative Thinking

Creative thinking is the ability to find many possible answers to a problem, where the emphasis is on quality, appropriateness and diversity of answers [14]. Creative thinking is defined as a mental activity that is used by a person to build new ideas or ideas [19]. Mathematical creative thinking indicators based on students' intellectual cognitive behaviors are fluency, flexibility, authenticity and elaboration [15]. Fluency is the ability of students to give answers to problems in more than two ways and smoothly. Flexibility is the ability of students to solve problems in a variety of different ways so that they appear on approach changes when responding to commands. Authenticity is the ability of students to answer problems with several different answers but it is true or one answer that is not normally done by students at the level of knowledge so authenticity is a novelty of ideas made in response to commands. While elaboration is the ability to develop or specify a situation in detail in solving problems.

B. Creative Thinking Process

According to [9] stating creative thinking is a position that exceeds the principle of learning and creates new methods to solve problems. [10] The process of creative thinking has stages of idea synthesis, generating ideas and applying ideas. The creative thinking process consists of three stages, namely understanding the problem (finding goals, data/facts, finding problems) [7]. The creative thinking process consists of stages, namely synthesizing ideas, planning the application of ideas and applying ideas [25]. At the stage of synthesizing ideas it means establishing or integrating ideas (ideas) that can be derived from classroom learning and everyday experience. At the stage of planning the application of ideas means choosing a particular idea to be used in solving problems that are given or want to be resolved. At the stage of implementing the idea it means implementing the planned idea to complete the task.

C. Problem Based Learning

One effort that can develop students' creative thinking skills is to use the problem based learning model. Problem-based learning is learning that uses real-world problems as a

context for students to learn creative thinking and problem solving skills, and to acquire the knowledge and concepts that are essential to the subject matter. In line with the opinion of [20] states that "problem-based learning is a learning approach that uses real-world problems as a context for students to learn about critical thinking and problem solving skills and to acquire knowledge and concepts that are essential to the subject matter. "The link between PBL and creative thinking was explored by looking into study which supported the PBL teaching method contributes positively on students' creative thinking skills" [27]. Problem based learning is effective in terms of mathematical creative thinking skills [6]. The use of problem-based learning is an effective way to facilitate the development of the ability to think creatively [17]. Relevant research that the Problem based learning model can be used as an alternative learning model used in schools to achieve high-level thinking competencies [30]. PBL can also be used to immerse students in authentic scenarios that require creative thinking [5]. In line with the opinion of [28] states that by applying this model, it is expected that the learning that takes place can be more meaningful and give a strong impression on students, and certainly can improve students' mathematical creative thinking skills so that the learning process always demands improvement. Reinforced by the results of the research [12] state that "PBL is one alternative model that can develop students' thinking skills (reasoning, communication, and connections) in solving problems".

This research attempts to describe the difficulties of the creative thinking process that students have in the learning process, so that the teacher can know and improve the factors that cause these difficulties in the learning process. The research that has been carried out, it can describe the analysis of difficulties in the process of creative thinking in solving problems related to students' creative thinking abilities [18].

III. RESEARCH QUESTION

The following research questions were formulated to guide this study:

1. What are the difficulties of students' mathematical creative thinking processes in Problem Based Learning (PBL)?

IV. RESEARCH METHOD

This research is a descriptive qualitative study using a case study method. Qualitative research is research that intends to understand the phenomena experienced by the subject of research such as behavior, perceptions, motivations, actions, etc., holistically and by means of descriptions in the form of words and language, in a specific natural context and with utilizing various natural methods [13]. This type of qualitative research means that this type of research aims to describe the difficulties of students' creative mathematical thinking processes in problem based learning.

This research was conducted at SMP Negeri 13 Medan. The reason for choosing research locations is that researchers want to know the difficulties of students' creative mathematical thinking processes, the absence of similar research in schools, namely research on the analysis of the difficulties of students' creative mathematical thinking

processes in problem-based learning models at SMP Negeri 13 Medan.

Subjects in this study were class VIII-5 as many as 35 students, interview subjects were selected based on their level of creative thinking ability while the object of research was mathematical creative thinking ability. The mechanism used in this study includes three stages, namely (1) the stages of preparation of learning devices and research instruments; (2) stages of validation of learning devices and research instruments; (3) stages of conducting research and data analysis. Each stage is designed in such a way as to obtain valid data for research purposes. While the data analysis process used is the Miles and Huberman method which consists of three activities that occur interactively and continue until the end. Activities in data analysis are: data reduction, data display and conclusion [11], [26].

V. DATA ANALYSIS, RESULT, AND DISCUSSION

Analysis of the difficulties of students' creative mathematical thinking processes is carried out by analyzing the results of tests of mathematical creative thinking skills and the results of interviews conducted with selected subjects. Subjects were chosen based on their level of creative thinking ability, namely very high, high, medium, low and very low levels in each indicator of mathematical creative thinking skills, namely fluency, flexibility, original and elaboration [23].

A. Data Description

Qualitatively, the level of mathematical creative thinking skills of students can be seen in Table I.

TABLE I. LEVEL OF STUDENTS' MATHEMATICAL CREATIVE THINKING ABILITY

Score Interval	The number of students	Percentage	Rating Category
0 SCTAM < 50	10	31,25	Very low
50 SCTAM < 65	2	6,25	Low
65 SCTAM < 75	12	37,50	Is being
75 SCTAM < 85	4	12,50	High
85 SCTAM 100	4	12,50	Very high

SCTAM = Score of Creative Thinking Ability in Mathematics

Based on the results of tests of students' mathematical creative thinking skills as many as 32 students, the level of mathematical creative thinking ability of students was spread over five levels. Of the 32 students it turned out that the level of mathematical creative thinking in students with moderate ability had the highest proportion and was followed in very low ability students. The results of the study [24] stated that the results of the analysis of problem submission data from each research group showed that they tend to be in the 'less creative' group, meaning fulfilling one or two creative product criteria, namely novelty, fluency or flexibility. When compared with the results of these studies, the results of the

test of students' mathematical creative thinking skills as many as 32 students in SMP Negeri 13 Medan are in the criteria of 'moderate'.

So, the level of mathematical creative thinking ability of students with 'very low' abilities as much as 31.25% amounted to 10 students, 'low' abilities as much as 6.25% totaling 2 students, 'moderate' abilities as much as 37.50% totaling 12 students, ability 'high' 12.50% amounted to 4 students and 'very high' abilities as much as 12.50% amounted to 4 students.

B. Data Analysis

The interviews with the subjects were carried out on each classification of answer patterns raised through indicator glasses (very high, high, medium, low and very low). Analysis of data from the results of the test data of students' mathematical creative thinking skills is triangulated by identifying the problems students are working on. The analysis of the difficulties of the mathematical creative thinking process of students was found according to the level of mathematical creative thinking abilities of students which consisted of 3 stages of synthesizing ideas, building ideas and applying ideas.

a. Analysis of the Difficulties of Students' Mathematical Creative Thinking Process in Very High Categories

Based on the answer sheet the results of the test of creative thinking ability as well as paying attention to the willingness of students to be interviewed, S-8 was chosen as a student who was analyzed qualitatively from very high-ability students. The following is a transcript of the interview with S-8 as a triangulation of the description of observations about the student's answer sheet. (Remarks: Teacher = T, and Student = S-8).

T: Why be u_n ? Don't it ask for S_n ? Please explain what u_n and S_n is?

S-8₂₂: U_n is the n th term while S_n is the sum of the list terms, Miss.

T: That knows, why did you make it so?

S-8₂₃: Yes, Miss. u_n here same as S_n Miss. Because we need to find the n th term or 11^{th} term, and it is equal as the sum of first 11^{th} term, Miss.

T: Try to explain!

S-8₂₄: $n = 11$ $a = 1$ $r = 2$

$$u_n = ar^{n-1} \quad u_{11} = 1.2^{11-1} \quad u_{11} = 2^{10} \quad u_{11} = 1.024$$

T: How can $r=2$?

S-8₂₅: The first term is 1, second term is 2, third term is 4.

$$\text{So } r = \frac{u_2}{u_1} = \frac{u_3}{u_2} = \frac{2}{1} = \frac{4}{2} = 2 = 2$$

T: Ok, good. What is conclusion you can make?

S-8₂₆: Then the sum of first 11^{th} term is 1.024.

T: Maintain your achievements in creative thinking, kid!

S-8₂₇: Yes Miss.

Based on the answer sheets and transcripts of very high-ability student interviews, it can be concluded that creative

thinking indicators, namely fluency, flexibility, elaboration, and originality, students have no difficulties.

b. Analysis of the Difficulties of Students' Mathematical Creative Thinking Process In The High Categories

Based on the answer sheet the results of the test of creative thinking ability as well as paying attention to the willingness of students to be interviewed, the S-30 was chosen as a student who was analyzed qualitatively from high ability students. The following is a transcript of interviews with S-30 as a triangulation of the description of observations about the student's answer sheet. (Remarks: Teacher = T, and Student = S-30).

T: *Where did 10 come from?*

S-30₂₀: *$n=11, 11-1=10$.*

T: *The third way?*

S-30₂₁: *I used this formula, Miss. $u_n = ar^{n-1}$.*

T: *Are you sure? We haven't learned about r, where did it come from?*

S-30₂₂: *(silent)*

T: *Try to finish it with the formula you made!*

S-30₂₃: *I don't understand to find r, Miss.*

T: *Alright... Here's how it works. The first term is 1, second term is 2, and third term is 4.*

In the process of creative thinking, there are difficulties with students with high abilities, namely is Students experience difficulties in applying ideas, namely difficulties in using formulas to solve problems and when students are interviewed S-30₂₃ states "I don't understand looking for r, miss".

Based on the answer sheet and transcript of interviews with high-ability students, it can be concluded that is: (1) In the fluency indicator, students do not experience difficulties. (2) On the flexibility indicator, students do not experience difficulties. (3) In the originality indicator, students do not experience difficulties. (4) In the elaboration indicator, students experience difficulties applying ideas, it appears that students have difficulty using formulas to solve problems.

c. Analysis of the Difficulties of Students' Mathematical Creative Thinking Process In The Medium Categories

Based on the answer sheet the results of the test of creative thinking ability as well as paying attention to the willingness of students to be interviewed, the S-10 was chosen as a student who was analyzed qualitatively from students with moderate abilities. The following is a transcript of the interview with S-10 as a triangulation of the description of observations about the student's answer sheet. (Remarks: Teacher = T, and Student = S-10).

S-10₂₀: *7th line is 1*

T: *How much after that?*

S-10₂₁: *I don't understand, Miss.*

T: *the 6th row are 1 5 10 10 5 1. The 7th row is 1, 1+5=6, 5+10=15, 10+10=20, 10+5=15, 5+1=6, and 1. You are understand, kid?*

S-10₂₂: *I understand miss.*

T: *Are there other ways?*

S-10₂₃: *No, Miss. It just two ways.*

T: *Why is it only two ways?*

S-10₂₄: *I'm confused to find another formula to work on it.*

T: *Ok.*

In the process of creative thinking, there are difficulties with students with moderate abilities, namely: 1) Students have difficulty planning the application of ideas, namely the difficulty of finding other ways to solve problems. This was confirmed by interviews with students and when asked by the S-10₂₄ stated "confused mom wants to find a formula especially to work on it". 2) Students have difficulty applying ideas, namely difficulties in solving problems. This was confirmed by interviews with students and when asked by the S-10₂₃ stated "don't understand miss".

Based on the answer sheet and transcript of the interview with students with moderate ability, it is obtained: (1) In the fluency indicator, students do not experience difficulties. (2) On the flexibility indicator, students do not experience difficulties. (3) In the originality indicator, students have difficulty planning the application of ideas where students have difficulty giving new ideas and difficulties in applying ideas where students have difficulty solving problems.(4) In the elaboration indicator, a) students have difficulty planning the application of ideas, it appears that students have difficulty giving new ideas; and b) difficulties in applying ideas, it appears that students have difficulty using formulas to solve problems.

d. Analysis of the Difficulties of Students' Mathematical Creative Thinking Process In The Low Categories

Based on the answer sheet the results of the test of creative thinking ability and attention to the willingness of students to be interviewed, S-21 was selected as students who were analyzed qualitatively from low-ability students. The following is a transcript of interviews with S-21 as a triangulation of the description of observations about the student's answer sheet. (Remarks: Teacher = T, and Student = S).

S-21₂₀: *First step, $S_n = 2^{n-1}$ $S_{11} = 2^{10}$ $S_{11} = 1.024$.*

T: *Why are those 10?*

S-21₂₁: *That's the answer I made during the exam*

T: *Try to explain how you can get 10.*

S-21₂₂: *I don't know where it come from, I cheated, Miss.*

T: *The second way?*

S-21₂₃: *I don't know another formula, Miss.*

T: *Why don't you make a different answer that has been taught?*

S-21₂₄: *Don't understand what the meaning, Miss.*

T: *Why don't you understand?*

S-21₂₅: *It's hard, Miss.*

In the process of creative thinking, there are difficulties with students with low abilities, namely: 1) Students have difficulty synthesizing ideas, namely difficulties in understanding problems. This was reinforced from the S-21₂₄ interview which stated "Don't understand what the meaning, miss". 2) Students have difficulty planning the application of ideas, namely the difficulty of finding other ways to solve

problems. This was confirmed by the interview with S-21₂₃ which stated "Don't know another formula, miss". 3) Students have difficulty applying ideas, namely difficulties in solving problems. This was reinforced from the S-21₂₂ interview stating "Do not know ma'am, where did that come from 10".

Based on the answer sheet and interview transcript of low-ability students, it is obtained: (1) On the fluency indicator, a) students have difficulty planning the application of ideas, it appears that students are not fluent in generating ideas; and b) difficulties in applying ideas, it appears that students are unable to solve problems. (2) On the flexibility indicator, a) students have difficulty synthesizing ideas, it appears that students have difficulty understanding the problem; b) planning the application of ideas, it appears that students have not worked in a different way; and (c) the application of ideas, it appears that students have difficulty in solving problems. (3) In the originality indicator, a) students have difficulty synthesizing ideas, it appears that students have difficulty understanding the problem; b) planning the application of ideas, it appears that students have not worked in a different way; and c) the application of ideas, it appears that students have difficulty in solving problems. (4) In the elaboration indicator, a) students have difficulty synthesizing ideas, it appears that students have difficulty understanding the problem; b) planning the application of ideas, it appears that students have not worked in a different way; and c) the application of ideas, it appears that students have difficulty in solving problems.

e. Analysis of the Difficulties of Students' Mathematical Creative Thinking Process In The Very Low Categories

Based on the answer sheet the results of the ability to think creatively and pay attention to the willingness of students to be interviewed, S-18 was selected as a student who was analyzed qualitatively from very low ability students. The following is a transcript of the interview with S-18 as a triangulation of the description of observations about the student's answer sheet. (Remarks: Teacher = T, and Students = S-18).

- T: *What can you understand from that problem?*
 S-18₅: *Don't understand, Miss.*
 T: *How many ways do you do it?*
 S-18₆: *One way, Miss.*
 T: *How are the steps you made, try do it!*
 S-18₇: *1, 1 2 1, 1 3 3 1, 1 4 6 4 1, 1 5 10 10 5 1.*
 T: *What line is that, kid?*
 S-18₈: *Line 1-6, Miss.*
 T: *Then what's the next step?*
 S-18₉: *What do you mean Miss?*
 T: *For the 7th line, what are the numbers?*
 S-18₁₀: *I don't know, Miss. How to find it?*
 T: *Why is it only one way you work, why don't you make it two ways?*
 S-18₁₁: *That's all I know, Miss.*
 T: *Ok, you have to practice a lot at home, boy. Thank you, kid.*

S-18₁₂: *Yes, Miss. Thank you, Miss.*

In the process of creative thinking, there are difficulties with students with very low abilities, namely: 1) Students have difficulty synthesizing ideas, namely students have difficulty understanding problems. This was confirmed by the S-18₅ interview which stated "don't understand miss". 2) Students have difficulty planning the application of ideas, namely the difficulty of finding other ways to solve problems. This was reinforced from the S-18₁₁ interview which stated "that's all I know, miss". 3) Students have difficulty applying ideas, namely difficulties in solving problems. This was confirmed by the interview with S-21₁₀ which stated "I don't know, miss. How to find it?".

Based on the answer and transcript sheets, the answers of students with very low abilities were obtained: (1) In the fluency indicator, a) students have difficulty synthesizing ideas, it appears that students have difficulty understanding the problem; b) the application of ideas, it appears that students have difficulty planning many ideas / ideas; and c) difficulties in applying ideas, it appears that students are unable to solve problems. (2) On the flexibility indicator, a) students have difficulty synthesizing ideas, it seems that it is difficult to understand the problem; b) planning the application of ideas, it appears that students have not worked in a different way; and c) the application of ideas, it appears that students have difficulty in solving problems. (3) In the originality indicator, a) students have difficulty synthesizing ideas, it appears that students have difficulty understanding the problem; b) planning the application of ideas, it appears that students have not worked in a different way; c) the application of ideas, it appears that students have difficulty in solving problems. (4) In the elaboration indicator, a) students have difficulty synthesizing ideas, it appears that students have difficulty understanding the problem; b) planning the application of ideas, it appears that students have not worked in a different way; and c) the application of ideas, it seems students have difficulty in solving problems.

C. Discussion

This study focuses on analyzing the difficulties of mathematical creative thinking processes of students by basing one of the main goals in learning that is training students' creative mathematical thinking processes. This needs to be overcome because students who are not accustomed to creative thinking will find it difficult to realize their own thinking processes in carrying out actions, including in learning activities. In this study, habituation of students to mathematical creative thinking will also tend to open the widest possible insight, so that mastery of the material is not only in the low aspect. This will begin to leave the learning methods that are not appropriate as stated [21] that ... In fact the learning of mathematics in Indonesia tends to be limited to the mastery of the subject matter or rely on low- cognitive levels of development are not able to develop the students' creativity. By accustomed to creative thinking, students are able to approach variously and have a variety of possible solutions to a problem, encourage the development of creativity of students who are parallel to the development of

other aspects in order to create balance and harmony, resulting in great satisfaction and pleasure.

Furthermore, in training and familiarizing students with creative mathematical thinking processes, many methods developed by the teacher both through the approach of instructional materials, student uniqueness, and innovations that were originally found alone. In this study, learning using the Problem Based Learning model greatly helps students plan solutions so that they are able to think mathematically creatively. All are directed at the efforts of student success in mastering competencies or learning objectives. In learning activities, the teacher gets a very wide space of freedom for students to test their creativity in reference to the four indicators of mathematical creativity that are used namely fluency, flexibility, originality, and elaboration using the right learning model [4]. Learning using the Problem Based Learning model is learning that is compatible with constructivism and mathematical creative thinking skills. This fact is supported by the theory of problem based learning, which can be considered both as a model for approaching learning. PBL is supported in many ways by theories in learning sciences ranging from constructivism and cognition to problem solving. As an interventionist model, it has also been substantiated by research that demonstrates its effectiveness in promoting higher-order thinking, knowledge construction, collaborative learning, and independent learning [29].

In the previous mathematics learning process (through interviews with teachers) that mathematics learning has been centered on the teacher while students are used as objects, students do not have enough time to construct their knowledge in learning mathematics, concepts, and principles in mathematics. The habits of students in conventional teaching that condition students are passive to receive knowledge, and teachers provide concepts and mathematical principles in the form of "intact" to students, and do not accustom students to solving problems will cause many problems [22]. Vygotsky believes that intellectuals develop when individuals face new and confusing experiences and when they try to overcome the discrepancies that these experiences pose [2]. Vygotsky emphasized the social aspects of learning. Vygotsky believes that social interaction with others spurs the construction of ideas and enhances children's intellectual development. Bruner emphasizes that the importance of helping students to understand the structure or key ideas of a scientific discipline [2]. The needs and active involvement of students in the learning process and true beliefs occur through personal discovery. Thus the mathematical creative thinking ability of students will be easier to develop to become a culture according to 21st century learning that is communicative, collaborative, critical, and creative.

In the learning process carried out for three meetings in class VIII-5 of SMP Negeri 13 Medan, student activity was getting better after the problem based learning model was applied compared to previous learning which still used conventional learning in the form of lectures or just explained theory. While learning emphasizes the student-centered learning model also requires mathematical creative thinking skills students can be trained, familiarized with, and cultured

well through interactions between students and teachers. Of the 32 students with 'very low' abilities as many as 31.25% totaling 10 students, 'low' abilities as much as 6.25% totaling 2 students, 'moderate' abilities as much as 37.50% totaling 12 students, 'high' abilities as much 12.50% amounted to 4 students and 'very high' abilities as much as 12.50% totaling 4 students.

Based on the level of mathematical creative thinking abilities of students who are dominated by moderate-ability students. In addition, only four students had very high levels of creative thinking and four students had high levels of creative thinking. In addition, the results of student answers related to the answers to the tests of mathematical creative thinking of students given as a whole are not good. This is because students are still not used to working on problems that lead to creative mathematical thinking. Furthermore, triangulation of data was carried out so that the results of the analysis of the difficulties of mathematical creative thinking processes were obtained. After analyzing the mathematical creative thinking difficulties of students, the results of the research were obtained and observing the students' answer sheets as a whole students had not been able to plan ideas and apply ideas.

VI. CONCLUSION

From the discussion above, it can be concluded that the analysis of the difficulties of the mathematical creative thinking process in problem-based learning, namely: 1) In the very high category, students have no difficulties. 2) In the high category, students experience difficulties in applying ideas to the elaboration indicator. 3) In the medium category, students have difficulty planning the application of ideas and applying ideas to indicators of flexibility, authenticity and elaboration. 4) At the level of students' ability, students have difficulty planning the application of ideas and difficulties applying ideas on indicators of fluency, having difficulty synthesizing ideas, planning the application of ideas and applying ideas to indicators of flexibility, authenticity and elaboration. 5) in the very low category, students have difficulty synthesizing ideas, planning the application of ideas and applying ideas to indicators of fluency, flexibility, authenticity and elaboration.

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