Artikel 20

by Agnita Siska Pramasdyahsari

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Profile of creative thinking skills in solving math problems on reflective and impulsive cognitive forces

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Abstract: This study aims to describe the profile of students' mathematical creative thinking ability in solving math problems of material circles students on with reflective and impulsive cognitive styles. This type of research is qualitative descriptive research. The subjects taken were 2 grade VIII students at one of the Madrasah Tsanawiyah in Magelang even semester of the 2020/2021 school year, each of which was cognitively reflective and cognitively impulsive. Data collection is used with MFFT test, mathematical creative thinking test and interview. Data analysis techniques are carried out in 3 stages, namely data reduction, data presentation, conclusion drawing. The technique of checking the validity of data using triangulation method is to compare the results of the test understanding mathematical concepts with the results of interviews. The analysis was developed based on indicators of creative thinking by paying attention to the cognitive style. Based on the results of the analysis, it is known that subjects with reflective cognitive styles have a category of TKBK 3 which means creative because it is able to meet only 2 indicators of fluency and flexibility. Subjects with impulsive cognitive style have a category of TKBK 1 which means less creative because the subject only meets 1 indicator, namely fluency.
Keywords: creative thinking skills; cognitive style; reflective; impulsive

INTRODUCTION

Creative thinking is a series of actions that people take by using their minds to create new thoughts from a collection of memories containing various ideas, descriptions, concepts, experiences, and knowledge (Siswono, 2008). While in the opinion of Fauzi (2004) creative thinking is thinking to determine new relationships between things, find new solutions of a problem, find new systems, find new artistic forms, and so on. Creative thinking is able to improve students' skills in problem solving (Artikasari &Saefudin, 2017). So that by thinking creatively students can think deeply about solving the questions given by the teacher by solving them themselves.

In accordance with the Regulation of the Minister of National Education (Permendiknas) No. 23 of 2006 concerning Graduation Competency Standards in mathematics subjects for primary and secondary education levels, it has been explained that one of the objectives of mathematics subjects is to equip students with logical, analytical, systematic, critical, and creative thinking skills, as well as the ability to cooperate. This is in accordance with the objectives of the 2013 curriculum to prepare Indonesian people to have the ability to live as

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individuals and citizens who are faithful, productive, creative, innovative, and affective and able to contribute to the lives of society, nation, state, and civilization of the world. The statement is a necessity for logical, systematic, critical and creative thinking skills and the ability to work together to be the focus in mathematics education. But in reality in the learning process does not always go well, especially in the field of mathematics. When viewed nationally, mathematics subjects are the subjects with the lowest achievement compared to other subjects. In the National Examination year 2018/2019 for MTs, showed that the average for Mathematics is 42.24 while the average score for other subjects is higher, namely the average Bahasa Indonesia of 61.06, the average English score of 45.94, and the average IPA score of 44.61 ministry of education and culture (2019).

According to Ningsih (2012), in solving problems, students who have creative thinking skills will use a variety of strategies. The strategies students use, particularly in thinking skills, tend to be influenced by cognitive style (Wulandari, 2017). According to Rahmatina (2014) children have different talents and abilities and classifying one's cognitive style is also different, allowing the child to have a creative picture of problem solving differently. This opinion is in line with Ningsih (2012) when students have different cognitive styles, so the way to solve problems is also different, so that each student will have a different level of creative thinking. Fadiana (2016) also revealed that the success of mathematics learning in receiving knowledge messages is also determined by cognitive style.

The first cognitive style to be discovered was reflective and impulsive cognitive style (Sudia &Lambertus, 2017). Kagan (1970) mentions that the characteristics of children who are quick in answering problems but less thorough or careful, so it tends to be wrong is a child of impulsive cognitive style. While children who have characteristics slow in answering but careful or careful, sehigga answers tend to be correct is a child of reflective cognitive style. Miatun and Nurafni (2019) mentioned that reflective and impulsive cognitive style types provide an idea of how a person's speed and readiness respond to a problem or challenge. So that cognitive style will affect the actions that a person takes in planning various creative ideas.

Students' thinking skills can be developed one of them through problem solving. According to Rahmazatullaili et al (2017) Learning mathematics with problem solving can give students the opportunity to actively find ideas that can be used. With problem solving one will be required to think systematically, critically, logically, and have an unyielding attitude to find solutions to the problems faced (Nengsih et al., 2019). Ulya (2016) states problem solving as an ability to use previously known knowledge in new situations involving high-level thought processes to solve problems. By solving the problem, students will try to find the right solution in their own way to solve the problem.

One of the materials studied in mathematics is circles. Circle material is part of the math lessons taught to grade VIII students of even semesters. Based on the observations of researchers conducted in Madrasah Tsanawiyah (MTs) during the validity test of the problem in May 2019 and also interviews with teachers of mathematics subjects Madrasah Tsanawiyah, understanding the circle material owned by madrasah Tsanawiyah students is

mostly in accordance with what the teacher teaches. Students will solve the problem with the formula they have memorized without developing their creative thinking skills. So with this condition makes students can not develop their understanding to think in solving a problem with strategy or other means.

Based on the above problems, research needs to be conducted that shows how students' creative thinking skills in solving math problems. Researchers want to know how the profile of creative thinking ability of grade VIII students is related to Circle material as well as how their stages in creative thinking. Researchers are interested in choosing circular material because circles are one of the mathematical materials that are widely used in daily life and also to solve problems on the circle material requires creativity, thoroughness and problem analysis. Thus, researchers took this issue as a researched object, with the title "Profile of Students' Mathematical Creative Thinking Ability in Solving Math Problems on Circular Material Reviewed from Reflective and Impulsive Cognitive Styles".

METHOD

This research is qualitative descriptive research. This research was conducted in one of madrasah Tsanawiyah in Magelang precisely class VIII. The study was started from March 10, 2021 to March 20, 2021 with 20 students selected by one student in the reflective cognitive style category and one student with impulsive cognitive style. Subjects selected based on the results of MFFT tests that have been done by students. The MFFT test used in this study uses tests that have been developed by Warli (2010) and have been tested for validity and reliability.

Researchers are the main instruments in this study. The instruments in this study are MFFT (Matching Familiar Figure Test), a test of mathematical creative thinking skills in circular materials as well as interviews. MFFT is used to classify students who have reflective cognitive styles as well as impulsive cognitive styles. MFFT consists of 13 picture questions plus 2 experiment questions. In each problem number there are 8 variations of images with only one image between them being the same as the standard image. The creative thinking ability test consists of one description question that contains three indicators of creative thinking that have previously been validated by the lecturer of mathematics education, PGRI Semarang University. The problem is based on indicators according to Silver (1973) namely (1) fluency with problem solving refers to the ability of students to provide answers to problems that are diverse and correct; (2) flexibility with problem solving refers to the ability of students to solve problems in different ways; (3) Novelty with problem solving refers to answers that are "unusual" performed by individuals. Based on indicators of creative thinking ability, Siswono (2016) classifies the level of mathematical creative thinking ability of students consisting of five levels, namely, TKBK 4 (Very Creative), TKBK 3 (Creative), TKBK 2 (Quite Creative), TKBK 1 (Less Creative) and TKBK 0 (Not Creative). Students are at level 4 if students are able to show fluency, flexibility, and novelty or novelty and flexibility in solving or asking problems, students are at level 3 if students are able to show fluency and novelty or fluency and flexibility in

solving or asking problems, students are at level 2 if students are able to show novelty or flexibility in solving or asking problems, students are at level 1 if students are able to show fluency in solving or asking problems , students are at level 0 if students are unable to demonstrate the three aspects of creative thinking indicators namely fluency, flexibility, and novelty. The interview guidelines instrument contains questions created to help clarify students' answers to previous tests. Questions in the question are attributed to indicators of creative thinking, namely fluency, flexibility and novelty. The interview method used is semi-structured interview, with the provision of interview questions asked in accordance with the test of students' creative thinking ability and questions do not have to be the same as the interview draft but still contain the same core problems.

The selection of subjects in this study was selected by at least one student per cognitive style category based on the results of the MFFT tests that have been conducted. The selection of the subject is chosen on the condition that one reflective student is taken from a group of reflective students whose time records are the longest and most careful (most correct) in answering all the points of the question, and one impulsive student is taken from the group of impulsive students whose time record is the shortest but least careful (at most wrong) in answering all the points of the question, this is done so that the selected student is really a reflective or impulsive student.

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RESULTS AND DISCUSSION

Students are given the MFFT test which has been designed and developed by Warli (2010). MFFT test questions consist of 13 picture questions and 2 test questions, the student's job is to choose the answer until the correct answer is obtained. Then the researchers noted a lot of time it takes students to answer the question for the first time in seconds and many frequencies of choosing until the correct answer is obtained. Furthermore, the time and frequency of answering is calculated the median value and obtained the grouping of cognitive styles as presented in Figure 1.

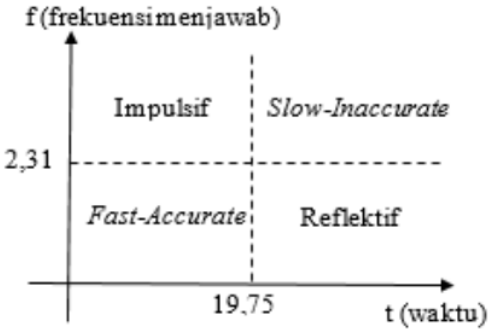

Figure 1. Student cognitive style group

Students with reflective cognitive style were taken from a group of students whose MFFT working time had a median time (t) ≥ 19.75 and the frequency of answering until the correct answer was obtained (f) ≤ 2.31 with the record of the longest and most careful work time (most correct) in answering all the questions. While students with impulsive cognitive style are taken from a group of students whose MFFT working time has a median time (t) <19.75 and the frequency of answering until the correct answer is obtained (f) > 2.31 with the fastest and least careful time record (at most wrong) in answering all the questions (Figure 1). After that, out of the 20 students who were given the MFFT test obtained a proportion of students per cognitive style category as in Table 1.

Table 1. Student Cognitive Style Measurement Results

Class	Number of Students	Time (seconds)			Frequency		
		Max	Min	Med	Max	Min	Med
8D	7 siswa	26,91	6,91	19,75	3,38	1,38	2,31

Reflective	**Impulsive**	**Fast Accurate**	**Slow Accurate**
9 students	7 students	2 students	2 students
45%	35%	10%	10%

The number of reflective students is 9 students (45%), the number of impulsive students 7 students (35%), the number of fast-accurate students 2 students (10%), and the number of slow-inaccurate students 2 students (10%) (Table 1). This showed that the proportion of students who had a greater reflective and impulsive cognitive style was 80% compared to students who had a fast-accurate and slow-inaccurate cognitive style of 20%. These results are in accordance with several previous researchers including research conducted by Warli (2010) the proportion of impulsive reflective children 73.7%, research Purnomo et al (2015) the proportion of reflective-impulsive children 71.875%, and research from Miatun & Nurafni (2019) that the proportion of students with reflective-impulsive style is (68.41)%.

Then selected one subject for each reflective and impulsive cognitive style, the selected subjects were BNA subjects for the category of reflective cognitive styles and ZNK subjects for the category of impulsive cognitive styles. After determining the subject according to his cognitive style then the subject was given a test of mathematical creative thinking ability then interviewed to get the validity of the answer. The following are the results of the test of creative thinking ability and student interviews:

1. Students' Mathematical Creative Thinking Skills with Reflective Cognitive Style

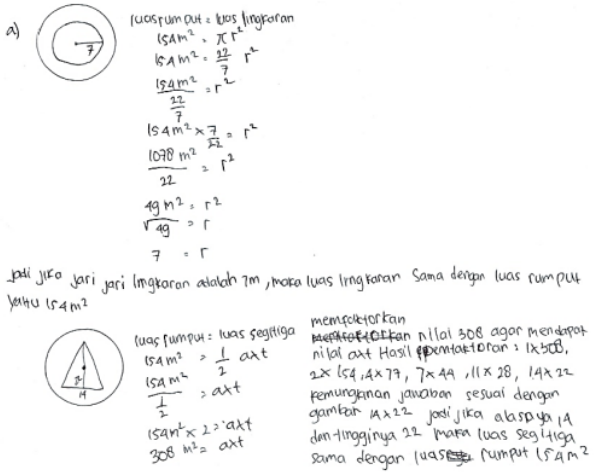

Figure 2. BNA Subject Answers to creative thinking questions

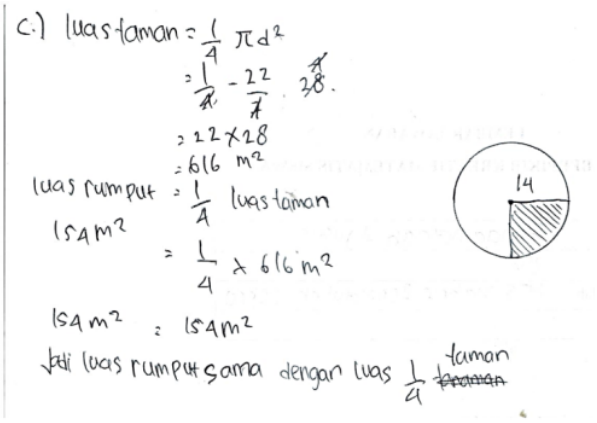

Figure 3. BNA Subject Answers to creative thinking questions

Students with reflective cognitive style on indicators of eloquence of reflective subjects are fluent in providing diverse and correct problem answers, this can be seen from subjects capable of properly designing 3 diverse designs. This is in line with research conducted by Muliawati &Istianah (2017) that reflective subjects are able to understand

problems by writing known and asked, students use clear strategies and make pictures appropriately.

On the indicator of flexibility of reflective subjects are able to solve the problem by finding 2 different ways (flexible) in drawing garden design. This is in line with research conducted by Rahmatina et al (2014) that reflective subjects are flexible in solving problems, because in both problems given the subject is able to solve the problem in more than one way.

On the novelty indicator the reflective subject has not found a new or different design so the subject has not met the novelty indicator. This is in line with research conducted by Miatun &Nurafni (2019) that subjects with reflective cognitive styles have not been able to solve the given problem using a new strategy.

Based on the results of creative thinking skills tests and interviews, it can be concluded that BNA subjects fall into the category of creative students (TKBK 3). Students with reflective cognitive style have fulfilled 2 indicators of creative thinking, namely fluency and flexibility. In addition, in answering the creative thinking test BNA subjects collect the results of creative thinking tests when the time has run out which is 30 minutes. This is in line with the statement from Kagan quoted by Warli (2010) that reflective cognitive styles tend to have slow characteristics in answering problems, but carefully or meticulously so that the answers given tend to be correct. The relatively long time it takes for bna subjects to complete creative thinking tests is also the reason BNA subjects are relatively small in making mistakes in solving problems because BNA subjects use time to think deeply in answering problems. Ketika wawancara berlangsung, subjek BNA juga mempertimbangkan jawaban yang berikan. During the interview, BNA subjects also considered the answers given.

2. Students' Mathematical Creative Thinking Skills with Reflective Cognitive Style

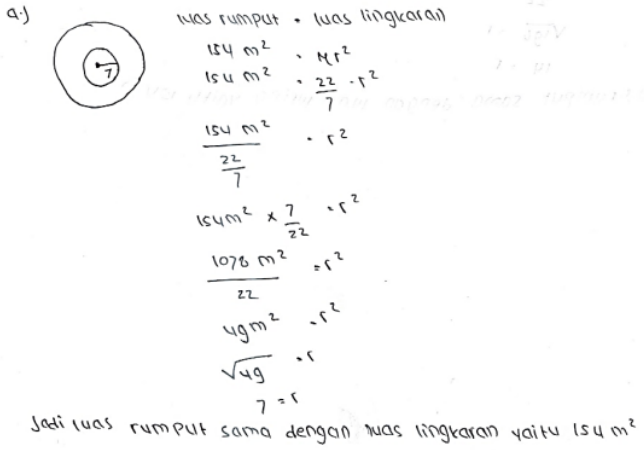

Figure 4. ZNK Subject Answers to creative thinking questions

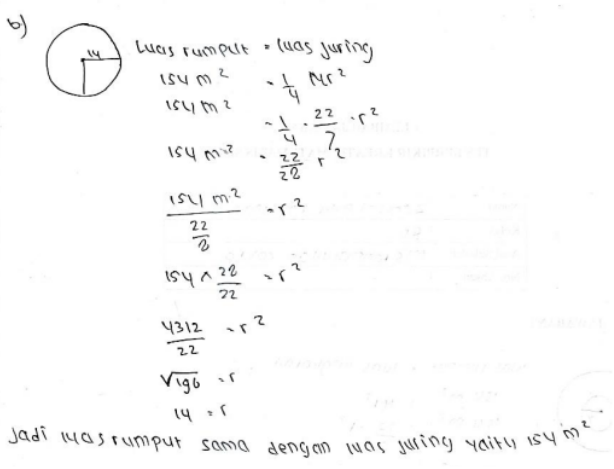

Figure 5. ZNK Subject Answers to creative thinking questions

On the indicator of eloquence the subject is impulsively fluent in providing answers to diverse and correct problems, this is seen from the subject who is able to design 2 diverse and correct designs. This is in line with research conducted by Rahmatina et al (2014) that on a given issue, impulsive subjects are fluent in making the requested flat wake image and are fluent in making line equations.

On impulsive subjects the flexibility indicator is not met because the subject is only able to solve the problem in one way only. This is in line with research conducted by Rahmatina et al (2014) that impulsive subjects are inflexible in solving problems, because in both problems given are unable to solve the problem in more than one way.

In impulsive subjects the novelty indicator is not met because the impulsive subject has not found a new or different design in solving the problem. This is in line with research conducted by Miatun &Nurafni (2019) that impulsive subjects have not been able to solve the given problem using new, unique, and unusual strategies.

Based on the results of creative thinking skills tests and interviews, it can be concluded that ZNK subjects fall into the category of less creative students (TKBK 1). In addition, in answering the creative thinking test questions ZNK subjects collect test results relatively quickly that is 10 minutes before the time to work on the question ends. This is in line with Kagan's statement as quoted by Warli (2010) that impulsive cognitive forces tend to have quick characteristics in answering problems but are not careful or conscientious so answers tend to be wrong. In terms of responding to interview questions ZNK subjects are quick in considering the answer because after being given the question directly answer quickly. This is in line with Kagan and Kogan's statement, as cited by Warli (2010) that impulsive cognitive styles use alternative answers briefly and quickly to get things done. This is why ZNK subjects have not yet found a new way of solving problems and also have not found a "new" or different design.

3. Uniqueness or differences found in the study subjects

Here is the uniqueness contained in each research subject, can be seen in table 2.

Table 2. Differences Between Reflective Subjects and Impulsive Subjects

No.	Reflective Subjects	Impulsive Subjects
1.	**Fluency** The reflective subject is able to explain in detail and clearly the answers he writes. Subjects can give a variety of answers and answer correctly	**Fluency** The impulsive subject is able to clearly explain the answers he writes. Subjects can give a variety of answers and answer correctly
2.	**Flexibility** Reflective subjects are able to solve a given problem using more than one method or strategy	**Flexibility** Impulsive subjects have not been able to solve a given problem using more than one way or strategy
3.	**Novelty** Reflective subjects have not been able to solve a given problem using a new, unique, and unusual strategy.	**Novelty** Impusive subjects cannot solve a given problem by using a new, unique, and unusual strategy.

From the results that have been described it has been known that reflective subjects are more masterful indicators of creative thinking. It has also been revealed by Miatun &Nurafni (2019) that reflective subjects are able to master more indicators of mathematical creative thinking ability compared to impulsive subjects. Puspitasari et al (2018) in his research said that creative thinking requires sensitivity to problems, can consider the information provided and be able to determine the steps to solve problems faced. This can be seen from reflective subjects that master indicators of creative thinking ability better compared to impulsive subjects, since impulsive subjects tend to be spontaneous and do not think long in solving a given problem.

CONCLUSION

Based on the results of research and discussions that have been conducted by researchers on 2 research subjects that have been described earlier, the conclusion is obtained is the profile of students' mathematical creative thinking ability in solving mathematical problems in circular material reviewed from reflective and impulsive cognitive styles as follows

Students with reflective cognitive style have category TKBK 3 which means creative, because reflective subjects are able to meet 2 indicators namely fluency and flexibility, while novelty indicators are not met. As for the description is on the indicator of fluency it can be said that the subject is fluent to provide answers to diverse and correct problems, this is seen

from being able to design 3 designs that are the same area as the area of grass. On the flexibility indicator is also fulfilled because the subject is able to create a garden design in 2 different ways. However, the subject has not yet found a new or different design so the subject has not met the novelty indicator.

Students with impulsive cognitive style have a category of TKBK 1 that is less creative, because impulsive subjects only meet 1 indicator of fluency, while for indicators of flexibility and novelty is not met. As for the description is on the indicator of fluency it can be said that the subject is fluent in providing answers to diverse and correct problems, this can be seen from the subject who is able to design 2 designs that are the same area as the area of grass. The flexibility indicator is not met because the subject is only able to solve the problem in one way only. Furthermore, the novelty indicator is also not yet met for the subject because the subject has not found a new or different design in solving the problem.

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Artikel 20

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