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DESCRIPTION OF DIFFERENCES IN CREATIVE THINKING PROFILE FOR MALE AND FEMALE STUDENTS IN OPEN ENDED PROBLEM SOLVING

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Abstrak: Salah satu perwujudan dari berpikir tingkat tinggi yaitu berpikir kreatif yang ditandai dengan terciptanya sesuatu yang baru dari ide, konsep, pengalaman, maupun pengetahuan yang ada dalam pikiran seseorang. Penelitian ini bertujuan untuk untuk mendeskripsikan profil berpikir kreatif siswa laki-laki dan siswa perempuan dalam menyelesaikan soal open ended. Metode penelitian yang digunakan adalah penelitian deskriptif dengan pendekatan kualitatif. Subjek penelitian yang digunakan adalah 2 siswa kelas VII SMP Negeri 3 Surakarta. Instrumen penelitian ini menggunakan tes soal open ended dengan indikator berpikir kreatif dan wawancara. Dalam mendeskripsikan profil berpikir kreatif siswa, peneliti akan memperhatikan 4 tahap, yaitu tahap persiapan, inkubasi, iluminasi, dan verifikasi. Hasil penelitian ini menunjukkan bahwa siswa laki-laki dapat menjelaskan masalah dan penyelesaian secara lisan maupun tertulis. Sementara siswa perempuan bisa menjelaskan masalah dan penyelesaiannya baik secara lisan tetapi kurang mampu menjelaskan dengan tulisan.

Kata kunci: berpikir kreatif, open ended, gender.

Abstract: One of the manifestations of high-level thinking is creative thinking, characterized by creating something new from ideas, concepts, experiences, and knowledge that is in one's mind. This study aims to describe the creative thinking profile of male and female students in solving open-ended problems. The research method used is descriptive research with a qualitative approach. The subject of the study used was 2 grade VII students of SMP Negeri 3 Surakarta. This research instrument uses open-ended problem tests with indicators of creative thinking and interviews. In describing the student's creative thinking profile, the researcher will pay attention to 4 stages: preparation, incubation, illumination, and verification stages. The results of this study show that male students can explain problems and solutions orally or in writing. While female students can explain the problem and the solution is both verbally but less able to explain with writing

Keywords*: creative thinking, open-ended, gender.*

INTRODUCTION

Creative thinking is one of the focuses in mathematics learning that must be developed in the students in the classroom. One of the manifestations of high-level thinking is creative thinking, characterized by creating something new from ideas, concepts, experiences, and knowledge that is in one's mind. However, in reality, mathematics is often regarded as a science that emphasizes only logical thinking with a single solution. This causes mathematics to become one of the subjects that students do not like. In addition, teachers often provide a single type of problem with a solution so that students do not have

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the freedom to develop their creative ideas in solving the problem (Irvani, 2017). The condition causes low creativity of students in learning mathematics.

(Tafrilyanto & Rahmaniyah, 2017) creative thinking can also be seen as a process used when an individual brings in or brings up a new idea. When someone already has creative ideas, then they will process those ideas. The process of creative processing ideas is called the creative thinking process. The discussion of creative thinking will not be separated by the term creativity, which is the product of creative thinking (Saefudin, 2011). (Subarinah, 2013)states that creativity is a cognitive activity that produces a new view of a problem and is not limited to pragmatic results (always viewed according to its usefulness). Therefore, the study of the creative thinking process is used as the focus in this research.

(Martin, 2009)explained that the creative thinking process is mental activity to help solve problems or answer curiosity to find a thought that has not been previously known so that the creative thinking process can also be seen as a process used when an individual fulfills his curiosity to come up with a new idea. To find out the creative thinking process of students, the guideline used is the creative process developed by Wallas because it is one of the most commonly used theories to determine the creative thinking process of inventors and art workers, which states that the creative process includes four stages, namely: 1) Preparation, 2) Incubation, 3) Illumination, and 4) Verification (Siswono, 2004). (Silver, 1997)explained that creative thinking is often used "The Torrance Test of Creative Thinking (TTCT)." The three key components assessed in creativity using the TTCT are fluency, flexibility, and novelty. Silver (in Siswono, 2006) provides indicators to assess students' creative thinking (fluency, flexibility, and novelty) using problem-posing and problem-solving.

One of the ways to identify students' creative thinking is by using an open-ended test. With the open-ended test, it is hoped that it can bring students to answer problems in many ways, thereby inviting intellectual potential and student experience in the process of finding something new. Related to Ramdhani's research (Ismara, Harlini, & Suratman, 2017), the provision of Open-Ended questions in mathematics learning can improve students' verbal, mathematical representation skills, besides that students respond positively to learning mathematics using Open-Ended questions.

Open-ended questions trigger students' thinking because with the many ways they get, students are fixated on one concept in solving math problems, but they can have various solutions and make them think creatively to solve the problem in their way according to their opinion. (Putri & Wijayanti, 2013) The math problems given require a solution to encourage students' creative thinking skills, namely open-ended questions. (Kang Sup, Dong-jou, & Jong Jin, 2003) Recommends that the provision of mathematics tests based on open-ended problems should be introduced in schools to stimulate students' mathematical creativity and divergent thinking. To measure students' creative thinking level, open-ended questions were given because the ability to think creatively is closely related to solving mathematical problems.

The research conducted (Fardah, 2012)about the process and creative thinking ability of students in mathematics through the Open-Ended task shows that the creative thinking ability of students is in the high category as many as six students (20%), in the medium category as many as ten students (33.33%), and the low category as many as 14 students (46.67 %). One of the factors that cause low achievement in Indonesia is the weak ability of students to solve non-routine or high-level questions. The evaluation system in Indonesia still uses low-level questions, and students are accustomed to obtaining and using formal knowledge in class. Therefore, it is necessary to have consistent habituation by providing non-routine or open-ended questions in mathematics learning to encourage students' creative problem-solving activities.

One factor which affects students' creative thinking ability is gender. According to Fakih (2006) Gender is an inherent trait of both men and women constructed socially and culturally. Gender differences will certainly cause physiological differences and affect psychological differences in learning, so that male students and female students have differences in learning mathematics (Novianti & Yunianta, 2018). Several previous studies have also examined the influence of gender or gender on creative thinking skills, including:(Abraham, 2014) reported no significant difference between male and female gender creative thinking skills; Suprapto, Zubaidah, & Corebima(2018)reported that gender did not affect students' creative thinking skills. Based on the results of the above review, it is known that it is important to analyze students' creative thinking skills in terms of gender differences. Based on previous research, many studies discuss students' creative thinking skills (Anggoro, 2015; Argarini et al., 2014; Choridah, 2013; Kurniasari, Dwijanto, & Soedjoko, 2014; Noviyana, 2017; Rahman, 2010; Saputra, 2016). Previous research conducted by (Nurmasari, Kusmayadi, & Riyadi, 2014) shows that male subjects can meet aspects of fluency, flexibility, authenticity, and judgment, while female subjects can meet aspects of fluency, flexibility, authenticity. Research related to the creative thinking process was carried out by (Tafrilyanto & Rahmaniyah, 2017) shows that in the problem-solving plan, after the subject gets information, the subject uses other ways to solve the problem because the problem given there is an open problem (Open Ended), the subject explains that the strategy used can solve the problem correctly, the subject carries out the problem-solving plan according to the plan In problem-solving, the subject re-examines the problem-solving steps by rereading the answers that have been obtained, then the subject re-corrects the mathematical operations.

To see the creative thinking process of students in solving open-ended questions on the flat shape material, the researchers conducted a pre-survey on three students of Class VII SMP N 3 Surakarta. This pre-survey was conducted by giving a written test. Based on the results of the written test, it can be concluded that each student has different creative thinking skills. When viewed from student work, some students are able to show the three indicators of creative thinking, namely fluency, flexibility, and novelty. Students Meanwhile, the other two students could only show the flexibility component, which is one indicator of creative thinking. This difference is due to each student's different

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skills, so that these differences in skills can affect the way students solve math problems from a given situation. This means that there are also differences between students in creative thinking, then how is the creative thinking process in solving open-ended questions using 4 Wallas stages, namely the preparation, incubation, illumination, and verification stages. In this case, there is still no research that describes the creative thinking process of SMP N 3 Surakarta students in solving open-ended questions in terms of gender differences. Therefore, the purpose of this study is to describe the creative thinking process of male and female students in solving open-ended problems in grade VII flat building materials at SMP N 3 Surakarta.

RESEARCH METHOD

This study is intended to describe students' creative thinking profile in solving open-ended questions in terms of gender differences. The subjects of this study were 2 grade VII students of SMP N 3 Surakarta in the odd semester of the 2020/2021 academic year. It took the subject in this study using purposive sampling (objective sample), which was selected based on the objectives to be achieved, namely knowing the profile of students' creative thinking. The instrument in this research is a creative thinking test that uses open-ended questions and questions in the form of a description test to see students' creative thinking processes with indicators of fluency, flexibility, and novelty. The data obtained were tested for validity with the triangulation method so that the data was valid and could be analyzed as conclusions or research results. In data collection, after the written test, the researcher conducted interviews with the tests that had been given. Data analysis in this study is a systematic search and compilation process, starting from valid data obtained from interviews, clarifying data, reducing data presentation, and making conclusions.

RESULTS AND DISCUSSION

The following are the results of the analysis of student answers during tests and interviews based on achievement for creative thinking indicators

a. Male Subject

1) Question Number 1

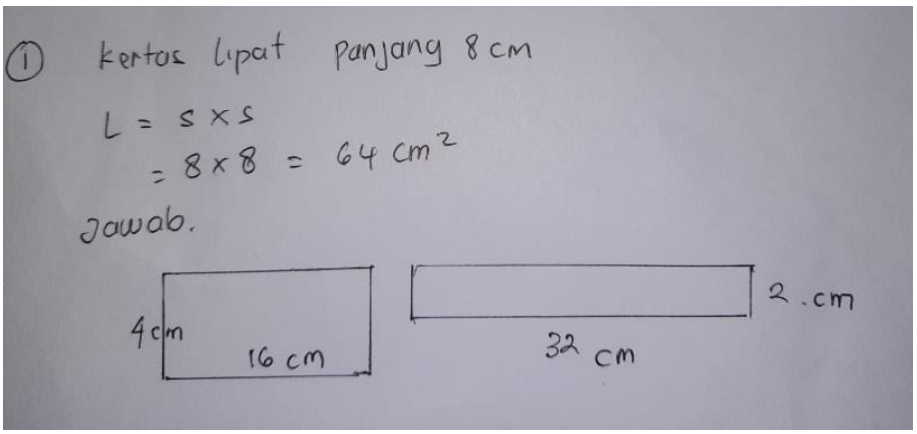

Figure 1. Answer sheet S1 Aspect of Fluency

In the preparation stage, the subject reads the questions repeatedly and observes any information contained in the questions. After reading the open-ended questions given, the students then observe the instructions and information by mentioning the things they understand. At this stage, undergraduate students are able to understand the problem by writing down what they know. The subject wrote down the problem that occurred, namely Ari's folding paper in the form of a square with a length of 8 cm

Incubation stage, the subject does so by thinking about the meaning of the question in the problem. After understanding the purpose of the question, students begin to identify possible solutions based on their knowledge and experience. During the identification process, the subject of S1 paused to observe the information and remember the material that had been received. The subject does not need a long time to reveal the solution to the situation and the questions given. This is shown by S1 when solving problems in other flat shapes; namely, students make plans to solve open-ended problems by calculating the area of folding paper using the concept of a square area, namely 64 cm^2 Next, subject S1 *states that he wants to make a rectangular shape by trying to multiply different sizes to find the same area as the area of folded paper.*

In the illumination stage, the S1 subject writes a solution in solving the problem by calculating the area of the folded paper and then entering the known side of the problem, name, and the calculated area. 8 cm 64 cm^2 smaking it easier to create another build. Based on the answer sheet, the subject made 2 rectangles with different lengths and widths. For square I, the length and width are 16 cm and 4 cm, respectively. As for square II, the length and width are 32 cm and 2 cm.

In the verification stage, the creative thinking process that will be revealed is reading open problems, re-correcting the information obtained and re-examining the answers. Based on the subject's description, the S1 subject reread the questions at a glance and re-examined the information that had been written. To test the correctness of the answers that the subject has made, S1 multiple the length and width of the rectangle.

2) Question Number 2

Preparatory stage, the subject seems to look at the problem by reading it by heart immediately. After reading the open-ended questions given, the students then observe the instructions and information by mentioning the things they understand. Based on the answer sheet, it can be seen that the subject divides the shapes into several flat shapes, namely 3 rectangles and a triangle.

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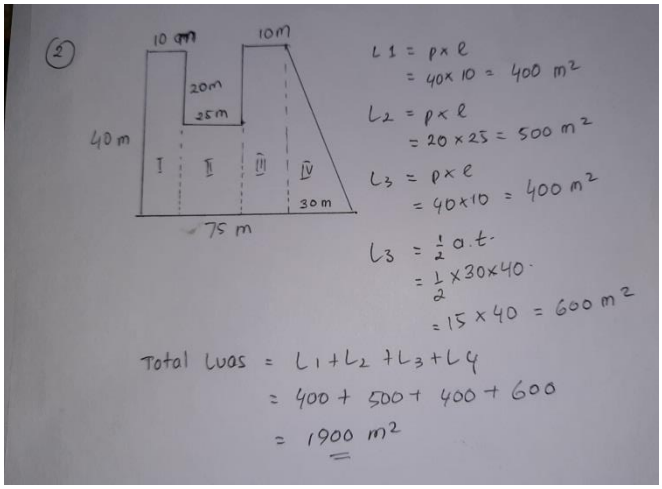

Figure 2. S1 answer sheet Flexibility Aspect

In the incubation stage, the subject makes an alleged strategy about solving the problem on the question. The subject stated that S1 has a strategy to solve this problem, namely by calculating the area of several flat shapes that have been divided. It can be seen on the answer sheet that the subject has carried out problem-solving strategies to solve open-ended questions.

Illumination stage, S1 subjects write solutions in solving problems by calculating the area of each flat shape. Furthermore, the subject added up the total area of all shapes, and the results found were 1900 cm2 so that the subject met the flexibility indicator to divide several flat shapes.

In verification stage, where students re-correct the information obtained and the answers from beginning to end. The subject does not reread the questions but checks the information and the written completion steps again. Then the subject re-examined the answer to the problem by recalculating the multiplication of each square and triangle area.

3) Question Number 3

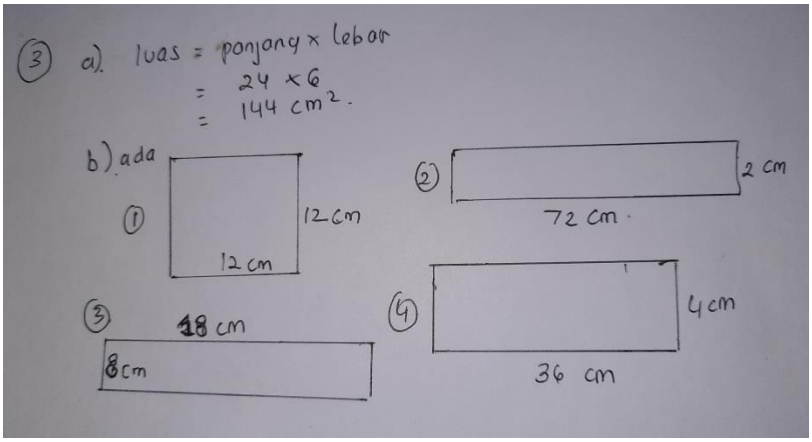

Figure 3. Answer sheet S1 Aspect of Novelty

In the preparation stage, the subject reads and observes the open problem. Based on the answer sheet, it can be seen that students calculate the area of a rectangle, then make several flat shapes, including a square and 3 rectangles. The subject collects relevant information by mentioning the known elements and mentioning the thing being asked but not writing it down on the answer sheet. Furthermore, the subject relates the problem information by stating that question number 3 is the same as question number 1, namely making flat shapes with the same area. The difference is the novelty in creating different flat shapes and having the same area.

The subject identifies the problem in the incubation stage by stating that they have encountered the problem before. The subject of S1 collects relevant information by stating that the appropriate mathematical concept to solve the problem is the concept of flat shape. Next, subjects make assumptions about strategies and possibilities to solve these problems, namely by knowing the area of the rectangle first, which will then be continued to make other flat shapes with the same area.

In the illumination stage, the subject is seen carrying out problem-solving according to the plan that has been made. Based on the answer sheet, the subject calculated the rectangle area with the correct result, namely 144 cm2. Next, the subject makes another flat shape to solve the problem in the problem. It can be seen that the subject drew a square with sides 12 cm, the first rectangle 72 cm long and 2 cm wide, the second rectangle 18 cm long and 8 cm wide, and a third rectangle 36 cm long and 4cm wide. Thus, the subject did not find it difficult to solve the problem.

The subject does not reread the questions in the verification stage to re-check the information obtained and then re-examine the answers from beginning to end. The subject shows alternatives/other ways to solve the problem and explains the procedure for solving the proposed mathematical problem.

b. Female Subject

1) Question Number 1

The following is an answer sheet for female subjects:

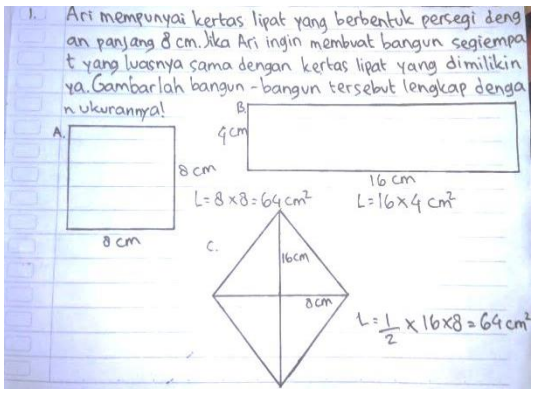

Figure 4. Answer sheet S2 Flexibility Aspect

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In the preparation stage, S2 reads the questions twice and looks silent for a moment while observing the questions. Then, the subject writes down the information obtained, namely information from what is known and asked. Seen on the answer sheet, the subject draws a rectangular shape and its area. Thus, the subject writes completely what is known from the problem and can convey smoothly what is known from the problem.

In the incubation stage, the subject identifies by associating the information with a problem marked by the subject making another flat shape, namely a rectangle and a rhombus. Subjects think about the meaning of the questions well. The subject also wrote a complete problem-solving plan but could not convey smoothly the method used to solve the problem.

In the illumination stage, the subject writes down all the information contained in the problem. However, the subject shows that at this stage, they have difficulty in explaining the completion steps. The subject solved the open-ended problem by using the formula for the area of a square but did not write down the description of the area of the parallelogram and the area of the parallelogram properly and completely. S2 also mentions the next step, which is to make another flat shape with the same area as a square area of 64 cm2.

In the verification stage, the subject rereads the open problem repeatedly. The subject also re-identifies the information obtained by correcting it. Finally, the subject re-examines the answer or solution obtained by doing multiplication to find out whether the answer is correct or not.

2) Question Number 2

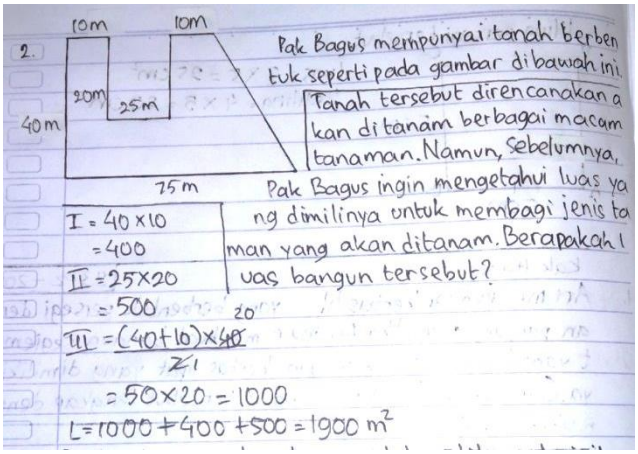

Figure 5. Answer Sheet S2 Flexibility Aspect

In the preparatory stage, the subject reads the questions many times. Subjects feel that they need more time to understand the problems in the questions. This is shown when conducting an interview, the subject is afraid if the answer is wrong. Based on the answer sheet, the subject wrote down the complete information by drawing the shapes on the questions and writing down the description of each size on the shapes correctly.

At the incubation stage, the subject is required to make assumptions about the strategy that will be used to solve the problem. The subject conveys fluently the method used to solve

the problem and relates what is known and what is being asked. However, it can be seen on the answer sheet that the S2 subject does not write down the formula for each flat shape but instead does the calculations directly.

At the illumination stage, the subject solves the problem in a coherent manner according to the plan that has been made and solves the problem with the correct calculation using a method that has been known before. S2 solves the problem with the correct calculation using a simple way even though it does not write down the area formula for each flat shape.

In the verification stage, the subject re-examines the answers by rereading the questions and writing down the process of re-checking the answers. S2 believes that the answer written from the beginning to the end is correct even though it is incomplete for question number 2.

3) Question Number 3

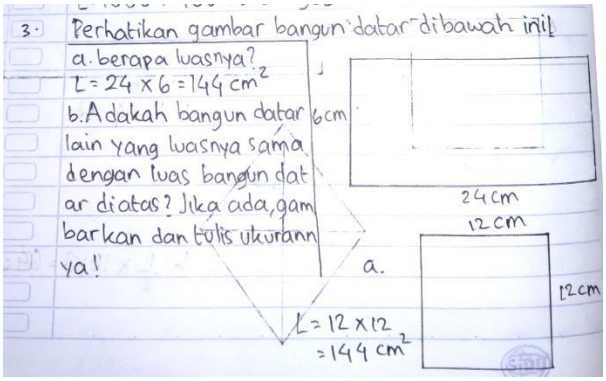

Figure 6. S2 Answer Sheet Aspect of Novelty

At the preparation stage, the subject did not understand the meaning of the number question. This can be seen during the interview. The subject is confused when mentioning what is known and what is being asked. When the subject represents the problem in the problem, the subject reads the question many times. In the incubation stage, the subject makes a plan to solve the open-ended problem but does not write the formula for the area of the rectangle so that he cannot write a complete problem-solving plan, but can convey smoothly the method used to solve the problem. At the illumination stage, solving problems coherently according to the plans that have been made, and being able to solve problems with correct calculations using methods that have been known before. And at the verification stage, the subject re-examined the answers by reading repeatedly and writing down the process of identifying the information obtained by correcting. The following are excerpts from female students' answers

Based on the explanation above, it can be seen that there are differences in each stage of male students and female students in the creative thinking process based on the Wallas stage. It can be concluded that male students seem to be able to explain problems and solutions orally and in writing. Meanwhile, female students seemed to explain the problem and its solution well but were less able to explain in writing. This result is in accordance with Kartono's opinion (in Subarinah, 2013) that women are generally focused on things that are concrete and practical,

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while men are more focused on things that are intellectual, abstract, and objective. Also, according to Heuvel-Panhuizen's opinion(2008)which states that girls can work on calculations and work on familiar problems in standard procedures, 'straight' problems without needing to reorganize, whereas boys are better than girls at everyday problems of knowledge of numbers and measurements. However, this research is not in line with the research conducted by Hodiyanto(2014) stated that there was no difference in the ability to increase students' creative thinking skills in terms of gender, while Munandar stated that there was no significant difference between female and male students on the creativity test.

CONCLUSSION AND SUGGESTIONS

Based on the results of the analysis and discussion, the conclusion of this study is that at the preparation stage, male students tend to be able to understand the meaning of the questions well and tend not to reread the questions, they can explain smoothly what is known and asked in the questions. Stepincubation (incubation) male students are silent for a moment then can relate to the relevant material and make assumptions about strategies and possibilities for solving problems. Then, illumination stage, male students write solutions in solving problems and carry out problem-solving according to the plan that has been made. Finally, male students in the verification stage reread open problems, re-correct the information obtained, and re-examine answers.

While female students, in the preparation stage, the subject mentions what is known and what is asked and represents the problem in the problem in its language appropriately and feel that they need more time to understand the problems in the questions. In the incubation stage, female students write a problem-solving plan even though it is incomplete and cannot convey smoothly the method used to solve the problem and relate what is known and what is asked. At the illumination stage, female students solve problems in a coherent manner according to the plan made and solve problems with correct calculations using methods known before. Finally, at the verification stage, review the answers and write down the process of identifying the information obtained by correcting it, even though it has to be read again and again. It can be concluded that male students seem to be able to explain problems and solutions orally and in writing. Meanwhile, female students seemed to explain the problem and its solution well but were less able to explain in writing.

As for suggestions for other researchers, they should provide enrichment questions after identifying students' creative thinking profiles based on the results of research that has been done so that students can develop their creative thinking process skills. More subjects are taken for research so that the research results are maximized by looking for as much literature as possible to strengthen the theory. The use of other materials in research such as geometry or algebra.

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