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Creative thinking skill of junior high school students in solving mathematical pattern problems based on sex

The problem and the aim of the study. Nowadays, in the era of digital technology, the ability to think creatively is one of the abilities that students must have. One of these abilities can be developed through learning mathematics. The problem so far is that students' creative thinking abilities in Indonesia have not shown optimal results. To justify this, it is necessary to study the ability to think creatively by looking at the gender aspect of students. So far, many people believe that gender does not affect a person's thinking ability in solving math problems, even though many studies show that women are more patient, precise, and more structured in their thinking.

This study aims to determine creative thinking skills in solving mathematical pattern problems based on sex in grade 8 students of Junior High School.

Research methods. This research is qualitative research with a descriptive approach. The subjects of this study were 8th-grade junior high school students in Madiun, East Java, Indonesia, which consisted of 2 female students and two male students. The main instrument in this research is the researcher himself. In addition, the instrument is assisted by tests of creative thinking skills and interviews. The indicators of creative thinking in this study are fluency, flexibility, and novelty.

Results. The results showed that male subjects were able to fulfill all indicators of creative thinking, namely fluency by answering question number one by providing six alternative answers, flexibility by answering question number two by providing four ways of completion, and novelty by giving answers in new ways or different from other students. Female subjects are only able to meet two indicators of creative thinking, namely fluency by answering question number one by providing three alternative answers and flexibility by answering question number two by describing two ways of solving, and unable to meet the indicator of novelty because it does not provide new or different ways with other students.

In ***conclusion***, based on research, it was found that male subjects could fulfill all indicators of creative thinking. In contrast, female subjects could only complete two indicators of creative thinking. This shows that male students have better mathematical creative thinking skills than female students. In addition, this study also indicates that the ability to think creatively mathematically is influenced by the sex of the students.

Keywords: creative thinking skill, sex, junior high school, mathematical problem, pattern problem

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Introduction

World travel has entered a new chapter. The world order is in the 21st century, where advances in science and technological sophistication have significantly impacted various aspects of life, including education. Competition in the 21st century places new demands on everyone to have good skills and competencies to compete and survive in the era of the industrial revolution 4.0. Partnership for 21st-century learning reveals the skills that everyone should have in the 21st century are critical thinking, problem-solving, creative thinking, communication, and collaboration. This aligns with UNESCO's framework in education in the 21st century, known as 4C (Critical Thinking & Problem Solving, Creativity and Innovation, Communication, and Collaboration) [1]. These 21st-century skills are part of the four pillars of education initiated by UNESCO: learn to know, do, remember to be, and learn together [2; 3]. For this reason, thinking creatively is still one of the essential abilities students must develop. This ability is necessary to face the challenges of education in this century.

The development of science and technology has a significant role, especially in developing a country. The better the development of science and technology in a country will be very influential [4]. This is in line with the quality of the education system, where the better a country's education system, the better its human resources. Therefore, all countries must be very concerned about their education system in the hope that it can give birth to quality human resources, which will significantly support the country's development in the future [5]. In line with that, Indonesia is also very concerned about its education system. This can be seen in one of Indonesia's national goals, namely educating the nation's life, as written in Law No. 20 of 2003 concerning the National Education System. Implementing education as mandated in this regulation is expected to develop abilities and shape students' personal qualities so that one day, they will become the next generation who are competent, creative, and have innovative new ideas to answer the challenges of the times. So that this learning process can bring progress to Indonesia in the future because students, as the next generation of the nation in the future, have competent, creative, and creative abilities.

Developing the potential of students to become human beings who can think creatively can be realized in several subjects, one of which is mathematics [6; 7]. By studying mathematics, students will get used to thinking systematically, critically, scientifically, and logically, increasing their creativity [8; 9]. Mathematics subjects are fundamental to learn because, from being a means of scientific thinking, students are also very much needed to grow and train their creative thinking skills [10; 11]. Creativity can be interpreted as having the power to create or having the ability to develop [12; 13]. Therefore, the skill to think creatively is the ability to believe that one can make or find new ideas, original, different from others, or unusual, with definite results [14]. Creative thinking is essential for everyone when studying at school and dealing with work [15; 16].

So that students' creative thinking skills can increase, teachers, in carrying out learning, can ask students to think divergently, not convergent. Divergent thinking explores various possible solutions to generate brilliant and creative ideas in finding a solution to a problem [17; 18]. This thinking refers to opening the mind in all directions and always trying various solutions to solve problems [19; 21]. Even though there is a solution, divergent minds will try to find a new answer [21; 22]. They adhere to the principle that there are infinitely

many solutions to a problem for the best choice [23]. The divergent has the characteristics of spontaneous, non-linear, and free-thinking [24]. This shows that creative thinking is also essential for students to answer the challenges of the times.

At this time, the learning process in schools is sometimes still not what is expected, as well as in mathematics. The results of an international study conducted by TIMSS (Third International Mathematics and Science Study) show that, in general, mathematics learning in schools still focuses on developing low-level thinking and is procedural [25; 26]. Several other studies also suggest that most teachers use ordinary or direct learning [27], whose learning is still focused on the teacher and does not stimulate students' creativity [28; 29]. In addition, previous research revealed that school learning tends to focus on the teacher, the teacher's explanation, and the student's attention, while mathematics is more abstract [30; 31]. So, learning by memorizing and remembering something abstract will make mathematics learning more complex and tedious and, of course, impact decreasing students' creative thinking skills [32; 33]. The ability to think creatively is an essential component that students must possess, especially in mathematics [34; 35].

Based on the results of observations made by researchers at Junior High School SMPN 7 Madiun, most students working on the practice questions given by the teacher were only glued or based on formulas or examples of questions explained by the previous teacher. So that when students are given questions slightly different from those that have been clarified, not a few students feel confused about the question. Even on some questions that should have several alternative solutions to solve the problem, most students have the same answer, even to the point that all the steps are the same. This shows that students are still less creative in developing what has been explained by the previous teacher and are also still less creative in solving the problems given.

One of the materials in mathematics that can be used is to see and train students' creative thinking skills in mathematical patterns. In mathematics learning material at school, the mathematical pattern is known as the number pattern. Generally, a pattern can mean a form, design model, or abstract idea that has regularity and is arranged repeatedly with specific rules to predict its continuation [36; 37]. Generalize the pattern into 3, namely factual, contextual, and symbolic [38]. Generally, accurate generalizations lie in actions on numbers, words, and perceptual activities. Then in contextual conception, in the form of objects whose descriptions are manifested and located from that object (for example, the following picture, the line above, etc.). In comparison, the generalization of symbols in the form of general things and operations is made by expressing them in an algebraic alphanumeric semiotic system [39].

Mathematical pattern questions, especially pictures, will train students more in creative thinking because students will be introduced to observing and finding patterns in the questions [40]. Then from the patterns found, creative ideas can be born to find solutions to these problems. There are several stages in finding a solution to a pattern; the first is to pay attention to some similarities. Second, form a general concept by generalizing the observed similarities. Third, give any tribal expression of the ideas found [38]. From the stages proposed by Radford, the creative thinking skills students use in solving mathematical pattern problems will be more clearly visible.

In creative thinking, several things make a person's judgment creative, such as the Torrance Tests of Creative Thinking or TTCT [41]. In this instrument, three indicators are used to determine a person's level of creativity, namely (1) Fluency is when students can work on questions by giving various answers, (2) Flexibility is when students can work on

questions in different ways, (3) Novelty is when students can work on questions by giving answers that are not common or not usually done by other students.

Each student's ability to think creatively is different in the learning process. There are two assumptions related to creative thinking [42]. First, everyone can be creative to some degree in their way. Second, the ability to think creatively is a skill that can be learned. Based on these assumptions, it can be concluded that everyone has a different level of creativity and has a way of realizing their creativity. In the learning process at school, especially in mathematics, students must have extra creativity to find solutions to problems [43; 44]. In this regard, the level of a person's creative thinking ability can be grouped into five levels, namely (1) Level 4 (very creative) when solving problems, students can show fluency, flexibility, and novelty; (2) Level 3 (creative) when solving problems students can show fluency and flexibility or fluency and novelty; (3) Level 2 (creative enough) when solving problems students can show flexibility or novelty; (4) Level 1 (less creative) when solving problems students are only able to show fluency; and (5) Level 0 (not creative) is when students are unable to show any of the three indicators of creative thinking ability.

One of the factors that can cause differences in the level of students' creative thinking ability is sex difference. This is because sex determines a person's pattern and thinking [45; 46]. Sex differences in students can cause discrepancies in student psychology learning, so male and female students will have many differences, especially in mathematics [47]. Sex differences in students can result in differences in mathematical abilities and ways of acquiring mathematical knowledge. As with previous research, it was found that there were differences in students' mathematical skills in terms of sex based on their psychology, which was in the way male and female students solved problems [48]. In addition, the results of research conducted at a Vocational High School stated that the average creative thinking ability of female students at Vocational High Schools was higher than that of male students [49].

Studies on sex still have mixed results. In some cases, it is stated that sex differences do not affect thinking processes, but in other cases, sex variables significantly affect a person's thinking ability, especially in mathematics [50]. But, by studying and understanding the differences between men and women in the creative mathematical thinking process, we know that both have different brain structures and abilities [51]. For this reason, this study focused on students' creative thinking abilities in solving mathematical pattern problems based on sex. Thus, this study aimed to determine the creative thinking abilities of male and female students in solving mathematical pattern problems.

Methods

The type of research used in this study is qualitative with a descriptive approach [52; 53]. The descriptive analysis seeks to describe a symptom, event, and event that is happening at present, where the researcher tries to photograph the events and incidents that are the center of attention to then describe them as they are. In this study, researchers attempted to qualitatively explain students' creative thinking abilities in solving mathematical pattern problems based on sex. The expected data in this study is in the form of answer sheets on the innovative thinking skills test results, complete with the scarcity of the interview process and impact.

The research subjects of this study were grade 8 students of Junior high school in Madiun, East Java, Indonesia. They chose grade 8 junior high school because they had been

taught material about number patterns. Grade 8 junior high school students are also at the formal operational stage, so students can think abstractly and can think logically. A total of 29 students in the class were given pattern questions. Two male and two female students were selected with the highest scores and good communication skills based on information from the mathematics teacher. The selection of 2 students each was used as a comparison in conducting source triangulation.

The instruments used in this research are the main and supporting tools. The primary device here is the researcher, who is in charge of directly determining the data in the field so that a researcher is expected to adapt and interact well with the data source or research subject. At the same time, the supporting instruments consist of test question sheets and interview sheets. The test contains validated mathematical pattern questions. The mathematical pattern questions were validated by two mathematicians, with results that were feasible to use. The questions given are in the form of description tests to make it easier for researchers to see the solution process carried out by students in answering the questions given (Figure 1).

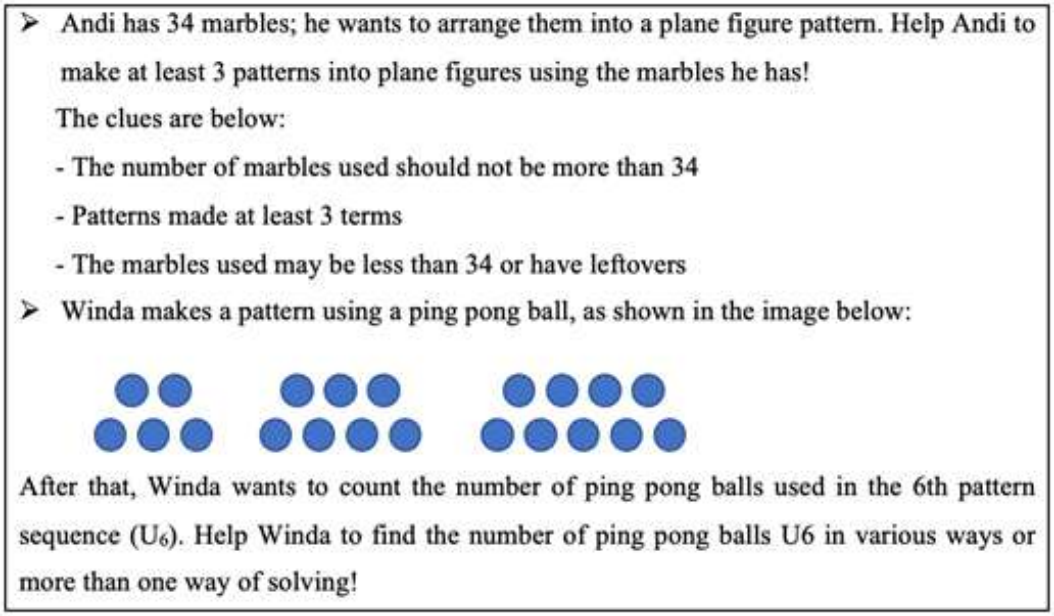

Figure 1 Instrument of Pattern Task

The interview sheet is a non-test instrument containing a series of questions used as a reference to obtain specific information or data related to respondents through a question-and-answer process. The interview guidelines referred to in this study are central questions more directed at the ability to think creatively in solving problems and following the answers written by the subject. One mathematician and linguist validated the interview guide, making the results feasible (Table 1).

Table 1

Interview Guidelines

Indicator Creative Thinking	Questions
Fluency Students can solve problems by providing various answers.	What information is obtained after reading the questions? How to solve a problem by giving a variety of answers? How to find the possible answers to the question?

Flexibility Students can solve problems by providing a variety of ways.	How to solve the problem by providing various ways? Can you explain the difference between the solution method you used to solve the problem?
Novelty Students can solve questions with answers that are not common or provide new or different ways with other students	How to solve questions with answers that are not common or provide new or different ways from other students? Where did you get the idea to solve the problem? What is the difference between the method you used in solving the problem and other standard methods?

In this study, the data collection techniques used were written tests and interview techniques. The written test technique is in the form of questions for creative thinking skills. In contrast, the interview technique is a series of leading questions used to dig deeper into students' creative thinking skills from the results of previously written tests [54]. Interviews were conducted with two selected male and two female subjects.

Data analysis techniques in this study consisted of 1) Data reduction was the stage of correcting the answers to student test results that had been collected to see students' creative thinking abilities and recording the results of interviews that had been recorded previously. 2) Data presentation presents the data obtained in narrative text, making it easier for readers to understand and draw conclusions later. 3) Concluding. The conclusion referred to here is students' ability to think creatively in solving mathematical pattern material problems regarding sex differences based on source triangulation.

To assess the creative thinking ability of children and adults is often used TTCT (The Torrance Tests of Creative Thinking) [41]. Three indicators are evaluated in creativity using the TTCT: fluency, flexibility, and novelty. Students are said to be fluent when students can solve problems given with various answers. Students are said to be flexible when students can solve a given situation in a variety of different ways of solving it. Other than that, students are told to find novelty when students can solve a given problem by making a different way of solving it, and not usually done by other students. For more details, three indicators of creative thinking can be seen in Table 2 [41].

Table 2

Indicators of Creative Thinking Ability

Components of Creative Thinking	Student Abilities
Fluency	Students can solve problems by providing various answers.
Flexibility	Students can solve problems by providing a variety of ways.
Novelty	Students can solve questions with answers that are not common or provide new or different ways with other students

Research Results

As equated in the method section, the subjects selected in this study were four people, namely two female and two male students. Further related to ethics, two male students are called SL1 and SL2, while two female students are called SP1 and SP2.

First Male Subject

Based on Figure 2, SL1 stated that the information obtained in the question was that Andi had 34 marbles; Andi wanted to arrange them into a flat-shaped pattern but on the

condition that the marbles used should not exceed 34 items and the pattern should be made up of at least three terms. Then SL1 explained how he answered the questions by trying to make patterns by estimating what flat shapes could be used while counting so that no more than 34 marbles were used. SL1 also explains the difference in answers to parts 1 and 6 are rectangles but with different patterns.

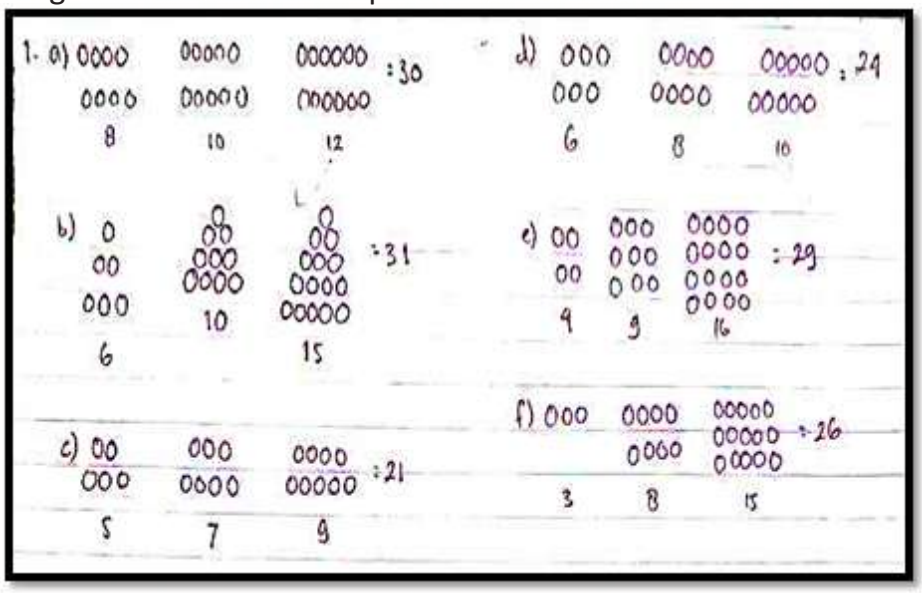

Figure 2 Answer Model of Problem No 1 on subject SL1

Based on Figure 3, SL1 explained that what was known was that Winda made a pattern using a trapezoid-shaped ping-pong ball. After that, Winda wants to count the number of ping pong balls in the 6th order or term. SL1 also mentions that what will be sought or what is being asked is looking for many ping pong balls in the 6th order or period. Furthermore, SL1 explained how he worked on the problem, namely the first one by using the Un formula, the second way by continuing the pattern of the picture, the third way of working by first converting the image into a number and then adding up the difference or difference to determine the next term. After that, SL1 explained the difference between the 2nd and 3rd ways of working if the image pattern method (2nd method) directly continues the drawing pattern, while with the number method (3rd method), we first change it to a number, and then we add it up with the difference to determine the next term. Finally, SL1 explained how the 4th worked by looking for roughly what formula was suitable to decide on each period: "I tried to change the numbers that seemed to fit by paying attention to the pattern". SL1 also explained the first way to the third method he had studied while studying mathematics. Still, for the fourth method, he said he was trying to find another answer because he said we were told to solve many problems in many ways, so he tried to enter numbers that matched by paying attention to the pattern.

Second Male Subject

Based on Figure 4, SL2 stated that the information obtained in the question was that Andi's marbles were 34 items. Then we were asked to make at least 3 picture patterns in a flat shape with the number of marbles used not exceeding 34. Then SL1I explained how he answered the questions by paying attention to the conditions. First, he drew by forming a rhombus, the second a triangle, a square, a parallelogram, and a rectangle. SL1I also explained that he could get ideas for all alternative answers from the flat shapes he usually saw.

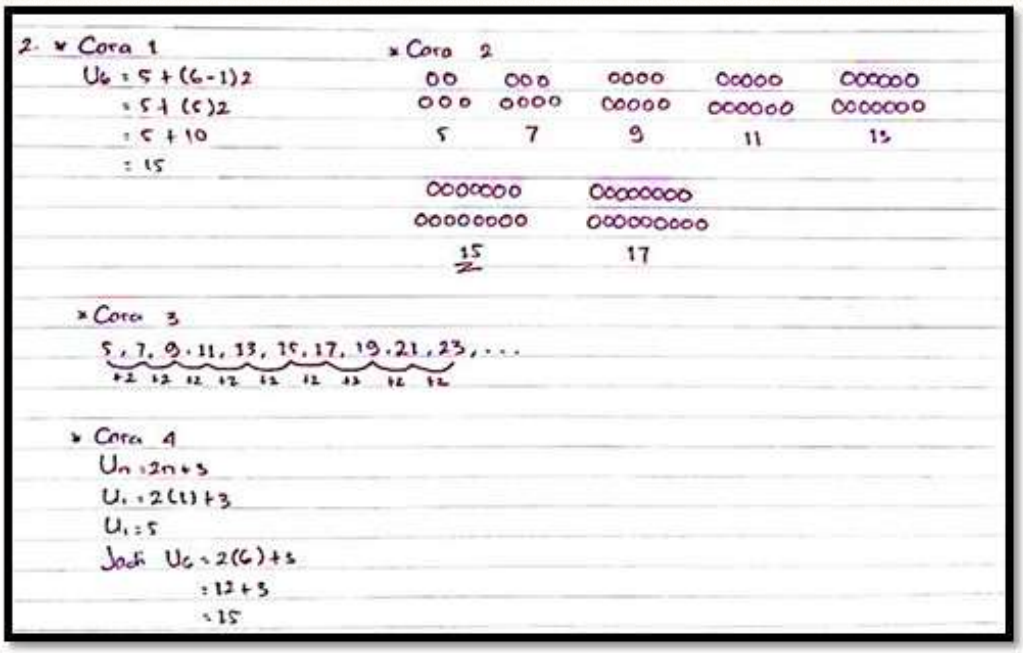

Figure 3 Answer Model of Problem No two on subject SL1

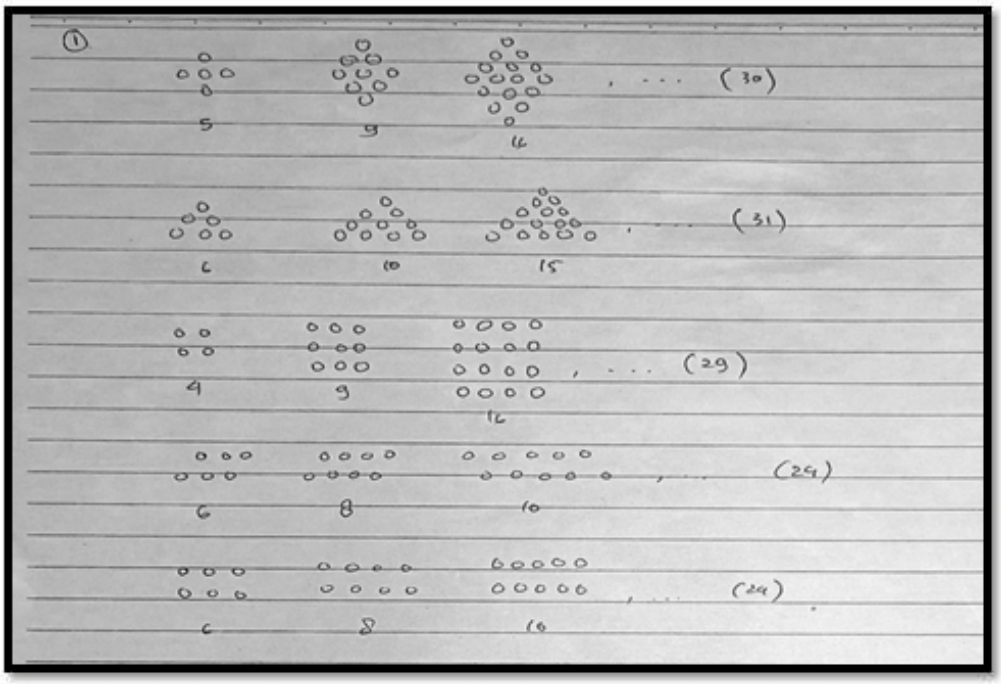

Figure 4 Answer Model of Problem No one on subject SL2

Based on Figure 5, SL2 could explain the information he got from the problem, namely that there was a picture pattern consisting of three terms, namely 5, 7, and 9. Then we were asked to look for the 6th term. Furthermore, SL2 explained how he worked on the problem; his first method was the Un formula. Then the second method uses a pattern; the pattern from the picture in the issue is continued until the 6th term. Then for the third method, besides the Un formula, he found another almost identical procedure: the Un formula is 4+(2n-1). Then SL2 added a way he saw the formula for the 3rd way. First, he paid attention to the general Un formula, namely Un = a+(n-1) b after he changed the numbers while paying attention to the pattern of pictures that were approximately good, and how much or minus how much until I get that formula. SL2 also added that the first working method uses the general or provision procedures. There are first and different terms used.

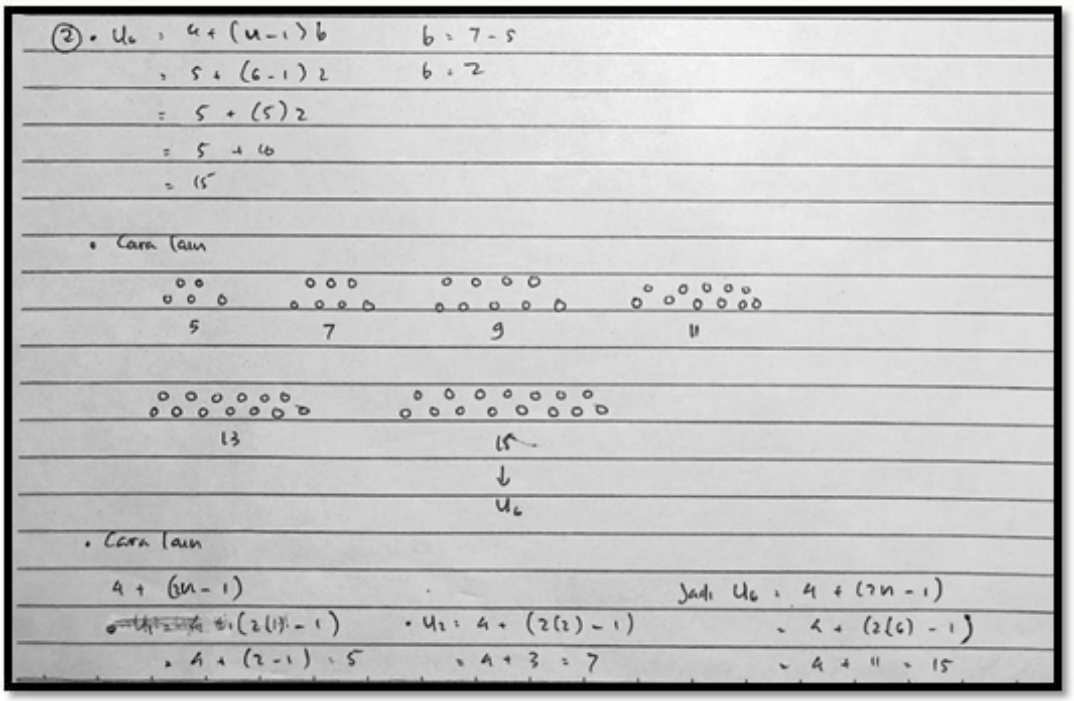

Figure 5 Answer Model of Problem No 2 on subject SL2

Meanwhile, in the third method, only the numbers are changed or what tribes will be searched for. Finally, SL2 explained where he got the idea when working on the problem, namely for the third method; he just tried to find the right formula because he said we were told to do it in many ways. As for the first and second methods, he learned from his teacher.

Credibility Test of Male Subjects

Based on the credibility test of SL1 and SL2 data, it can be seen that male subjects are equally able to work on the problem by bringing up three indicators of creative thinking ability, namely fluency, flexibility, and novelty. Thus, it can be said that the test results of the male subject's creative thinking ability are valid because both can bring up the three indicators of creative thinking ability.

First Female Subject

Based on Figure 6, SP1 stated that the information obtained in the question was that Andi had 34 marbles, she wanted to arrange them into a flat-shaped pattern, the number of marbles used should not exceed 34 items, and the pattern should be made up of at least three terms. Then SP1 explained how she answered the questions by trying to draw trapezoidal shapes, squares, and parallelograms. SP1 responded by experimenting with a flat shape according to which a pattern could be made.

Based on Figure 7, SP1 explained that what was known was that Winda made a pattern with a trapezoidal ping pong ball, and Winda wanted to count the number of ping pong balls in the 6th term. SP1 also explained that the problem's core problem was that we were asked to help Winda find many ping pong balls in the 6th term. Furthermore, SP1 explained how she solved the problem by paying attention to the pattern first and then trying to continue the pattern until the sixth term. The second method she did was using the Un formula. Finally, SP1 explained that in solving the problem, he got the idea from when she studied mathematics with the teacher, she also tried to find another way or another formula that could be used, but she couldn't find it.

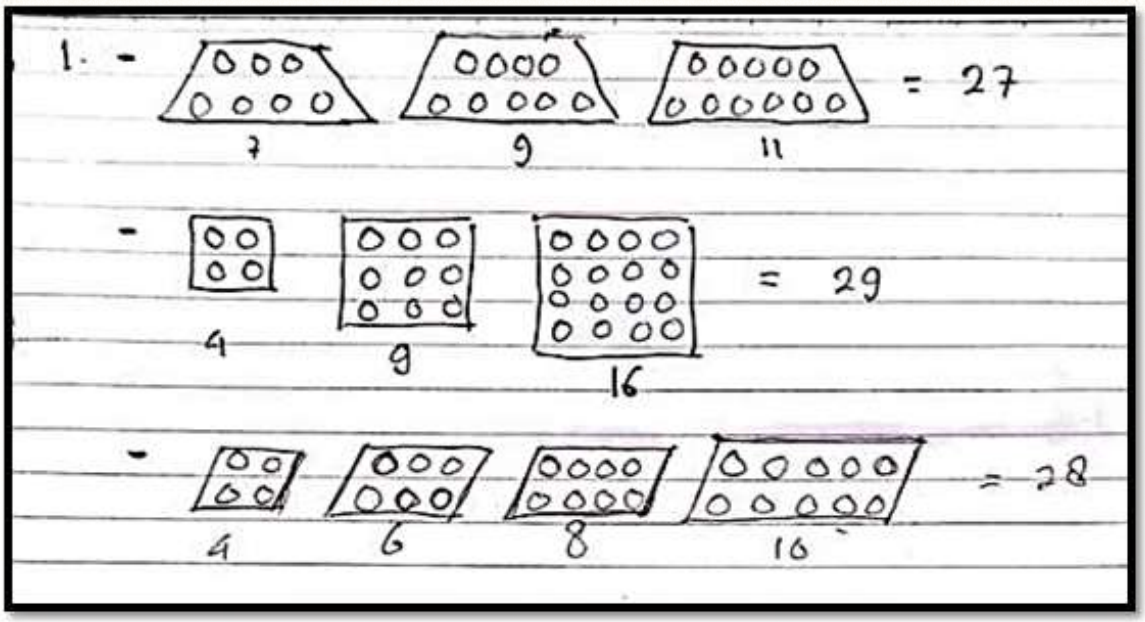

Figure 6 Answer Model of Problem No 1 on subject SP1

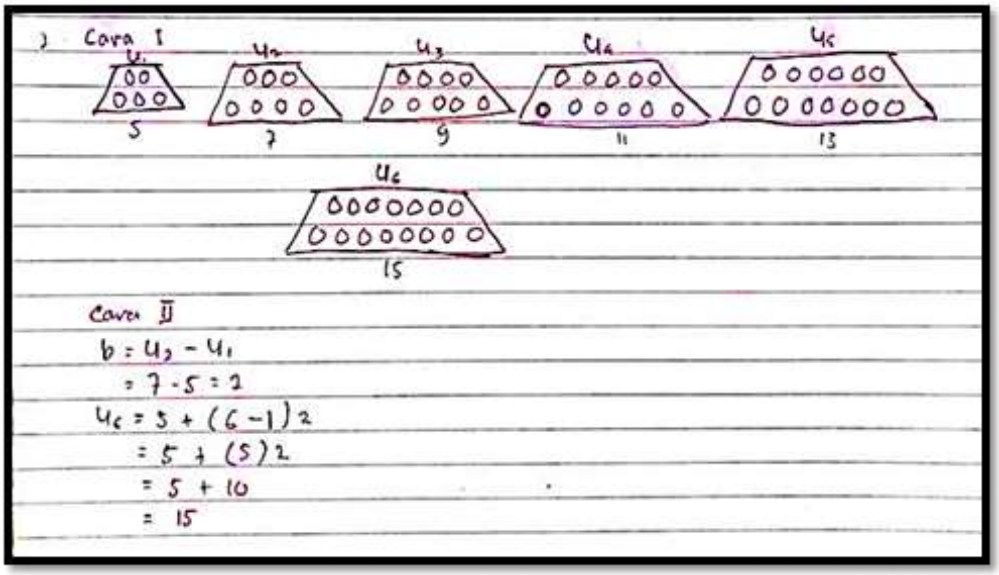

Figure 7 Answer Model of Problem No 2 on subject SP1

Second Female Subject

Based on Figure 8, SP2 states that the information obtained in the question is that Andi has 34 marbles, and she wants to make a flat pattern with the marbles used may be less than 34, and the pattern made at least 3 tribes. SP2 says that we are asked to make at least 3 patterns in a flat shape using the marbles we have. Furthermore, SP2 explained how she worked on the problem by drawing a pattern in the form of a balanced body, looking for what flat shapes could be made. SP2 added that he had tried many flat shapes but only three patterns she could make.

Based on the results of the interview with SP2 for question number 2, SP2 explained that what is known is that Winda makes a drawing pattern with a trapezoidal ping pong ball, and Winda wants to count the number of ping pong balls in the 6th term. After that, Winda explained how he worked on the problem using the Un formula and the second way she continued the drawing pattern. SP2 added that she had learned both ways of working while studying mathematics and had never seen another way. SP2 also had time to find another way or formula that could be used, but she couldn't find it.

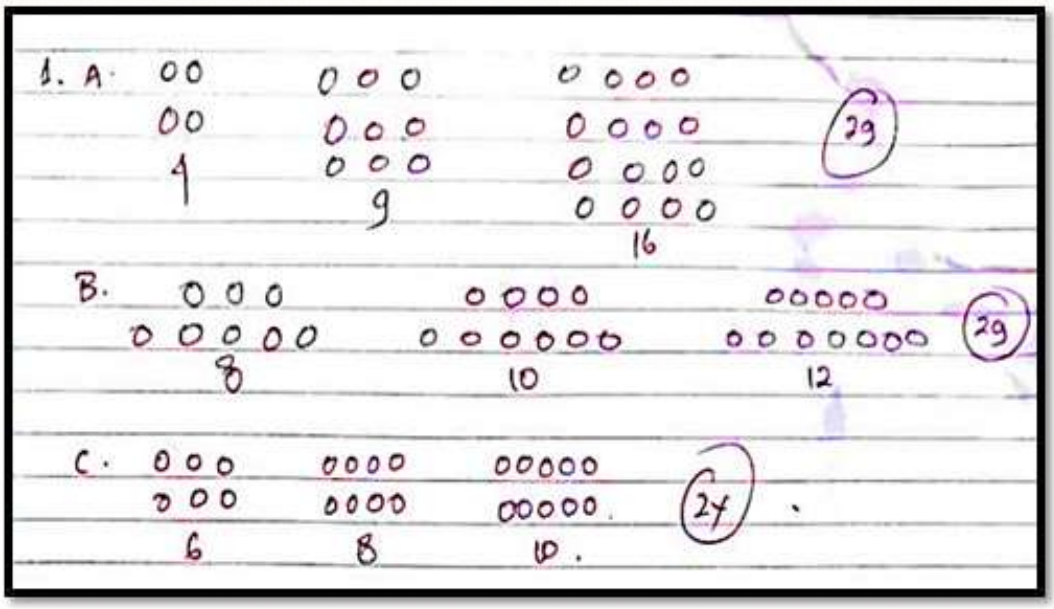

Figure 8 Answer Model of Problem No 1 on subject SP2

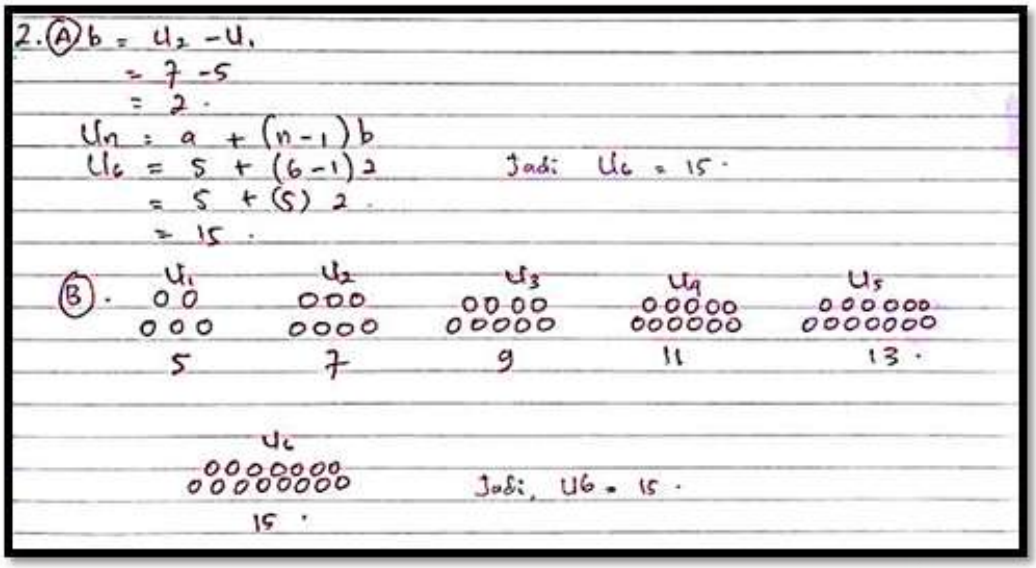

Figure 9 Answer Model of Problem No 2 on subject SP2

Credibility Test of Female Subjects

Based on the credibility test of SP1 and SP2 data, it can be seen that female subjects working on these questions can only bring up two indicators of creative thinking ability: fluency and flexibility. Both could not bring up the third indicator of creative thinking ability: novelty. Thus, it can be said that the results of the innovative thinking ability test of female subjects are valid because both can only bring up indicators of fluency and flexibility.

Discussion

Male Subject

Male subjects understand what information is contained in question number 1 and what is asked for in that question. We can see this from the work of the issue who can solve problem number 1 by providing various alternative answers. The subject provided six alternative solutions, and after the interview process with the matter,

the subject could explain or express themselves well using their language. From this explanation, it can be concluded that male subjects met the indicators of fluency and were categorized as fluent because they were able to give correct answers and provide reasons for these answers when interviewed. This aligns with research done before students are said to be fluent if they can offer several alternative answers and explain all these alternative solutions [55].

Male subjects understand what information is contained in question number 2 and what is asked for in that question. Based on male subjects' test results, the problem has been solved by providing four different ways of solving it but with the same and correct final result. Based on the interview results, we can see that the subjects could explain their way of solving problem number 2 with various ways of solving it. From this explanation, it can be concluded that the topic meets the flexibility indicator. The issue is categorized as flexible because he can solve problems using various methods of completion and can explain how to solve them when interviewed. This is in line with research done before those students are said to be flexible when they can solve problems and explain all the ways of solving them [55].

Male subjects also really understand what the question means. This can be seen from the results of the creative thinking ability test number 2, where the issue can solve problems using new or different ways from other students. From this explanation, it can be concluded that the subject met the indicators of novelty and was categorized as new because he could solve problems differently from other students and explain well when interviewed. This aligns with research conducted by [56; 57] that students are categorized as new when they can solve questions with answers not usually done by other students.

Based on the data analysis above, it can be seen that the male subjects met all the indicators of creative thinking skills, namely fluency, flexibility, and novelty. So it can be concluded that male subjects are students who are very creative or categorized into the 4th level at the level of creative thinking ability. This is different from the results of other studies, where in his research, male subjects were at level 3 creative thinking ability or categorized as creative because they could only bring up indicators of fluency and flexibility [58]. However, the results of this study align with the results of research conducted by [55; 57], where the level of creative thinking ability of male subjects is also at level 4, which can bring up indicators of fluency, flexibility, and novelty.

Female Subject

The female subject understood what information was contained in question number 1 and what was asked for in that question. We can see this from the work of the subject who can solve problem number 1 by providing various alternative answers. The subject can provide three alternative solutions to the question. After the interview process with the subject was carried out, the subject could explain or express well using their language about what was understood from question number 1 even though they did not write down what was known and asked when working on the question. The subject can also explain how he solves problem number 1 by providing various alternative answers. From this explanation, it can be concluded that female subjects met the indicators of fluency and were categorized as fluent because they could give correct answers and provide reasons for these answers when interviewed. This aligns with research conducted by [59; 60] that students are said to be fluent when they can offer several alternative solutions and explain all of them.

The female subject understood what information was contained in question number 2 and what was asked for in that question. Based on the test results, female issues solved the

problem by providing 2 different ways of solving it but with the same and correct final result. Based on the interview results, we can see that the subjects were able to explain well their way of solving problem number 2 with various ways of solving it. From this explanation, it can be concluded that the subject meets the flexibility indicator. The subject is categorized as flexible because she can solve problems using various methods of completion and can explain how to solve them when interviewed. This aligns with previous research, which found that students are said to be flexible when solving problems and explaining these solutions in various ways [55; 59].

Female subjects could complete the creative thinking ability test number 2 by using two ways of solving them but could not show new or different ways from other students. After being confirmed through the interview, the subject solved the problem using only the method generally taught by a mathematics teacher. According to the issue, he had tried to find another way or a new way to solve the problem but did not get it. From this explanation, it can be concluded that the subject does not meet the novelty indicator and is categorized as not new because the two subjects have been unable to solve the problem using a new or different way of solving it from other students.

Based on the data analysis above, it can be seen that female subjects can only bring up two indicators of creative thinking ability, namely fluency, and flexibility, and have not been able to bring up indicators of novelty. So, it can be concluded that female subjects are students at level 3 at the level of creative thinking ability or categorized as creative students. This is in line with the research results conducted by [57; 60], where female subjects were also at the 3rd level in his study because female subjects could bring up indicators of fluency and flexibility only. Likewise, previous research found that female subjects could only bring up two indicators of creative thinking ability: fluency and flexibility. Female subjects were also classified as level 3 at the creative thinking ability level or as creative students [58].

Conclusion

Based on the results of the data analysis and discussion, the results were obtained that (1) male subjects were able to fulfill all indicators of creative thinking, namely fluency by answering question number one by providing six alternative answers, flexibility by answering question number two by providing four ways of completion and novelty by providing answers in new ways or different from other students. (2) Female subjects are only able to meet two indicators of creative thinking, namely fluency by answering question number one by providing three alternative answers and flexibility by answering question number two by describing two ways of solving, and unable to meet the indicator of novelty because it does not provide new or different ways with other students.

From this research, the researcher provides recommendations to develop creative thinking ability in solving mathematical pattern problems based on sex. Schools can also create similar studies because they will positively contribute to the school's quality. Learning mathematics using mathematical pattern questions that can train students' creative thinking skills will certainly make students understand better for the subject matter. For this reason, teachers can also use mathematical pattern questions to prepare their students in class because it leads students to develop their creative thinking when they try to solve mathematical pattern questions.

The limitation of this study is the test instrument used was adapted from the mathematical pattern problems developed by previous researchers. In addition, this study was limited to only one school. Opportunities for further researchers are to examine schools in the high, medium, and low categories and can also be carried out at the elementary and high school levels.

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