



## Students' Creative Thinking Ability in Solving Mathematics Problems Based On Gender

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### **Abstract**

*This qualitative research aims to describe students' creative thinking ability in solving math problems in terms of gender. The instruments used are tests and interviews. The research subject is distinguished by gender selected based on the daily score and the final test score. It consists of four students: one male and one female student with high achievement, one male and one female with low achievement. Based on the result of observation on the four selected subjects, it was obtained that (1) male and female high-achievement students get the same score in solving math problems. In addition, indicators of creative ability, which can be seen from the answer sheets in solving these problems and interviews, are the same in the creative category (2) for low achievement students, males and females earn different scores; however, indicators of creative are classified in not creative category ability. Based on the results above, it can be concluded that in this study, gender does not affect students' creative thinking skills in solving math problems.*

**Keywords:** *Creative thinking; Math Problems; Gender.*

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### **INTRODUCTION**

Mathematics as a subject has an important role in preparing the younger generation to face challenges in life, be it personal, work, and social challenges, so that mathematics lessons are not just counting but are expected to emphasize thinking skills. Kurniati et al. (2016) said that understanding mathematics is central to preparing young people to live in modern society. So that by studying mathematics, students are required not only to count but more to emphasize skills in solving a problem so that they will get used to facing real-world challenges, thus, students will better interpret mathematics in learning.

In line with this, Dosinaeng (2019) said that there had been a shift in perspective on mathematics from just arithmetic to being a means of forming one's thinking ability. Thus mathematics is a lesson that participates in developing in line with the times. In mathematics, thinking skills are needed. Thinking skills are a person's thought process that is poured into writing. Irawati (2018) states that thinking is a mental activity that occurs in a person who answers a problem, makes a decision, and finds understanding. There are two levels of thinking, namely low-level thinking skills and higher-order thinking skills.

Mahanal (2019) revealed that the two thinking skills are closely related, so lower-order thinking skills are needed to achieve higher-order thinking skills. Purbaningrum (2017) said that the ability to process information and ideas by changing their meanings and relationships, uniting data with ideas to conclude, explain, interpret, generalize and synthesize is part of higher-order thinking skills. Meanwhile, according to Dosinaeng (2019), higher-order thinking skills combine critical thinking and creative thinking skills. Someone who thinks critically and creatively can solve a problem better. This is because he can understand the problems he faces in depth so that he can develop and implement a detailed settlement plan, and can review the work he has done based on his

ability to evaluate and self-regulate. According to Moma (2016), indicators of creative thinking ability can be seen in fluent thinking skills, flexible thinking, originality, elaboration, and judging skills. Thus it can be said that higher-order thinking skills are the ability to manipulate information and ideas critically so that they are able to solve problems creatively.

Creativity is one of the higher-order thinking skills, which until now has received less attention in learning mathematics. The teacher does not explore students' creativity in solving problems because the problems given only have one correct answer. Teachers are not used to teaching math problems with more than one correct answer. This causes students to be less interested in solving mathematical problems that require creativity. If you pay attention the 2013 Curriculum, it states that education aims to prepare Indonesian people to have the ability to live as individuals and citizens who are productive, creative, innovative, and effective. Based on this goal, one of the abilities to be achieved is thinking creatively (Agus, 2017).

In measuring the ability of creative thinking see the necessary instruments refer to the indicators of the inability to think creatively. Thus, the indicators of the ability of creative thinking that will be considered in this study are (1) the interpretation which is indicated by giving the meaning of the data or information on the issue, (2) analysis which is shown by providing analysis along with relevant arguments in solving problems accompanied by steps (3) inference which is the ability to obtain the things needed to conclude (4) fluency which is shown by writing answers in more than one way with right (5) originality shown by giving answers in their way (unusually). One way to measure students' creative abilities is to provide math problems.

One of the factors that can affect students' errors when working on math problems, namely gender differences. Men and women have differences in learning behavior; for example, women, on average, use learning strategies that are said to be more than men (Nurjanah, Kadarisma, & Setiawan, 2019).

Women have differences in thinking. In the composition of the physiology of the brain, the most important part of the human brain is the *cerebral cortex*, which is divided into two circles, namely the left and right circles. If the brain tissue in adults is disturbed, their intelligence activity may be disturbed. This means the brain network is involved in a person's intelligence activities. Considering that each student has different achievements and gender, it is possible that students also have different of thinking solving math problems.

## METHOD

This qualitative research aims to describe students' creative thinking ability in solving math problems in terms of *gender* (male and female). This research was conducted in class X SMK Kartika Makassar, choosing two classes by *random sampling* because there is no special class in the school; each class has students with heterogeneous cognitive abilities. Then, identify the cognitive abilities of each class by looking at the daily scores and semester test scores using a benchmark reference with a category value of 80 - 100 is a high-ability student, a score of 50 - 79 is a medium-ability student, and a score of 0-49 is a low-ability student. After that, choose two men, one with high ability and one with low ability, as well as in the female class, choose one woman with high ability and one woman with the low ability so that four subjects are selected. HOTS math questions are given to all students in one class so that the selected students do not know that they are being researched topics; why is that? It is feared that when they discover that they are research subjects, they will behave as well as possible in front of the researcher to produce data that is not valid for the researcher.

The focus of this research is to describe students' creative thinking skills in solving math problems in terms of *gender*. Indicators of students' creative thinking skills in solving math problems that are considered are fluent, flexible, original, detailed, and evaluation.

The instruments used are tests and interviews. The test presented is a math problem in the form of a description and contains indicators of creative thinking ability. This test is given to describe how the creative thinking ability of male and female students in solving hots questions. Not all indicators of creative ability appear in students' writing in doing math problems, or not everything that is in

students' minds is written on the answer sheet. So to reveal students' thoughts that are not or have not been revealed on the answer sheet, then an interview is carried out.

Activities and data analysis that will be carried out in this study are data display, data reduction, data presentation, and conclusion. The data validity test in this study is the credibility test, transferability test, dependability test, and confirmability test.

## RESULT AND DISCUSSION

### Result

Based on the results of tests and interviews conducted by researchers on the subject, the data obtained from the results of the study are as follows:

**Table 1.** Test Results of High and Low-Ability Student SLT and SLR

Gender	High Ability	Low Ability
<p><b>Male</b></p>	<p>The creative thinking ability of high-skilled male students (SLT)</p> <ol style="list-style-type: none"> <li>1. In question Number 1, the SLT subject gave a complete and correct answer; the indicators of creative thinking ability that were expected to appear on the subject's answer sheet were all fulfilled, including fluent and original.</li> <li>2. In question Number 2, the SLT subject answered completely and correctly. The indicators of creative ability expected to appear on the subject's answer sheet are also fulfilled, including fluent, flexible, and original.</li> <li>3. In question Number 3, the SLT subject answered by presenting a complete and correct picture. The indicators of creative thinking ability expected to appear on the subject's answer sheet are fulfilled, including fluent, flexible, original, and detailed.</li> <li>4. In question Number 4, the SLT subject gave a complete and correct answer; the indicators of creative ability that were expected to appear on the SLT answer sheet were all fulfilled, namely fluent, flexible, flavorful, and evaluative.</li> <li>5. In question number 5, SLT subjects provide answers by presenting complete pictures and doing calculations correctly. The indicators of creative thinking ability that are expected to appear are all fulfilled including fluent,</li> </ol>	<p>The ability to think creatively of boys - ladies low (SLR).</p> <ol style="list-style-type: none"> <li>1. In question Number 1, the SLR subject answered by not presenting a picture; it was seen that he had written the answer, showing limited understanding, so the indicators of creative ability that were expected to appear on the SLR answer sheet were not fulfilled, including the original indicators.</li> <li>2. In question Number 2, Subject SLR gave an almost correct answer. Still, it looked messy, so none of the indicators of creative thinking ability expected to be revealed were fulfilled.</li> <li>3. In question Number 3, the SLR subject gave answers by not presenting pictures, not detailed mathematical explanations, and performing mathematical operations showed limited understanding, so the indicators of creative ability that were expected to appear, namely fluent, flexible, original, and detailed, were not met.</li> <li>4. In questions Numbers 4 and 5, the SLR subject did not have an answer, so it was assumed that these two questions were not understood by the SLR at all.</li> </ol>

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flexible, original, detailing, and evaluating.

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<b>Female</b>	<p>Creative thinking ability of high-skilled female students (SPT)</p> <ol style="list-style-type: none"> <li>1. In question Number 1, the subject of the SPT answered by presenting a complete picture and doing the calculations correctly. Still, in part b, the subject seemed wrong, so he incorrectly determined the set of solutions. Still, based on the answer steps described on the SPT answer sheet, the indicators of creative ability are. It is hoped that everything will be revealed, including smooth and original.</li> <li>2. In question Number 2, the subject of the SPT gave a complete and correct answer; the indicators of creative thinking ability, which are expected to be revealed on the subject's answer sheet, are all fulfilled, including fluent, flexible, and original.</li> <li>3. In question Number 3, the subject of the SPT answered by presenting a complete picture, explanation, and complete and correct mathematical calculations. All indicators of creative ability expected to be fulfilled include fluent, flexible, original, and detailed.</li> <li>4. In question Number 4, the subject of the SPT gave a complete and correct answer. The indicators of creative ability expected to be revealed are all fulfilled, including fluency, flexibility, detailing, and evaluating.</li> <li>5. In question Number 5, the SPT answers by presenting a complete picture and mathematical calculations correctly. Then the indicators of creative ability expected to be revealed are all fulfilled, including fluent, flexible, original, detailed, and evaluative.</li> </ol>	<p>Creative thinking ability of female students with the low ability (SPR)</p> <ol style="list-style-type: none"> <li>1. In question Number 1, the SPR subject answered by presenting an incomplete picture; the mathematical explanation showed limited understanding, so the indicators of creative ability that appeared on the SPR answer sheet were only fluent, and the originality indicator was not fulfilled.</li> <li>2. In question number 2, the subject of the SPR writes the answer completely and correctly; the indicators that are expected to appear on the SPR answer sheet are that all of them are fulfilled, including fluent, flexible, and original.</li> <li>3. In question number 3 and question number 4, the SPR subject did not write down the answer at all, so it was considered that these two questions were not understood by the SPR subject at all.</li> <li>4. In question number 5, the SPR subject gives answers without presenting pictures, mathematical explanations are not detailed, and perform inaccurate calculations resulting in wrong final answers; indicators that appear are smooth and flexible, while indicators that do not appear are original, detailed, and evaluate.</li> </ol>
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**Tabel 2 .** Test Results of High and Low-Ability SLT and SPR

<b>Gender</b>	<b>High Ability</b>	<b>Low Ability</b>
<b>Male</b>	Based on the results of interviews from question number 1 to question number 5, the researcher assumes that the male subject has a high level of ability (SLT), is able to answer questions correctly, completely, and is able to explain the answers obtained orally, so that the indicators of creative thinking revealed in test results are also shown in the interview results.	Based on the results of interviews from question number 1 to question number 5, the researcher assumes that male subjects of low ability level (SLR) are unable to answer questions correctly and completely and are unable to explain the answers obtained orally; this can be seen from the answers. The answer that came out the most was the word "forget" or did not know, ma'am, so the indicators of creative thinking that were revealed in the overall test results were not shown at the time of the interview.
<b>Female</b>	Based on the results of interviews in general from question number 1 to question number 5, the researcher assumes that the female subject of high ability level (SPT) is able to explain the answers obtained orally, although there is a slight error in determining the set of solutions to one of the questions, but at the time of the interview able to be explained correctly so that the researcher concludes that the indicators of creative thinking are all revealed at the time of the interview.	Based on the results of interviews from questions number 1 to question number 5, the researcher assumes that female subjects of low ability level (SPR), are unable to explain the steps for solving problems in unstructured mathematical language, most of them are silent and answer they don't know and some answers are answered with doubt. , so that the indicators revealed in the overall test results were also not revealed at the time of the interview.

**Discussion**

Based on the results of the research stated above, in general, it can be seen that men and women have comparable creative thinking characteristics but specifically have differences in various aspects of their creative thinking skills. Men excel in certain aspects, while women also excel in other aspects. Each individual has the same potential to develop, so there needs to be a form of comprehensive learning as a place to hone his creative thinking skills. What affects the level of creative thinking is the level of ability. Students with different levels of thinking ability will have different levels of creative thinking. This is evidenced by the data obtained in this study, namely that students with high abilities, both male and female, both received high scores in solving the questions given and based on the results of tests. Interviews were in the creative category, and vice versa. Male students and women with low abilities both get low scores. The level of creative thinking is in the non-creative category. This research is in line with research conducted by (Huliatunisa et al., 2019), whose research results show that high-ability students achieve level 4 creativity (very creative) if students are able to show flexibility and novelty in solving or posing problems. This study also found that *gender* does not affect students' creative thinking skills; it is relevant to the results of research conducted by (J. A. C. van der Zanden et al., 2020) shows that several factors affect inhibiting creativity, among which individual factors, parental factors, educational factors, and social contextual factors.



## CONCLUSIONS AND SUGGESTIONS

Based on the results of research on how the creative abilities of male and female students in solving math problems, the conclusions obtained are:

1. Male students with high skills (SLT) and female students with high skills (SPT), the creative indicators revealed based on the results of tests and interviews on these two subjects were fluent, flexible, original, detailed, and evaluated based on the scores obtained were in the category creative
2. Male students with low abilities (SLR) and female students with low abilities (SPR), creative indicators revealed based on the results of tests and interviews on these two subjects were flexible and original. Based on the score obtained, it is in the non-creative category.

Based on the conclusions stated above, some suggestions need to be submitted as follows:

1. Future researchers are expected to be able to follow up on the results and findings of this study, such as developing a learning model that can increase students' mathematical creativity based on factors that affect students' creativity inhibition.
2. It is hoped that teachers will develop their creative ideas in making learning designs that can increase students' creativity, especially in learning mathematics.

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