e-ISSN: 2549-5070
p-ISSN: 2549-8231

Journal of Medives : Journal of Mathematics Education IKIP Veteran Semarang
Volume 9, No. 2, 2025, pp. 145-157

https://doi.org/10.31331/medivesveteran.v9i2.3595

Critical Thinking Abilities of Junior High School Students on Numeration Problems in View of Gender Differences

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Received: *November 2024.* ***Accepted***: *December 2024.* ***Published***: *May 2025.*

ABSTRACT

This study aims to describe the critical thinking abilities of masculine male and feminine female junior high school students in solving numeracy problems. This type of research is qualitative research. This research was conducted on class VIII junior high school students in Banjarmasin. The subjects selected for this study were two students consisting of one masculine male student and one feminine female student with equal mathematical ability. The instruments used are gender test sheets, Mathematics Ability Test (MAT), Problem Solving Task (PST), and interview guidelines. Data analysis techniques include analysis of gender test results, analysis of math ability tests, analysis of problem-solving tasks, and analysis of interview data. The results showed that the critical thinking skills of masculine male and feminine female students on numeracy problems could fulfill the five indicators of critical thinking, namely identifying statements and questions/requests in the given situation, applying the steps used to solve the problem, concluding logically from the data submitted, clarifying the conclusions drawn and writing the final result, validating the answers obtained.

Keywords: *Critical Thinking Skills, Numeracy, Gender Differences in Learning,*

How to Cite: Tjitradi, S., Setianingsih, R., & Manoy, J. (2025). Critical Thinking Abilities of Junior High School Students on Numeration Problems in View of Gender Differences. *Journal Of Medives : Journal Of Mathematics Education IKIP Veteran Semarang, 9*(2)

INTRODUCTION

In the 21st century, students are asked to be able to use their high-level thinking skills, so students are expected to be creative and innovative in implementing the learning strategies that will be used. In 21st-century learning, there are very important learning skills in addition to communication and collaboration skills, namely high-level thinking skills (Ismail, 2020). One of the high-level thinking skills needed in 21st-century learning is critical thinking.

According to Facione & Facione (2007:2), critical thinking is reflective decision-making and problem-solving with full consideration of what to do or believe. Critical thinking skills are one way of thinking needed to solve problems (Ansori et al., 2020). This is in line with what was expressed by Dores et al. (2020) and Lestari et al. (2019): critical thinking skills are very important because they function as a tool to solve problems and as a basis for making the right decisions.

Based on the above opinion, individuals have different critical thinking skills. It is in accordance with the results of research by Nisa et al. (2020), which states that the distribution of critical thinking skills of grade VIII students at SMPN 1 Kalipare who have very high critical thinking skills is six students (7.23%), high critical thinking skills are seven students (8.43%), moderate critical thinking skills are 17 students (20.48%), low critical thinking skills are 20 students (24.10%). Very low critical thinking skills are 33 students (39.76%). In general, the critical thinking skills possessed by students are not the same.

Gender differences can influence individual critical thinking skills (Sari et al., 2022; Anggreini & Asmarani, 2022). Research by Suárez-Brito et al. (2025) examined the effect of gender on the development of complex thinking skills in 225 engineering students from Northern Mexico. The study aimed to evaluate how gender and academic background influence the development of these skills, using a machine learning analysis approach. The results showed significant differences between male and female students in their mastery of critical thinking. These findings suggest that gender can be a factor influencing students' critical thinking abilities. Therefore, it is important for educators to consider gender when designing learning strategies.However, in a study by Bagheri and Ghanizadeh (2016), gender did not have a significant effect on the critical thinking skills of the respondents, who consisted of 120 EFL students at Hakim Sabzevari University in Iran.

This statement is to the results of research by Rachmawati et al. (2022), where there are differences in the way of solving the numeracy literacy problems given, especially in the second stage, which concluded that students with masculine male gender can analyze the relationship between problems and mathematical concepts, while students with feminine female gender do not analyze the relationship between problems and mathematical concepts, and the third stage which concluded that students with masculine male and feminine female Gender solve the numeracy literacy problems in their own ways and use different solution steps. So, there are differences between masculine men and feminine women regarding their critical thinking skills. Psychological differences are also evident between masculine males and feminine females. Masculine males

tend to be less meticulous but make decisions more quickly and often do not process information comprehensively. In contrast, feminine females are generally more careful, precise, and accurate in processing information (Meyers-Levy, 1986; Nurmitasari & Astuti, 2017; Lager et al., 2024; Plotkina et al., 2024).

At school level, it is important for students to improve their critical thinking skills to face current and future problems. One method that a teacher can use to improve student's critical thinking skills is by providing complex challenges or problems. One problem that can be given is a problem in the Minimum Competency Assessment (AKM).

AKM is a type of assessment carried out by the Ministry at the elementary and secondary education levels (Permendikbud, 2020) as part of the evaluation of the education system. According to the AKM Framework (2021:4), "AKM is an evaluation of basic competencies needed by each student to develop their potential and make a positive contribution to society (Ma'rifah et al., 2023). This assessment aims to obtain information and find out students' achievements towards the expected competencies." The Minimum Competency Assessment measures two essential competencies: numeracy and reading literacy.

Mathematics learning is closely related to numeracy literacy in its implementation. Numeracy literacy, commonly called numeracy, is one of the basic literacies students must master (Izzatin et al., 2022). Numeracy is a person's ability to apply reasoning, which refers to the process of analyzing and understanding a statement by processing mathematical symbols or terms that are often found in everyday situations (Ekowati et al., 2019; Zahro et al., 2022; Risqi & Setianingsih, 2021). Numeracy is essential in mathematics because mathematics is not only the application of formulas but also requires students' memory or critical thinking skills to solve every problem (Salvia et al., 2022).

The difference between the problems in the Minimum Competency Assessment and other problems, especially in numeracy used in mathematics learning, lies in content, cognitive processes, and context. AKM questions, especially in numeracy, are expected to be able to measure various contents, cognitive levels, and contexts so that they do not only focus on specific topics or content.

Regarding numeracy in this study, the researcher wants to focus on the context of the wetland environment. Context refers to aspects of life or situations used. The context here is associated with the environmental conditions of South Kalimantan, especially in the wetland environment, which includes various community activities around waters such as rivers, swamps, and beaches.

Based on previous research by Mawaddah et al. (2021), who developed LKPD learning devices with a wetland context, the results of student learning completion criteria reached 84.5% of students with a minimum score of 70.

The study by Zulkarnain et al. (2022) developed an Android-based mathematics learning media with a wetland environmental context, where the results of student learning tests reached 85.7% of students who got a minimum score of 70. Based on the results of this study, Zulkarnain et al. (2018) argued that "the potential of diverse wetland environments needs to be understood by students and can be used as a learning resource. Therefore,

utilizing the wetland context can support the development of mathematical concepts for students." Questions related to the wetland context can help students improve their critical thinking skills. This statement is based on the research of Bakti et al. (2023) and Rusmansyah et al. (2023), who stated that the wetland context effectively improves students' critical thinking skills.

Based on the description of unequal critical thinking skills, critical thinking skills can be influenced by gender differences (Sari et al., 2022; Suárez-Brito et alher, 2025), but from Bagheri & Ghanizadah's research (2016) gender factors do not have a significant effect on critical thinking skills. There is also a relationship between numeracy and critical thinking because critical thinking skills are needed to solve these problems. The wetland context is effective for improving students' critical thinking skills. The difference between previous research and this research is the discussion of gender that leads to differences in masculine men and feminine women and the use of numeracy literacy in the context of wetlands in South Kalimantan.

METHOD

This study aims to describe the critical thinking skills of subjects in solving numeracy problems in the context of wetlands. Based on its purpose, this study is included in the type of qualitative research. This study was conducted on junior high school students in class VIII in Banjarmasin.

The subjects were selected from class VIII-C, consisting of 19 students, 9 male and 10 female. Initially, all students were given a gender orientation test to identify their gender orientation. The results showed that three students had a masculine orientation, six had a feminine orientation, one had a androgyny orientation, and nine showed no particular tendency. Subsequently, the students with masculine and feminine orientations were given a mathematical ability test. Students were selected as subjects if the difference in their mathematics scores was no greater than five points, ensuring comparable levels of mathematical ability between the groups. The subjects selected for this study were two students, one masculine male student and one feminine female student, with equivalent mathematical abilities. Data from both research subjects are shown in the table below.

Table 1. Research Subject Data

No.	Initials of Name	M/F	Gender Orientation	Mark
1	CCS	F	Feminine	78
2	TL	M	Masculine	81

The main instruments used in this study were the researcher and supporting instruments. These consisted of gender test sheets, mathematical ability test sheets (TKM), problem-solving task sheets (TPM), and interview guidelines.

The gender test administered was a standardized instrument derived from the Bem Sex Role Inventory (BSRI), developed by Bem (1974). This test was used to identify the gender orientation of students, specifically masculine-oriented males and

feminine-oriented females. The gender test was administered after the research class had been determined and was given to students as potential research subjects. The test consists of 60 items related to personality characteristics, categorized into 20 masculine traits, 20 feminine traits, and 20 neutral traits. Students were asked to rate each item on a 7-point Likert scale, indicating how well each characteristic describes themselves. A detailed description of the scale is presented in the table below.

Table 2. BEM Scale

Scale	Description
1	Not true or almost never true
2	Usually not true
3	Sometimes but not often true
4	Occasionally true
5	Often true
6	Usually true
7	Always or almost always true

(Sodaqta & Priambodo, 2018)

Subsequently, the determination of each student's gender type was carried out based on the following criteria (Santrock, 1996, p. 368): (i) Masculine, if the student obtained an average masculine score above 4.9 and an average feminine score below 4.9; (ii) Feminine, if the student obtained an average feminine score above 4.9 and an average masculine score below 4.9.

The mathematical ability test used in this study was a standardized assessment. The material covered in the test was based on the topics previously taught during the first semester of the eighth grade. The test consisted of seven open-ended questions to minimize the possibility of students answering correctly by chance. The test results were analyzed by calculating the scores of each student according to their previously determined gender group. Subjects were selected from each gender group whose scores fell within the range of 0–5 on a scale of 0–100. As a result, two research subjects were identified: one masculine male student and one feminine female student.

The problem-solving task sheet was designed to describe junior high school students' critical thinking skills in solving numeracy problems within the context of wetlands, specifically in the domain of data and uncertainty, focusing on statistical concepts. The domain of data and uncertainty in this study refers to statistical material, particularly related to determining and using the mean, median, and mode. This problem-solving task will be administered once the students selected as research subjects have been identified.

Table 3. Level of Mathematical Ability

No	Score Range	Mathematical Ability Level
1	$81 \leq x \leq 100$	Very High
2	$71 \leq x < 81$	High
3	$61 \leq x < 71$	Moderate
4	$0 \leq x < 61$	Low

Data were collected by providing TPM related to numeracy with problems taken from the context of wetlands. Interviews were used to explore data not documented on the student worksheets that were the focus of the study. Interviews were conducted with both students individually and alternately. After the data were collected, a triangulation technique was carried out that combined the interview results with the TPM that students had worked on to ensure data consistency so that the data could be considered valid. The data analysis method used the data analysis stages from Miles et al. (2014), which consisted of three activity flows, namely (1) data reduction, (2) data presentation, and (3) drawing conclusions and verification.

RESULTS AND DISCUSSION

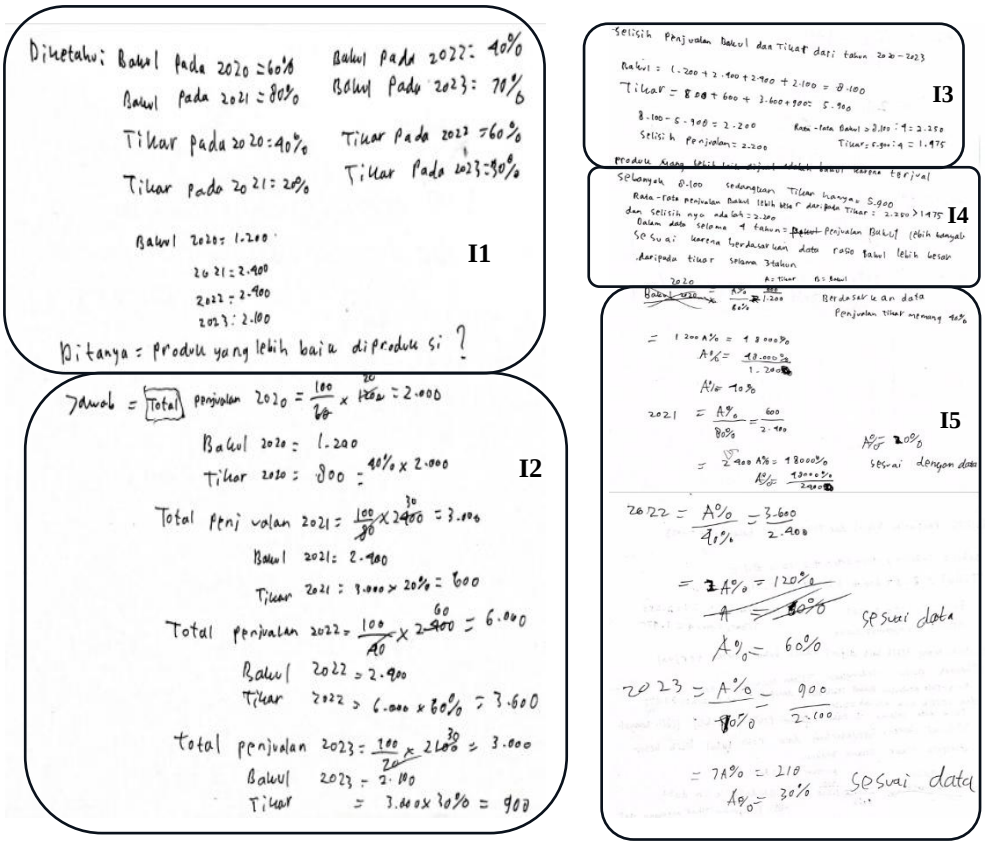
The provision of TPM to students includes five indicators of critical thinking: identifying statements and questions/requests on the given problem, applying the steps used to solve the problem, concluding logically from the data submitted, clarifying the conclusions drawn and writing the final results, and validating the answers obtained. In order to facilitate data presentation, the researcher created a coding of critical thinking indicators as follows.

Table 4. Coding of Critical Thinking Indicators

No	Indicator	Code
1	Identify statements and questions/requests on the given problem.	I1
2	Implement the steps used to resolve the problem.	I2
3	Draw logical conclusions from the data presented.	I3
4	Clarify the conclusions drawn and write down the final results.	I4
5	Validate the answers obtained.	I5

The following is a presentation of data regarding the critical thinking abilities of masculine male and feminine female students on numeracy problems.

1. Data on Critical Thinking Skills of Masculine Male Students in Providing TPM

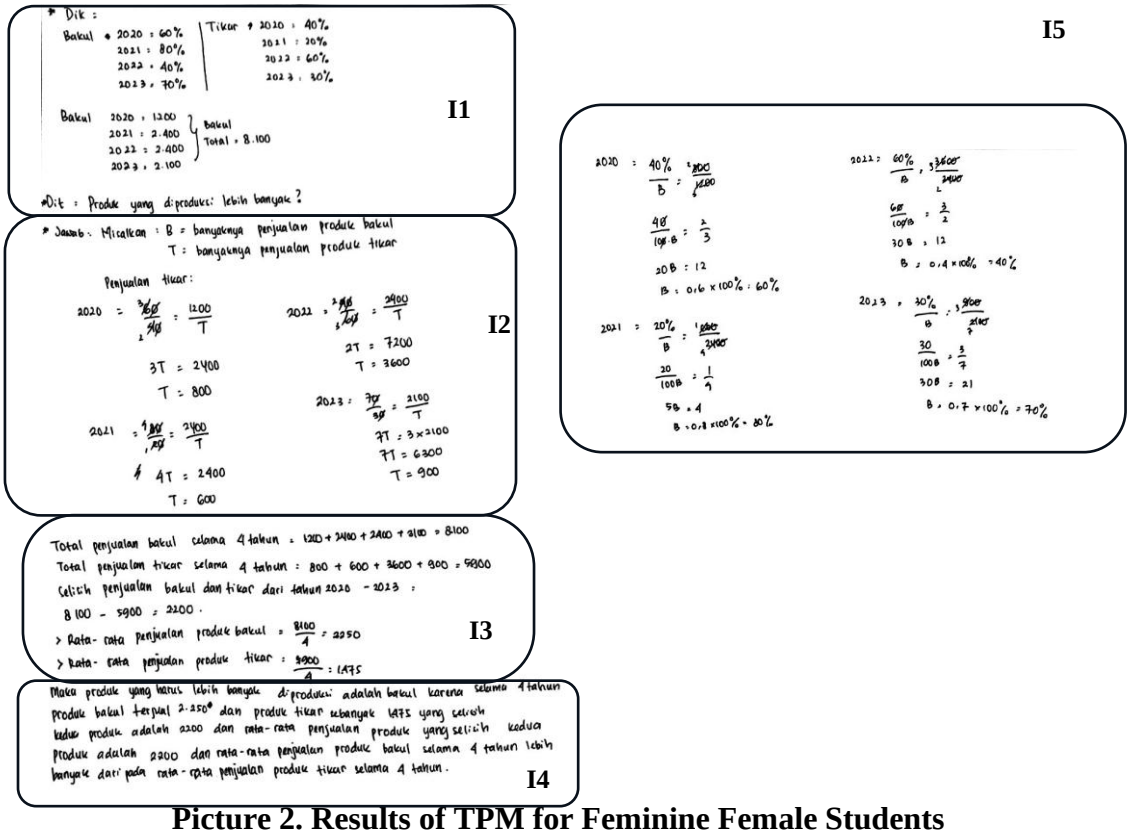


Picture 1. Results of TPM for Masculine Male Students

Based on Picture 1, in the indicator of identifying statements and questions/requests on the given problem, students can write down information that is known and asked in the problem. This statement is supported by research results, which state that students identify important information from questions relevant to the problem by writing down things that are known and asked in the question (Shafa et al., 2023; Widya et al., 2023). The initial statement is also in accordance with the statements of Anderson & Krathwohl (2001) and Mawaddah et al. (2018), where most students can meet the first indicator. Then, when applying the steps to solve the problem, students can find the total sales first and then find the unknown product, namely the mat product. This statement is supported by research results where students who choose the proper steps can be able to answer known problems (Aini et al., 2024; In'am, 2014). In the indicator of concluding logically from the submitted data, students are able to write down the final results after obtaining unknown product results by finding the difference between the total sales of basket products and the total sales of mat products, as well as finding the average of the two product sales from 2020 - 2023. In the indicator of clarifying the conclusions drawn and writing down the final results, students can

write and interpret the conclusions obtained, namely that the product that is better produced is the basket product because the basket product sold 8100 while the mats only sold 5900, the difference being that the basket product sold 2200 more than the mat product, and the average sales of basket products for 4 years are more than the average sales of mat products for 4 years. This is in accordance with research from (Shafa et al., 2023; Afnia & Setyawan, 2021; Mawaddah et al., 2018) that students who can provide further explanations related to solving the problem can conclude according to the context of everyday life problems. In the indicator of validating the answers obtained, students can recheck the answers obtained with the available data and the results of interviews where students are sure of the answers they have obtained. It is by research by (Habibi et al., 2020), students are sure of the answers that have been given according to the questions that can be known from the results of the statements during the interview. Thus, this is in line with the research conducted by Hante et al. (2020), Adawiyah et al. (2021), Suárez-Brito et al (2025) that there is no difference in critical thinking skills based on Gender in students. It is in line with research by Kaliky & Juhaevah (2018), which states that the results of the analysis of critical thinking skills reviewed from Gender in solving trigonometric identity problems obtained that both male and female students met the five indicators of critical thinking.

2. Data on Critical Thinking Skills of Feminine Female Students in Providing TPM



Picture 2. Results of TPM for Feminine Female Students

Based on Picture 2, in the indicator of identifying statements and questions/requests on the given problem, students can write down information that is known and asked in the question. This statement is supported by research results, which state that students identify important information from questions relevant to the problem by writing down things that are known and asked in the question (Shafa et al., 2023; Widya et al., 2023). The initial statement is also in accordance with the statement of Anderson & Krathwohl (2001) and Mawaddah et al. (2018), where most students can meet the first indicator. Then, students can find unknown products in the indicator of applying the steps used to solve the problem. Students first make an example of B for the number of basket products sold and T for the number of mat products sold. After being given an example, students look for mat sales with a value comparison. It is in accordance with the research of Rachmawati et al. (2022) that although both use different steps, both (masculine men and feminine women) can solve problems logically and coherently. Aini et al. (2024) and In'am (2014) stated that students who choose the proper steps can be able to answer known problems correctly. In the indicator of concluding logically from the submitted data, students can write down the final results obtained after searching for sales of unknown products, namely sales of mat products from 2020 - 2023. Students search for the difference in total sales of basket products and mat products and search for the average of the two total product sales from 2020 - 2023.

In the indicator of clarifying the conclusions drawn and writing the final results, students can write and interpret the conclusions obtained, namely that the product that must be produced more is baskets because, for 4 years, basket products have sold more than mat products, namely 2200 and the average sales of basket products are more than the average sales of mats for 4 years. This is in accordance with research from (Shafa et al., 2023; Afnia & Setyawan, 2021; Mawaddah et al., 2018) that students who can provide further explanations related to solving the problem can draw final conclusions according to the context of everyday life problems. In the indicator of validating the answers obtained, students can recheck the answers that have been obtained by comparing the sales of basket products and mat products with the ratio of basket and mat products each year with a comparison of value and interview results where students are sure of the answers they have obtained. This is in accordance with research by (Habibi et al., 2020) that students are sure of the answers that have been given according to the questions that can be known from the results of the statements during the interview. Thus, this is in line with the study conducted by Hante et al. (2020), Adawiyah et al. (2021), Suárez-Brito et al (2025) that there is no difference in critical thinking skills based on Gender in students. In line with research by Kaliky and Juhaevah (2018), the analysis of critical thinking skills reviewed from Gender in solving trigonometric identity problems showed that both male and female students met the five indicators of critical thinking.

CONCLUSION

The critical thinking ability of masculine male students on numeracy problems can meet the five indicators of critical thinking, namely identifying statements and questions/requests on the given problem, applying the steps

used to solve the problem, concluding logically from the data submitted, clarifying the conclusions drawn and writing the final results, validating the answers obtained. The critical thinking ability of feminine female students on numeracy problems can meet the five indicators of critical thinking, namely identifying statements and questions/requests on the given problem, applying the steps used to solve the problem, concluding logically from the data submitted, clarifying the conclusions drawn and writing the final results, validating the answers obtained. Researchers who will conduct similar research can expand the topic of problems that focus on ethnomathematics in the environment to be studied. Additionally, it is recommended to include a broader range of subjects rather than limiting the study to only one masculine male and one feminine female participant.

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