



## THE EFFECT OF GENDER CHARACTERISTICS AND MATHEMATICS HABITS OF MIND ON STUDENTS' MATHEMATICS LEARNING OUTCOMES IN KENDARI

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### Abstrak

Penelitian ini bertujuan untuk mendeskripsikan karakteristik gender, Mathematics Habits of Mind, dan mengetahui pengaruh karakteristik gender dan Mathematics Habits of Mind terhadap hasil belajar matematika. Metode penelitian ini menggunakan pendekatan kuantitatif dengan jenis penelitian ex-post facto. Angket karakteristik gender diadaptasi dari Bem Sex Role Inventory oleh Sandra L. Bem (1977) dan angket Mathematics Habits of Mind dimodifikasi dari Costa dan Kallick (2008). Sedangkan hasil belajar matematika diambil dari dokumentasi hasil ulangan harian siswa oleh guru. Berdasarkan hasil analisis data penelitian diperoleh bahwa: 1) Terdapat 10 siswa dengan Gender Feminim, terdapat 34 siswa dengan Gender Maskulin, terdapat 26 siswa dengan Gender Androgini, dan terdapat 35 siswa dengan Gender Tidak Terbedakan; 2) Mathematics Habits of Mind siswa yang berada pada kategori Tinggi sebesar 1,9% siswa; 55,2% berada pada kategori Sedang; dan 42,9% berada pada kategori Rendah; 3) Terdapat Pengaruh karakteristik gender dan Mathematics Habits of Mind terhadap hasil belajar matematika siswa.

**Kata kunci:** hasil belajar matematika; karakteristik gender; mathematics habits of Mind,

### Abstract

This study aims to describe gender characteristics, describe Mathematics Habits of Mind, and determine the effect of gender characteristics and Mathematics Habits of Mind on mathematics learning outcomes. This study method uses a quantitative approach with the type of ex-post facto research. The gender characteristics questionnaire was adapted from the Bem Sex Role Inventory by Sandra L. Bem (1977), and the Mathematics Habits of Mind questionnaire was modified by Costa and Kallick (2008). While the results of learning mathematics are taken from the teacher's documentation of the results of students' daily tests. Based on the results of the research data analysis, it was found that 1) There were ten students with Feminine Gender, there were 34 students with Masculine Gender, there were 26 students with Androgyny Gender, and there 35 students with Undifferentiated Gender; 2) Mathematics Habits of Mind of students who are in the High category by 1.9% of students; 55.2% are in the Medium category, and 42.9% are in a Low category; 3) There is an effect of gender characteristics and Mathematics Habits of Mind on students' mathematics learning outcomes.

**Keywords:** gender characteristics, mathematics habits of mind, mathematics learning outcomes



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## INTRODUCTION

Mathematics learning is a two-way interaction between students and teachers. The activity is a teaching and learning process in which students are the recipients of lessons and teachers are the teaching staff. Learning mathematics is a teaching and learning process built by teachers to develop students' creative thinking. This process can also improve students' ability to think and construct new knowledge to improve students mastery of mathematics material or lessons (Susanto, 2013). However, mathematics is a difficult branch of science, and students do not like it (Siregar, 2017; Kholil & Zulfiani, 2020; Wasiah, 2021). This results in low student interest in mathematics and low learning outcomes (Nugroho et al., 2020; Dewi et al., 2021).

Student learning outcomes in Indonesia are reflected in the tests conducted by PISA (*Programme for International Student Assessment*). The results of the last test carried out in 2018 and published in 2019 showed that Indonesian students' average math ability score was 379. The math ability score was below the international average of 489. Several studies have confirmed that learning outcomes in some areas in Indonesia are still low (Sidi & Yunianta, 2018; Hidayah et al., 2021; Kue et al., 2022). Low learning outcomes are influenced by several factors, both internal and external.

One factor that affects students' mathematical abilities is the habits of mind (Rahayu, 2015; Dwirahayu et al., 2018; Halistin et al., 2020). If students have habits of mind that are well developed, the learning outcomes will be good too. Previous researchers' opinion supports that a person's intelligence is the result of his thinking habits. Thinking will develop gradually according to its habits (including the habit of mathematical thinking). A person with a well-developed mind is more likely to be a superior learner than other learners (Handayani, 2015). Mathematics habits of mind are mathematical dispositions that are essential and



need to be possessed by students and developed by students (Hendriana et al., 2017). In mathematics, Cuoco (1997) explains the meaning of mathematics habits of mind, namely as thinking habits carried out by mathematicians in dealing with a mathematical problem (Hendriana et al., 2017).

Habits of mind are one of the factors that support student behaviour and skills in everyday life. Habits of mind are strengths that need to be formed to train students' abilities in determining the solution to a problem. Habits of mind help a person respond to questions and problems whose answers are not known directly with ease. In measuring a person's Habits of mind, indicators are needed to measure it. Costa and Kallick (2008) identified sixteen characteristic indicators of thinking habits, namely as follows: 1) Persist or never give up; 2) Regulate conscience; 3) Listen to other people's opinions with empathy; 4) Think flexible; 5) Think metacognitively; 6) Try to work carefully and precisely; 7) Ask and pose problems effectively; 8) Take advantage of old experience; 9) Think and communicate clearly and precisely; 10) Utilize the senses; 11) Create, imagine, and innovate; 12) Enthusiastic in responding; 13) Dare to take responsibility and face risks; 14) Humorous; 15) Thinking interdependently; and 16) Continuous learning (Miliyawati, 2014).

In addition to habits of mind, several studies have also found that gender affects students' mathematics learning outcomes (Hidayat & Dwiningrum, 2016; Utomo et al., 2021). In male and female students, there are physiological and psychological differences between boys and girls, which result in differences in learning. In the learning process in the classroom, women and men have the same rights and opportunities to be actively involved. In learning situations, women and men have equal opportunities to access learning books. However, students' responses to teaching materials and teacher attitudes influence students' judgments about themselves and society. This depends on how gender characteristics a person has (Jensen, 2011).

The differences between women and men, of course, also cause differences in mindset and ways of dealing with various problems in learning. So that men and women certainly have many differences in learning mathematics.



Jensen (2011) suggests that previous researchers believe that the gender factor affects a person's mathematical ability because there are biological differences in the brains of men and women, so there are differences in the way of thinking between men and women which are influenced by the state of the physical and biological structures of the brain that are different. Different. This gives rise to differences in behaviour, cognitive development and processing.

Gender is shaped by local society and culture, so gender does not apply forever depending on the time (trend) and place. Identifying a person's gender development can refer to gender schema theory. According to Berk (2013), gender schema theory is an information processing approach that explains how environmental pressure and children's cognition work together to shape gender typing. Gender schema theory is an information processing approach that explains how environmental pressures and children's cognition work together to form gender typing. This approach also integrates various elements of gender typing, gender identity, gender stereotypes and adoption of gender roles. These elements become a unified picture of how masculine and feminine orientations emerge and are often strongly defended. By understanding the theory of gender schema, it can be seen that a child tends to be masculine or feminine. Children's perceptions and expectations about their gender characteristics are formed.

The development of children's gender identity is shaped during the school years. Cognitive, biological and learning factors influence children's gender development. Cognitive and learning factors are very dependent on the way of learning and the culture adopted by students (Trisnawati, 2020). Gender is not just limited to gender. Gender comes from socio-cultural construction. According to Hidayat & Dwiningrum (2016), the terms male and masculine are two identical but different things. A Male is a gender, while the masculine is a gender characteristic. It's just that the masculine gender is mostly found in boys.

Similarly, the female gender and feminine gender are both identical but different. Gender shows the biological differences between men and women born from birth, while gender is a psychosocial aspect of men and women. In this case, the gender in question is gender identity. According to Berk (2013), gender identity is the



private face of gender, the perception of the self as relatively masculine or feminine in characteristics. Gender identity is a person's self-perception as a person who has relatively masculine or feminine characteristics. So, each person has a perception of himself that can be measured with an instrument to determine whether it is masculine or feminine.

Several studies have reviewed the differences in the learning outcomes of male and female students (Hafidz et al., 2019; Avianty et al., 2018; Hafidz, 2019). This study looks at gender characteristics from different aspects, namely gender, which is formed from one's cultural construction. According to Sandra L. Bem (1977) in *The Bem Sex Role Inventory (BSRI)*, gender consists of four characteristics, namely: masculine, feminine, androgyny and undifferentiated (Sodaqta & Priambodo, 2018).

## METHOD

This research was conducted in one of the public junior high schools in Kendari. The population of this study was the students of SMP Negeri in Kendari, with a total of 105 people. This research method uses a quantitative approach with the type of ex-post facto research. The data collection techniques in this study are divided into 2, namely primary and secondary data. Primary data was collected using a questionnaire, while secondary data was in the form of a data document on the value of students' mathematics learning outcomes. This study's gender characteristic questionnaire contains the BEM scale and a questionnaire on students' mathematical thinking habits. Data analysis was carried out descriptively and inferentially.

### Gender Characteristics Instrument

The data collection tool to measure gender characteristics was adapted from the Bem Sex Role Inventory (BSRI) by Sandra L. Bem (1977) as follows.

**Table 1. Gender Characteristics Scale Questionnaire Grid**

<i>Item Num</i>	<i>Masculine</i>	<i>Item Num</i>	<i>Feminine</i>	<i>Item Num</i>	<i>Neutral</i>
1.	Self-confident	2.	Back down	3.	Helpful
4.	Maintain your confidence	5.	Happy	6.	like moody



7. Independent	8. Shy	9. Be careful
10. Athletic	11. Full of love	12. Acting made-up
13. Assertive	14. Nice to be flattered	15. Happy
16. Strong personality	17. Loyal	18. Hard to predict
19. Strong	20. Feminine	21. Can be trusted
22. Analytical	23. Sympathetic	24. Envy/jealousy
25. Have leadership ability	26. Be sensitive to other people's decisions	27. Honest
28. Want to take the risk	29. Full of understanding	30. like secret
31. Easy to make decisions	32. Easy to feel sorry	33. Sincere
34. Can be self-sufficient	35. Want to comfort hurt feelings	36. Arrogant
37. Dominant	38. Soft talk	39. Pleasant
40. Masculine	41. Warm	42. Serious
43. Want to hold on to an attitude	44. Soft hearted	45. Friendly
46. Aggressive	47. Gullible	48. Not efficient
49. Act as a leader	50. Plain	51. Can adapt
52. Individualist	53. Don't use harsh language	54. Not systematic
55. Like to compete	56. Love children	57. Wise
58. Ambitious	59. Gentle	60. Conventional

The calculation of gender categorization will be carried out as follows:

**Table 2. Gender Categorization**

		Average Masculine score	
		< Median	≥ Median
Average Feminine score	< Median	Undifferentiated (low-low)	Masculine (low fem-high mas)
	≥ Median	Feminine (high fem-low mas)	androgyny (high-high)



The formula used to find the median is as follows:

$$M_d = L + \left[ \frac{\frac{N}{2} - n_b}{n_w} \right] i,$$

When:

$M_d$  : Median

$L$  : The lower real score of the score interval containing the median

$N$  : The sum of the numbers in the total distribution

$n_b$  : The sum of the numbers under the median score interval

$n_w$  : Sum of numbers in the median interval

$i$  : Interval size

### Mathematics Habits of Mind Instruments

The Mathematics Habits of Mind indicator is modified from the Habits of Mind according to Costa and Kallick (2008), consisting of 16 indicators, namely:

**Table 3. Mathematics Habits of Mind Questionnaire**

No.	Activities, Feelings or Opinions	Positive	Negative
1	Persevere or Never Give Up, Don't Give Up Easily	2, 4	1, 3
2	Can Manage Conscience, Think Reflectively, Solve Problems with Care	5, 6, 8	7
3	Empathize With or Can Understand Others	10, 11	9
4	Think Flexible	13	12
5	Metacognitive Thinking	14, 15	-
6	Work Thoroughly and Precisely	17, 18	16, 19
7	Ask and Respond Effectively	20	21
8	Leveraging Old Experience	22, 23	-
9	Think And Communicate Clearly and Precisely	26	24, 25
10	Utilizing the Senses	28	27
11	Creating, Imagining and Innovating	31	29, 30
12	Eager to Respond	32, 33	34
13	Dare to take responsibility and face risks	36, 37	35, 38
14	Humorous	39, 40	-



15	Thinking Interdependence	41, 42, 43	-
16	Continuous Learning	44, 45	-
Sub Total		26	29
Total		45	

## RESULT AND DISCUSSION

### Description of Gender Characteristics

The results of the analysis of gender characteristics data by sex are shown in Table 4 below.

**Table 4. Description of Gender Characteristics by Sex**

Gender	Sex		Total
	Male	Female	
Feminine	4	6	10
Masculine	13	21	34
Androgyny	19	7	26
Undifferentiated	18	17	35

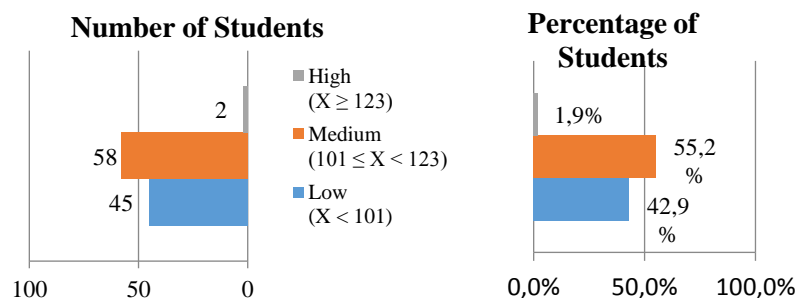
In the calculation for categorizing gender characteristics by sex, it is known that 40% of students with feminine characteristics are male. And 61.76% of students who have masculine gender characteristics are female. This finding shows that men do not characterize masculinity, and women do not characterize femininity. This is caused by several factors, including prenatal hormones, childhood social life, and cultural interactionism (Davis & Risman, 2015). In addition, only 9.53% of students with feminine gender, 32.38% of students with masculine gender, 24.76% with androgyny gender, and 33.33% with undifferentiated gender. This further emphasizes that a person's gender characteristics are dynamic and vary in different social contexts.

### Description of Students' Mathematics Habits of Mind

The results of the Mathematics Habits of Mind data analysis in Figure 1 below.







**Figure 1. Description of Students' Mathematics Habits of Mind by Category**

Based on Figure 1, it can be seen that the Mathematics Habits of Mind students are dominant in the medium category with a percentage of 55.2%. 42.9% of students with Mathematics Habits of Mind are in the Low category. And only 1.9% of students are in the High Mathematics Habits of Mind category.

### Mathematics Learning Outcomes of Junior High School Students in Kendari

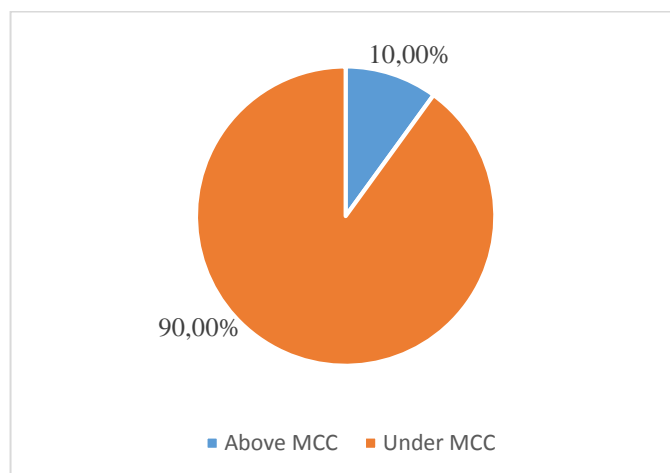
The results of the data analysis of Mathematics Learning Outcomes are presented in Table 5 below.

**Table 5. Description of Student Mathematics Learning Outcomes**

<i>Statistics</i>	<i>Value</i>
Mean ( $\bar{x}$ )	40,80
Standard deviation	16,98
Variance ( $\sigma^2$ )	288,56
Maximum ( $X_{\max}$ )	90,00
Minimum ( $X_{\min}$ )	13,33

The average student learning achievement in mathematics is 40.80. At the same time, the Minimum Completeness Criteria (MCC) set by the research location schools is 70. These results indicate that the average student learning outcomes are still below the MCC.





**Figure 2. Student Mathematics Learning Outcomes Based on MCC**

Based on the analysis results, 90% of students scored under the MCC. The value of learning outcomes is obtained from student tests on the Numbers material. This student achievement shows the ability of students to solve mathematical problems related to very low numbers. Many factors are behind the low learning outcomes, internally, the students and the surrounding environment (teachers and families). The value of this test result was obtained during a limited face-to-face period due to the Covid-19 pandemic. This result is an illustration of student learning outcomes during the Covid-19 pandemic. The changing learning situation during the Covid-19 pandemic resulted in low student learning outcomes. Kartika et al. (2021) stated that when learning online, students cannot meet directly with teachers and friends, which will cause boredom in the long term. If students are in a state of saturation, it will be difficult to learn, so what is conveyed by the teacher will not be well absorbed by students.

The teacher also said that during the pandemic, the teacher had difficulty evaluating and ensuring that students understood the material taught by the teacher. Zahrawati & Ramadani (2021) suggested that the teacher could not assess the entire student learning process in the assessment. Teachers can only give grades to students through the work they have collected. Especially during a pandemic, teachers cannot ensure that a task is done alone or assisted by others. So, complex learning problems arise during the Covid-19 pandemic (Asmuni, 2020).



**Table 6. Student Learning Outcomes Data Based on Gender Characteristics**

<i>Statistics</i>	<i>Gender Characteristics</i>			
	<i>Masculine</i>	<i>Feminine</i>	<i>Androgyny</i>	<i>Undifferentiated</i>
Mean ( $\bar{x}$ )	43,55	35,67	35,13	43,81
Standard deviation	18,87	9,94	14,73	17,13
Variance ( $\sigma^2$ )	356,06	98,87	217,08	293,57
Maximum ( $X_{\max}$ )	83,33	53,33	90,00	80,00
Minimum ( $X_{\min}$ )	13,33	23,33	16,67	16,67

Based on Table 6, it can be seen that the mathematics learning outcomes of students with undifferentiated gender are higher than those of other genders. This is because neutral students are cautious, serious, and easily adaptable, so they are more precise in solving math problems that require caution and seriousness. This study found that the average learning outcomes of masculine students were higher than the average learning outcomes of feminine students. This is because masculine students are better at reasoning than feminine students (Nafi'an, 2011). This finding is different from the finding Hidayat & Dwiningrum (2016) that the value of mathematics learning achievement of feminine students is higher than masculine students.

### Research Hypothesis Test

The normality test is one of the multiple regression assumptions to test whether the residuals meet the normal distribution. The test results are presented in Table 7.

**Table 7. Data Normality Test**

	<i>Kolmogorov-Smirnov</i>	
	<i>Statistic</i>	<i>Significance</i>
Y	0,127	0,000
Unstandardized Residual	0,102	0,009

Based on the normality test with the Kolmogorov-Smirnov test in table 7 for the  $X_1$  variable, namely gender characteristics,  $X_2$ , namely mathematical thinking habits, and Y, namely students' mathematics learning outcomes, a significance value of  $0,009 < 0,05$ ; it can be concluded that the residual regression model is not normally distributed.



Because the residuals are not normally distributed. The next hypothesis testing uses Generalized Linear Models (GLM). The test results using Generalized Linear Models are presented in Table 8 below.

**Table 8. Simultaneous Hypothesis Testing Results**

<i>Likelihood Ratio Test</i>	<i>Df</i>	<i>Sig.</i>
9,448	4	0,05

Based on the results of simultaneous hypothesis testing, it can be seen that at  $\alpha = 0,1$ ; significance value ( $Sig$ ) =  $0,05 < 0,1$ . So it can be concluded that at least one independent variable affects mathematics learning outcomes.

**Table 9. Partial Hypothesis Testing Results**

<i>Test of model Effect</i>			
<i>Source</i>	<i>Type III</i>		
	<i>Wald Chi-Square</i>	<i>Df</i>	<i>Sig.</i>
(Intercept)	0,475	1	0,489
Gender Characteristic	7,096	3	0,069
<i>Mathematics Habits of Mind</i>	3,581	1	0,058

Based on the hypothesis testing hypothesis presented in Table 9, it can be seen that at  $\alpha = 0.1$  the gender characteristic variable influences mathematics learning outcomes with a significance value of  $0,069 < 0,1$ . And the Mathematics Habits of Mind variable also influences mathematics learning outcomes with a significance value of  $0,058 < 0,1$ . To see the influence of the variables of gender characteristics and Mathematics Habits of Mind on students' mathematics learning outcomes, it is presented in the following table.

**Table 10. Parameter Estimation Results**

<i>Source</i>	$\beta$	<i>Hypothesis Test</i>		
		<i>Wald Chi-Square</i>	<i>df</i>	<i>Sig.</i>
(Intercept)	14,972	0,935	1	0,333
Masculine ( $X_{1.1}$ )	-7,918	1,880	1	0,170
Feminine ( $X_{1.2}$ )	-0,185	0,002	1	0,962
Androgyny ( $X_{1.3}$ )	-9,290	4,938	1	0,026
<i>Mathematics Habits of Mind</i> ( $X_2$ )	0,281	3,581	1	0,058

Based on the parameter estimation results, it is known that at  $\alpha = 10\%$ , only the Androgyny Gender variable ( $X_{1.3}$ ) significantly affects students'



mathematics learning outcomes (Y) compared to undifferentiated gender. Or in other words, there is a difference between androgyny and undifferentiated gender in influencing students' mathematics learning outcomes. Where undifferentiated gender 9,290 units are better than androgyny gender, it is also known that the Mathematics Habits of Mind ( $X_2$ ) variable affects students' mathematics learning outcomes (Y) at  $\alpha = 10\%$ . From the research results, it is also known that the value of the Mathematics Habits of Mind parameter is 0,281. This explains that for every additional unit of students' Mathematics Habits of Mind, students' mathematics learning outcomes will increase by 0,281. The results of this study support the results of research (Rahayu, 2015; Dwirahayu et al., 2018; Halistin et al., 2020). In Mathematics Habits of Mind, 16 indicators support students' mathematical abilities. According to Covey (Rahayu, 2015), habits are the meeting point of knowledge, skills, and desires. So, if students have good Mathematics Habits of Mind, they will get good learning outcomes as well.

## CONCLUSION

Based on the results of the research data analysis that has been described, the following conclusions can be drawn: 1) There are ten students with Feminine Gender, 34 students with Masculine Gender, 26 students with Androgyny Gender, and 35 students with Undifferentiated Gender; 2) Mathematics Habits of Mind of students who are in the High category by 1.9% of students; 55.2% are in the Medium category; and 42.9% are in a Low category; 3) There is an effect of gender characteristics and Mathematics Habits of Mind on students' mathematics learning outcomes.

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