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Analysis of Science Learning Outcomes on Matter and Its Changes in Seventh-Grade MTs Students Reviewed from Gender Differences

Fatimah Az-Zahro[1], Dian Nugraheni[2*], Aisyah Az-Zahro[3], Isnanik Juni Fitriyah[4], Yayuk Mulyati[5], Erti Hamimi[6]

[1,2,3,4,5]Science Education Study Program, Universitas Negeri Malang, Indonesia
[6]National Institute of Education, Universitas Teknologi Nanyang, Singapore

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Corresponding Author:
Author Name*: Dian Nugraheni
Email*:nugraheni.fmipa@um.ac.id

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ABSTRACT

This study investigates science learning outcomes on the topic *Matter and Its Changes* among seventh-grade students at MTs, with a focus on gender differences. Using a descriptive survey method, the entire population of 77 students (two male classes and two female classes) was involved. Data were collected through post-tests, questionnaires, observations, and interviews, and analyzed quantitatively using the Mann-Whitney U test. The results show that female students had significantly higher average learning outcomes (64.04) compared to male students (45.50). Further analysis revealed that female students performed better at cognitive levels C3, C4, and C5, as well as across all subtopics. Qualitative findings from teacher interviews suggest that this difference is consistent and may be attributed to female students' ambition and logical reasoning, as observed in class. However, questionnaire data indicate that male students report higher self-confidence. The study concludes that gender differences significantly influence science learning outcomes, with implications for instructional strategies and gender-responsive teaching practice.

Keywords: learning outcomes, gender, matter and its changes

INTRODUCTION

Natural science education in junior high school, commonly referred to as IPA, integrates the disciplines of chemistry, biology, and physics to provide students with a foundational understanding necessary for addressing real-world problems[1]. The educational process encompasses various phenomena encountered in daily life, with science knowledge serving as a critical component of this learning experience. Specifically, the topic of Matter and Its Changes is integral to seventh-grade science curricula, as it equips students with the ability to analyze and understand everyday occurrences[2].

The lessons on Matter and Its Changes are particularly relevant to students' lives, as they can be connected to numerous natural phenomena, such as the melting of ice cubes, the formation of dew in the morning, and the transformation of rice into porridge during cooking [3]. According to [4], this topic encompasses the forms of matter, physical and chemical changes, and their environmental impacts. However, the abstract nature of these concepts often poses challenges for students, making comprehension difficult. Consequently, it is essential to assess students' success in learning about Matter and Its Changes through their learning outcomes.

Learning outcomes serve as a critical indicator of student success, typically reflected in test scores and academic performance[5]. They represent the skills and competencies that students acquire throughout the educational process[6]. In academic discourse, it is often posited that educational achievement should not solely be assessed through grades or graduation rates; rather, cognitive success is more accurately gauged by evaluating student learning outcomes[7]. During the learning process, students are expected to achieve proficient learning outcomes, which are influenced by various interrelated factors, including gender [8].

In educational institutions, it is common to implement gender-segregated teaching practices, which can lead to distinct behavioral patterns among male and female students. Such segregation may impact their understanding and overall learning outcomes[9]. Gender-based classroom classification is prevalent in both formal and informal educational institutions, including tutoring services and Islamic schools[10]. Some educators argue that male and female students possess different learning principles, necessitating separate learning environments. For instance, female students often thrive in cooperative or familial settings, while male students may excel in competitive situation [11]. This perspective is supported by Setiawati & Arsana [12], who note a tendency for skill differences in learning outcomes between genders, particularly in science.

Gender refers to the social and cultural constructs that shape individuals' identities as male or female[13], [14], [15]. The differential treatment of male

and female students, both in educational settings and at home, significantly influences their personalities and academic progress[16]. This disparity in learning outcomes between genders is driven by a multitude of factors, including biological, cognitive, and social dimensions.Research by Kurnia et al.[17] suggests that differences in academic abilities between male and female students may be rooted in the anatomical structures of their brains. In general, the average volume of the female brain is approximately 1,130 cm^3, while that of the male brain is around 1,260 cm^3. The developmental trajectory of the male brain typically begins with the right hemisphere, followed by the left, whereas the female brain develops more symmetrically across both hemispheres. By the age of 6-12, male brain development begins to balance between the left and right hemispheres, achieving an ideal state by adulthood[18].

Furthermore, structural differences exist in key brain regions, such as the hypothalamus, corpus callosum, hippocampus, and lower parietal lobe, which may contribute to divergent cognitive abilities[19].Neuroscience research [20]indicates that the corpus callosum, along with the Broca and Wernicke areas, tends to be thicker and larger in females, potentially enhancing their empathetic and communicative skills. Conversely, males often excel in spatial and creative tasks, while females demonstrate strengths in language comprehension and memory[21]. Studies by Malenda et al.[22] highlight that male students typically outperform female students in numerical skills; however, contrasting findings from the researches [23]suggest that female students may possess superior numerical abilities. Additionally, female students have been found to excel in reasoning tasks compared to their male peers. Zaidi [24] argues that there is no significant difference in overall intelligence between genders, as they may employ different cognitive styles and brain regions for tasks such as memory, emotional processing, facial recognition, problem-solving, and decision-making.As junior high school students transition into the age range of 12 to 15 years, the development of the left and right hemispheres in males begins to balance, albeit at a slower pace. This developmental context is supported by various studies indicating that female students often outperform male students academically.

Zaidi's research indicates that during school age, female students often emerge as high achievers; however, as they transition into adulthood, males tend to assert their leadership roles in communication and idea expression. This observation is supported by findings that female students consistently outperform their male counterparts in various learning outcomes, including both Higher Order Thinking Skills (HOTS) and Lower Order Thinking Skills (LOTS), with the exception of creative tasks [25]. These differences in academic performance can be attributed to variations in brain development, which influence how males and females communicate, comprehend information, and engage in critical thinking.Previous studies have generally shown that female students excel in academic achievement compared to male students [26], [27], [28]. However, contrasting findings by Suherman et al. [29] suggest that male students may achieve better learning outcomes in certain contexts.

Based on previous research that has different findings, it is important to conduct further research on different students, subjects, and research sites. This study aims to observe the ability of learning outcomes, analyze the ability of learning outcomes, and test the significance of differences in the science learning outcomes of substance material and its changes in seventh-grade MTs students, taking into account gender differences.

RESEARCH METHODS

1. Research Design

This research used quantitative methods by collecting data and examining data to prove the hypotheses that have been made related to learning outcomes through posttest instruments to be further linked to the results of other instruments, namely questionnaires, observations, and interviews. The data were distributed to respondents and collected over a one-week period. Upon collection, the data were systematically organized into tabular format for subsequent analysis. The sampling technique in this study was saturated sampling. All classes had learned about substances and their changes in the odd semester from their science teacher. The initial ability between male students and female students is known to be the same which is obtained from the results of the school enrollment test scores.

2. Population and Sample

The research was conducted at one of the MTs in Lamongan Regency, which included all seventh-grade students at the MTs. The sample of this study amounted to 77 students, which were divided into two male classes 19students in class 7A and 18 students in class 7B, and two female classes respectively 20 students in grades 7C and 7D.

3. Data Collection Instruments

Learning outcome data were collected using a posttest instrument comprising 12 two-tiered multiple-choice questions aligned with Bloom's taxonomy cognitive levels C3 to C5. Each question assessed one of three indicators: application (C3), analysis (C4), or evaluation (C5), with a maximum score of 5 points per question. Additionally, students completed a closed-ended Likert-scale questionnaire with four response options: strongly agree, agree, disagree, and strongly disagree. To triangulate the data, classroom observations were conducted using an observation sheet adapted from Anwar [24], focusing on gender-related learning behaviors. Semi-structured interviews with science teachers were also carried out to gather contextual insights into learning outcomes, gender dynamics, and pedagogical challenges related to the topic of matter and its changes.

4. Validity and Reliability

After the instruments were created and validated by the experts, the researcher did the try-

out and continued with the validity and reliability test. The validity test was carried out by using Microsoft Excel. On each item, that has the results of t count > t table is considered valid, obtained 12 posttest items and 10 questionnaire items that are valid. Furthermore, reliability was tested with Cronbach's Alpha by utilizing the SPSS Statistic 16 program. The results of Cronbach's Alpha > 0.6 meant that the posttest and questionnaire items were reliable [30].

5. Data Analysis Techniques

To ascertain any differences in the science learning outcomes of matter and its changes in terms of statistically significant gender differences, the data were analyzed quantitatively and inferentially. Before further processing, the normality was tested using Shapiro Wilk, which determines whether the data is normally distributed or not, with α = 0,05. Additionally, the Levene test was done to determine whether the data is homogeneously distributed or not.

As a result, the data was found to be normally distributed but not homogeneous, so the data did not meet the requirements and then tested non-parametric using the independent sample Mann-Whittney test. The test is an alternative to the non-parametric test used to analyze the difference between two unpaired samples[31]. If the value of sig. (2-tailed) $<\alpha = 0{,}05$, so H_0 is rejected and H_a is accepted. Further, the hypothesis of this study is:

H_a : There is no significant difference in science learning outcomes between male and female seventh-grade students at the MTs level

H_0 : There is significant difference in science learning outcomes between male and female seventh-grade students at the MTs level

RESULTAND DISCUSSION

Data collection in male and female classes was obtained through questionnaires, posttests, observations, and interviews with science teachers. The focus of this research is to observe the ability of learning outcomes, analyze the ability of learning outcomes, and test the significance of differences in the science learning outcomes of learning matter and its changes in seventh-grade MTs students, taking into account gender differences. The research was conducted with valid and reliable instruments to get valid, reliable, and objective data. Posttest results were grouped according to cognitive levels consisting of three indicators, including application (C3), analysis (C4), and evaluation (C5). The findings obtained are as follows.

Table 1. Average Science Learning Outcomes of Learning Matter and Its Changes Based on Cognitive Level

Indicator	Learning Outcomes (%)	
	Male	Female
Applying (C3)	56	76
Analyzing (C4)	42	57
Evaluating (C5)	38	57

Science learning outcomes grouped by cognitive level are as follows:

1. Applying Indicator (C3)

   The ability of students to investigate an event and implement the formula in the questions given in this indicator. The application indicator has 4 questions. Male students demonstrated moderate proficiency in applying concepts (56%), while female students achieved significantly higher scores (76%). The data shows that female students excel in translating theoretical knowledge into practical solutions, possibly due to stronger verbal reasoning and systematic processing skills. It is relatable with how female students are empowered to navigate lab environment effectively and likely to excel in hands-on tasks, as observed in the study [32]

2. Analyzing Indicator (C4)

   Students' ability to select and diagnose in the questions given in this indicator. The analysis indicator has 4 questions. The results obtained from male students have the ability to analyze reaching a percentage level of 42% and the ability to analyze female students reaching a percentage level of 57%. This aligns with prior research indicating that females tend to adopt more structured approaches to problem decomposition [33].

3. Evaluating Indicator (C5)

   Students' ability to evaluate in the questions given in this indicator. The evaluation indicator has 4 questions. The results obtained by male students have the ability to analyze reaching a percentage level of 38% and the evaluation ability of female students reaching a percentage level of 57%. This may reflect gender differences in metacognitive awareness or attention to detail during complex assessments[34].

This study assessed science learning outcomes on matter and its changes across three cognitive levels: applying (C3), analyzing (C4), and evaluating (C5). The results revealed a consistent trend: female students significantly outperformed their male counterparts in all three cognitive domains. Specifically, female students achieved higher average scores in application (76%, moderate category), analysis (60%, low category), and evaluation (57%, low category), while male students scored lower across these indicators (56%, 42%, and 38%, respectively, placing them in the low to very low categories). These findings align with prior research suggesting that female students often excel in tasks requiring language proficiency, comprehension, and retention[35].

A deeper analysis of these differences may reflect underlying cognitive and social factors. For instance, the superior performance of female students in higher-order thinking skills (HOTS) such as analysis and evaluation could stem from stronger verbal reasoning abilities and metacognitive awareness, which are often linked to gender-based learning strategies. Conversely,

male students' lower scores might be attributed to slower developmental integration of brain hemispheres during adolescence, as noted in neuroscientific studies[36].

Interestingly, questionnaire responses indicated that male students perceived themselves as more competent in understanding certain sub-topics (e.g., states of matter, physical/chemical changes), despite their lower actual performance. This discrepancy could be explained by psychological phenomena such as the Dunning-Kruger effect, where individuals with limited competence overestimate their abilities, or gender socialization that encourages confidence in male students regardless of achievement.

Thematic integration of these findings suggests that gender differences in science learning outcomes are multifaceted, influenced by cognitive predispositions, self-perception biases, and classroom dynamics. Future research could further explore how pedagogical strategies might mitigate these disparities, particularly by tailoring instruction to leverage the strengths of both genders.

Table 2. Average Science Learning Outcomes Based on Sub-Materials and Question Distribution

Sub-Material	Question Number	Learning Outcomes (%)	
		Male	Female
Forms of matter and its characteristics	1, 9, 12	43	63
Changes in the state of matter	3, 6,7	43	66
Physical and chemical changes	5, 8	43	50
Density of substance	2, 4, 10, 11	50	70

Table 2 shows the learning outcomes of seventh-grade MTs students of the material of matter and its changes. The learning outcomes are distributed based on sub-materials and gender.

1. Sub-material of forms of matter and its characteristics

   Three questions (Items 1, 9, 12) assessed students' ability to investigate and evaluate particle behavior in liquids and gases. Male students achieved an average score of 43%, compared to 63% for females. This aligns with prior research suggesting that female students excel in tasks requiring verbal reasoning and systematic evaluation.
2. Sub-material of changes in the state of matter

   Items 3, 6, and 7 measured students' capacity to diagnose phase changes and particle dynamics. Again, female students demonstrated superior performance (66% vs. 43% for males). The gap may reflect gender differences in metacognitive skills, as females often exhibit stronger self-regulation in abstract scientific tasks [37].
3. Sub material of physical and chemical changes

   For Items 5 and 8, which required selecting characteristics of physical/chemical changes, females scored 50% versus males' 43%. While the difference was less pronounced, it underscores a recurring trend of female advantage in analytical tasks, possibly tied to their tendency toward methodical problem-solving.
4. Sub-material of the density of substance

   Calculations involving density and viscosity (Items 2, 4, 10, 11) revealed the largest disparity: females scored 70%, while males achieved 50%. Contrary to stereotypes about male dominance in numerical tasks, this finding supports recent evidence that female students excel in applied mathematical contexts [38]

Contradictory Self-Perception and Confidence

Despite their lower scores, male students reported higher self-perceived understanding in three sub-materials (forms of matter, phase changes, and physical/chemical changes). This misalignment may reflect the *Dunning-Kruger effect*, wherein individuals with limited competence overestimate their abilities. Observations additionally demonstrated that 64.9% of male students displayed high self-confidence, whereas merely 37.5% of female students did so, a pattern that aligns with existing research on gender socialization and its association with greater assertiveness among males in STEM learning environments.Conversely, females' higher scores in logic-driven tasks (62.5% prioritized logic vs. 51.4% of males) and ambition (60% vs. 37.8%) suggest that their achievement stems from disciplined reasoning rather than self-assurance. These findings collectively highlight a paradox: while female students achieve higher learning outcomes, their confidence lags behind males'. This discrepancy may arise from gendered classroom dynamics, where males are encouraged to vocalize understanding prematurely, whereas females adopt more reflective, accuracy-oriented approaches. These results are also supported by the acquisition of observation results on the indicator of prioritizing logic stating that female students who prioritize logic are 62.5%, while male students who prioritize logic are only 51.4%. In addition, the ambitious indicator stated that female students are 60%, while male students are 37.8%.

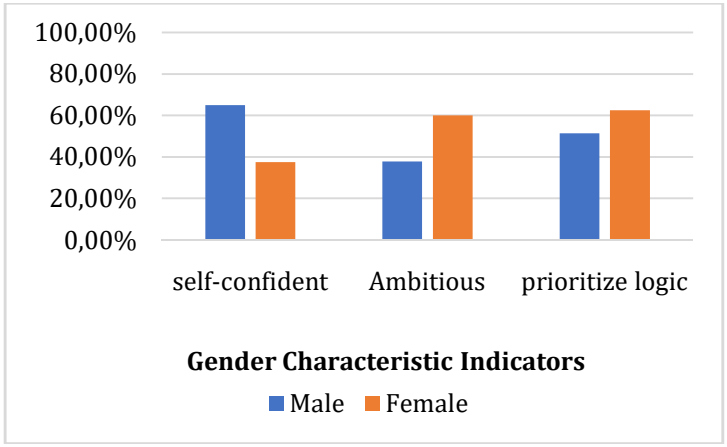

Figure 1. Histogram of Observation Results of Male and Female Students

The observational data, comprising 12 behavioral indicators, revealed distinct patterns between male and female students. Figure 1 highlights three critical indicators—*confidence*, *ambitiousness*, and *prioritization of logic*—which exhibited significant correlations with both questionnaire responses and posttest performance. Notably, while male students reported higher self-perceived understanding in the questionnaire, their actual posttest outcomes lagged behind female.

This discrepancy may reflect the Dunning-Kruger effect, wherein males overstimated their competence, whereas females despite stronger performance.

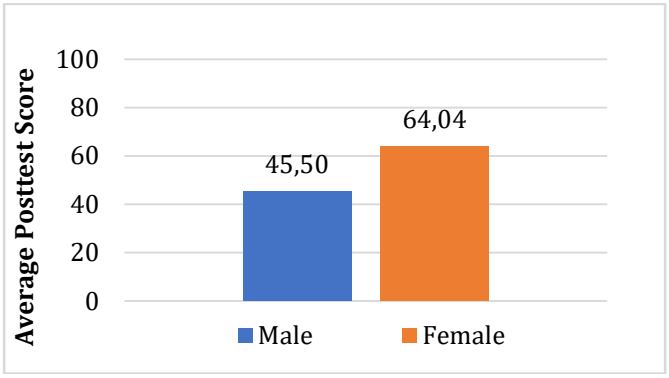

Figure 2. Histogram of Average Posttest Score

To prove the significance of differences in the learning outcomes of male and female students, the Shapiro-Wilk data normality test was conducted to check the distribution of data, and the Levene test to ensure homogeneity. The Shapiro Wilk result shows that the value of sig. $> \alpha = 0.05$ so it indicates that the data is normally distributed. Moreover, the Levene homogeneity test result shows sig. $= 0.000 < \alpha = 0.05$ which means posttest questions item instruments are not homogeneous. The requirements for normal distribution and homogeneous data were not met. Therefore, the analysis continued using non-parametric statistics, namely the Mann-Whitney test. Mann-Whitney test results in Sig. (2-tailed) $0.000 < \alpha = 0.05$, as the basis for decision in the Mann-Whitney test can be decided that $H_0$is rejected and H_a is accepted. Therefore, it means that there is a significant difference in science learning outcomes of matter and its changes in seventh-grade students in terms of gender.

Statistical analyses further validated these differences. Shapiro-Wilk tests confirmed normal data distribution ($p > .05$), but Levene's test indicated heterogeneity (*p = .000*), necessitating non-parametric analysis. The Mann-Whitney U test yielded a significant disparity (*Sig. [2-tailed] = .000*), rejecting the null hypothesis and affirming gender-based differences in learning outcomes. Female superiority was consistent across Bloom's cognitive levels: *application* (C3: 76% vs. 56%), *analysis* (C4: 57% vs. 42%), and *evaluation* (C5: 57% vs. 38%). This aligns with neuroscientific evidence suggesting that female adolescents often excel in verbal reasoning and metacognitive regulation, while male students may prioritize competitive over deep-learning strategies.

Thematic synthesis of these findings underscores the interplay of cognitive and sociocultural factors. Female students' dominance in higher-order thinking (C3–C5) and sub-materials requiring verbal-logical integration (e.g., *mass density*, 70% vs. 50%) resonates with studies highlighting their stronger *corpus callosum* connectivity, facilitating multimodal information processin. Conversely, males' overconfidence in questionnaires despite lower scores may stem from classroom dynamics that reward assertiveness over accuracy.

Cognitive neuroscience research suggests that differential brain development patterns between genders may contribute to observed disparities in academic performance. While male brains typically begin to achieve hemispheric balance between ages 6-12 with relatively slower development, female brains demonstrate more balanced bilateral development from

birth, possibility because of cognitive ability that contribute to the observed gender effects [39]. This neurodevelopmental variance manifests in distinct cognitive processing styles - junior high school male students predominantly utilize right-hemisphere functions, whereas their female counterparts employ integrated bilateral processing. These fundamental neurological differences likely underlie gender variations in communication styles, information processing, and problem-solving approaches, potentially explaining the superior academic performance of female students in this study.

CONCLUSION

The results of research conducted at MTs IhyaulUlum found that female students have learning outcomes that outperform male students, with an average female student learning outcome of 64.04 and an average male student learning outcome of 45.50. As for the analysis based on cognitive levels and sub-materials, it was found that learning outcomes at the C3, C4, and C5 cognitive levels of female students obtained results that outperformed male students. Learning outcomes based on sub-materials stated the same results that female students outperformed male students. In terms of the significance of differences in learning outcomes of male and female students through the Mann-Whitney test, it shows that there are significant differences between male and female students in the science learning outcomes of substance material and its changes in seventh-grade students in terms of gender differences. Findings based on the results of interviews with science teachers that the learning outcomes of both often have different results, female students tend to outperform the learning outcomes of male students. The high learning outcomes of female students are influenced by several aspects from the results of observations, including female students being more ambitious and prioritizing logic. However, the findings from the questionnaire results showed that male students tend to have a greater sense of self-confidence.

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REFERENCES

[1] A. D. A. Permatasari and D. M. Fajar, "Pengembangan Media Pembelajaran IPA Berbasis Powtoon Pada Pokok Bahasan Klasifikasi Materi Dan Perubahannya Di Tingkat SMP," *ScienceEdu*, vol. 5, no. 2, pp. 52–59, 2022.

[2] S. I. Wulandari, S. D. Pamelasari, and R. D. Hardianti, "Penggunaan E-Modul Berbasis Etnosains Materi Zat dan Perubahannya dalam Usaha Meningkatkan Kemampuan Berpikir Kritis Siswa SMP," *Proceeding Seminar Nasional IPA XIII*, pp. 103–113, 2023.

[3] I. N. Sari, I. Azwar, and Riska, "Kontribusi Keterampilan Proses Sains Siswa Terhadap Hasil Belajar Siswa Pada Materi Wujud Zat Dan Perubahannya," *Jurnal Pendidikan Informasi dan Sains*, vol. 6, no. 2, pp. 257–266, 2017.

[4] N. Latifah, M. S. Hayat, and Khoiri N, "Potensi Implementasi Pembelajaran Berdiferensiasi Berorientasi ESD dalam Projek IPAS Aspek Zat dan Perubahannya," *Jurnal Penelitian Pembelajaran Fisika*, vol. 14, no. 2, pp. 261–268, 2023.

[5] I. Irawati, M. L. Ilhamdi, and N. Nasruddin, "Pengaruh Gaya Belajar Terhadap Hasil Belajar IPA.," *Jurnal Pijar Mipa*, vol. 16, no. 1, pp. 44–48, 2021.

[6] Fitriani, "Pengaruh Motivasi Belajar dan Disiplin Terhadap Hasil Belajar IPS Siswa di SMP Karya Indah Kecamatan Tapung. Analisis Nilai Moral Dalam Cerita Pendek Pada Majalah Bobo Edisi Januari Sampai Desember 2015," vol. 4, no. 2, 2016.

[7] A. S. Dakhi, "Peningkatan Hasil Belajar Siswa," *Jurnal Education and Development*, vol. 8, no. 2, pp. 350–361, 2020.

[8] N. E. S. Utami and D. A. Yonanda, "Hubungan Gender Terhadap Prestasi Belajar Siswa," *Seminar Nasional Pendidikan, FKIP UNMA*, vol. 2, pp. 144–149, 2020.

[9] L. Saparwadi, "Perbedaan Hasil Belajar Mahasiswa Ditinjau Dari Gender Pada Mata Kuliah Analisis Data Kualitatif Dan Kuantitatif," *JURNAL MENTARI PUBLIKA*, vol. 4, no. 1, pp. 82–87, 2023.

[10] S. Hartina, "Gender Dalam Pendidikan (Studi Kasus Segregasi Gender Pada Mata Pelajaran Biologi di MAN 1 Jember Tahun Pelajaran 2019/2020)," 2019.

[11] Z. Abidin and A. Rahmatullah, "Manajemen Kelas Berbasis Pemisahan Gender dan Relasinya dengan Prestasi Siswa," *Al-Idaroh: Jurnal Studi Manajemen Pendidikan Islam*, vol. 7, no. 2, pp. 234–252, 2023, doi: https://doi.org/10.54437/alidaroh.v7i2.886.

[12] G. A. D. Setiawati and P. A. A. Arsana, "Pengaruh Motivasi Belajar dan Gender Terhadap Prestasi Belajar IPA Siswa Kelas Bilingual SMP (SLUB) Saraswati 1 Denpasar," *Proceeding Biology Education Conference*, vol. 15, pp. 173–179, 2018.

[13] A. Rosyidah and Suyadi, "Maskulinitas Dan Feminitas Kepemimpinan Pendidikan Islam: Kajian Deferensiasi Otak Laki-Laki Dan Perempuan Perspektif Neurosains," *Jurnal Manajemen Pendidikan Islam*, vol. 5, no. 1, 2021.

[14] Y. Sulistyowati, "Kesetaraan Gender Dalam Lingkup Pendidikan Dan Tata Sosial," *IJouGS: Indonesian Journal of Gender Studies*, vol. 1, no. 2, pp. 1–14, 2020.

[15] W. T. Sumar, "Implementasi Kesetaraan Gender Dalam Bidang Pendidikan," *Jurnal Musawa IAIN Palu*, vol. 7, no. 1, pp. 158–182, 2015.

[16] B. Cahyono, "Analisis Ketrampilan Berfikir Kritis Dalam Memecahkan Masalah Ditinjau Perbedaan Gender," *Aksioma*, vol. 8, no. 1, p. 50, 2017.
[17] A. Kurnia, Sukarmin, and W. Sunarno, "Pola Kemampuan Berpikir Kreatif Ditinjau dari Gender Siswa Sekolah Menengah dalam Pembelajaran IPA," *Risenologi*, vol. 6, no. 1b, pp. 6–10, 2021.
[18] M. S. Amin, "Perbedaan Struktur Otak dan Perilaku Belajar Antara Pria dan Wanita; Eksplanasi dalam Sudut Pandang Neuro Sains dan Filsafat," *Jurnal Filsafat Indonesia*, vol. 1, no. 1, p. 38, 2018.
[19] W. P. Hadi, L. K. Muharrami, and D. S. Utami, "Identifikasi Kemampuan Penalaran Ilmiah Berdasarkan Gender," *Wahana Matematika Dan Sains: Jurnal Matematika, Sains, Dan Pembelajarannya*, vol. 15, no. 2, pp. 1331–142, 2021.
[20] S. Suyadi, "Diferensiasi Otak Laki-laki dan Perempuan Guru Taman Kanak-kanak Aisyiyah Nyai Ahmad Dahlan Yogyakarta: Studi Pendidikan Islam Anak Usia Dini Perspektif Gender dan Neurosains," *Sawwa: Jurnal Studi Gender*, vol. 13, no. 2, p. 179, 2018.
[21] E. D. Yanti, I. Wigati, and U. H. Habisukan, "Perbedaan Kemampuan Berpikir Kritis Laki-Laki Dan Perempuan Pada Materi Sistem Peredaran Darah Mata Pelajaran Biologi Kelas XI MIPA MAN I Banyuasin III," *Bioilmi: Jurnal Pendidikan*, vol. 5, no. 1, pp. 66–71, 2019.
[22] T. O. Malenda, Kadir, and Suhar, "Kemampuan Numerik Siswa SMP Pesisir Ditinjau dari Perbedaan Jenis Kelamin dan Kemandirian Belajar Siswa SMP Negeri 14 Kendari," *Jurnal Penelitian Pendidikan Matematika*, vol. 6, no. 3, pp. 71–84, 2018.
[23] S. Sitriani, L. Arapu, and L. Ndia, "Analisis Kemampuan Numerik Siswa SMP Negeri Di Kota Kendari Ditinjau Dari Perbedaan Gender," *Jurnal Pendidikan Matematika*, vol. 10, no. 2, p. 161, 2019.
[24] S. Anwar, I. Salsabila, R. Sofyan, and Z. Amna, "Laki Laki atau Perempuan? Siapakah yang paling cerdas dalam belajar," *Jurnal Psikologi*, vol. 18, no. 2, pp. 281–296, 2019.
[25] A. Riadi, N. L. Atini, and R. A. Ferita, "Thinking Skills of Junior High School Students Related to Gender," *International Journal of Trends in Mathematics Education Research*, vol. 2, no. 3, pp. 112–115, 2019.
[26] Farianti, Rahmi, and F. Agustina, "Perbedaan Hasil Belajar Siswa Laki-Laki Dengan Siswa Perempuan Menggunakan Pembelajaran Kooperatif Model Mind Mapping Pada Pokok Bahasan Klasifikasi Makhluk Hidup Siswa Kelas VII Di SMP IT Nurul Muhajirin Batam," *Simbiosa*, vol. 5, no. 1, pp. 16–24, 2016.
[27] A. Hidayat and S. I. A. Dwiningrum, "Pengaruh Karakteristik Gender dan Motivasi Belajar Terhadap Prestasi Belajar Matematika Siswa SD," *Jurnal Prima Edukasia*, vol. 4, no. 1, pp. 32–45, 2016.
[28] Y. Pakaya, A. W. Abdullah, and D. R. Isa, "Analisis Hasil Belajar Matematika Siswa Pada Materi Persegi Dan Persegi Panjang Ditinjau Dari Perbedaan Gender Di Kelas VII SMP Negeri 1 Suwawa Timur," *Laplace : Jurnal Pendidikan Matematika*, vol. 5, no. 1, pp. 19–29, 2022.
[29] D. P. Suherman, W. Purwianingsih, and S. Diana, "Analisis Hubungan Self-efficacy dan Metakognitif terhadap Hasil Belajar Siswa SMA Berdasarkan Gender pada Konsep Genetika," *Assimilation: Indonesian Journal of Biology Education*, vol. 1, no. 1, pp. 14–20, 2018.
[30] L. Amanda, F. Yanuar, and D. Devianto, "Uji Validitas dan Reliabilitas Tingkat Partisipasi Politik Masyarakat Kota Padang," *Jurnal Matematika*, vol. 8, no. 1, pp. 179–188, 2019.
[31] T. Sriwidadi, "Pengujian mann whitney U pada analisis pengaruh pelatihan wiraniaga dalam penjualan produk baru [Testing Mann Whitney U on the analysis of the influence of sales force training in selling new products]," *Binus Business Review*, vol. 2, no. 2, pp. 751–762, 2016.
[32] I. Amanat, S. Kanwal, and N. Akhter, "Exploring the female students' and teachers' problems in conducting laboratory practicals," *Journal of Excellence in Social Sciences*, vol. 3, no. 2, pp. 188–202, 2024.
[33] F. Bezci and S. Sungur, "How is Middle School Students' Scientific Reasoning Ability Associated with Gender and Learning Environment?," *Science Education International*, vol. 32, no. 2, pp. 96–106, 2021.
[34] C. I. Ramadani, E. Purwaningsih, and E. Latifah, "Gender Differences in Metacognitive Awareness: A Study on Pre-Service Physics Teachers," *Jurnal Pendidikan Fisika dan Teknologi*, vol. 11, no. 1, pp. 118–125, Mar. 2025, doi: 10.29303/jpft.v11i1.8505.
[35] R. R. Riani, "The Effect of Gender and Self-Regulated Learning on Reading Achievement (Studies on English Department Students in Bekasi) Presented to the Faculty of Educational Sciences in Partial Fulfilment of the Requirements for the Master Degree in English Education," Syarif Hidayatullah State Islamic University, 2023.
[36] Z. Phillips V, E. Kim, and J. G. Kim, "Preliminary study of gender-based brain lateralization using multi-channel near-infrared spectroscopy," *J Opt Soc Korea*, vol. 19, no. 3, pp. 284–296, Jun. 2015, doi: 10.3807/JOSK.2015.19.3.284.
[37] W. O. Haliana, Kadir, Kodirun, and Saleh, "Kemampuan Numerik Siswa Kelas VIII SMP Negeri 6 Kendari Ditinjau," *Jurnal Pendidikan Matematika*, vol. 9, no. 2, pp. 218–228, 2018.
[38] Salim, L. Masi, and W. O. Fauziah, "Student ' S Numerical Ability Profile Reviewed By Gender," *AL-ISHLAH: JURNAL PENDIDIKAN*, vol. 12, no. 2, pp. 246–258, 2020.
[39] S. D. Newman, "Differences in cognitive ability and apparent sex differences in corpus callosum size," *Psychol Res*, vol. 80, no. 5, pp. 853–859, Sep. 2016, doi: 10.1007/s00426-015-0688-3.