M A T H L I N E
JURNAL MATEMATIKA DAN PENDIDIKAN MATEMATIKA
ISSN 2502-5872 (Print)
ISSN 2622-3627 (Elektronik)

Volume 8 Number 3, August 2023, 1091-1104

ALGEBRA REASONING ABILITY VIEWED FROM STUDENT GENDER DIFFERENCES

Nur Kurniyasih[1*], Esti Ambar Nugraheni[2]
[1,2]Departement of Mathematics Education, Universitas Muhammadiyah Prof. Dr. Hamka, Jakarta Province, Indonesia

*Correspondence: niyakur10@gmail.com

ABSTRACT
Algebraic reasoning skills are important for students to master, with algebraic reasoning students are able to solve everyday problems in algebraic form. Gender is one of the factors that differentiates students' reasoning abilities in solving math problems. This study aims to describe algebraic reasoning in terms of gender differences. This type of research is qualitative with research subjects of four students taken from 31 students, Middle School class VIII by selecting two female students and two male students based on the average score level of each gender in solving System of linear equations of two variables questions based on indicator of algebraic reasoning ability. Data collection techniques in this study were tests, interviews and documentation. The results of this study indicate that the algebraic reasoning of female subjects is higher than that of male subjects. Some of the factors for the low algebraic reasoning of the subject include: the subject is not careful and forgets the formulas that have been taught.
Keywords: Algebraic Reasoning Ability, Gender, Mathematics Education

How to Cite: Kurniyasih, N & Nugraheni, E. A. (2023). Algebra Reasoning Ability Viewed From Student Gender Differences. *Mathline: Jurnal Matematika dan Pendidikan Matematika, 8*(3), 1091-1104. http://doi.org/10.31943/mathline.v8i3.476

PRELIMINARY

Learning mathematics at school aims to make students have good reasoning power, especially in solving math problems (Noviar et al., 2019). One of the habits that causes some students to have difficulty mastering mathematics is due to the lack of logical reasoning in solving mathematical problems (Shodikin et al., 2020). Thus, mathematical reasoning and mathematics include things that are interconnected (Permata et al., 2019). Reasoning is related to making decisions in everyday life. Some people make decisions based on emotion and intuition, it would be better if they gather facts, ask for opinions and consider the consequences in solving mathematics (Handayani, 2013).

Mathematical reasoning includes the cognitive aspects needed to develop student reasoning by the teacher (Febriyanti et al., 2022). According to Antafani and Purwanti (2021) in an effort to improve students' mathematical reasoning, teachers must pay attention to supporting factors that are balanced with appropriate strategies, models,

methods during the learning process. Mathematical reasoning has an important role in students' thinking processes (Iskandar & Leonard, 2019). Good mathematical reasoning abilities in students can make it easier to understand mathematical material while low mathematical reasoning abilities will make it difficult for students to understand mathematical material (Tukaryanto et al., 2018).

It is important to do an analysis of mathematical reasoning abilities in order to find out the extent to which students' reasoning levels are to overcome the lack of mathematical reasoning abilities (Aziz & Hidayati, 2019). Reasoning analysis can be useful for teachers in developing strategies aimed at correcting learning errors (Quintasari et al., 2021).

Algebra can solve math problems related to systems of equations, the value of something that is not yet known using equations, symbols and letters. In studying algebra, it requires the ability to understand symbols, operations and rules, where this ability is contained in algebraic reasoning consisting of understanding patterns and making generalizations (Andriani, 2015).

A teacher can overcome student learning difficulties by finding the right learning approach and developing teaching materials. Students need algebraic reasoning to perform algebraic operations. Algebraic expertise links procedures and strategies as well as algebraic calculations with algebraic reasoning (Wijaya, 2016).

According to Akhwan, Zulkarnain, and Kamaliyah (2019) based on the results of his observations on the topic of solving algebraic operations questions, it was found that there were many student errors related to the lack of students practicing algebraic operation questions, lack of understanding regarding the definitions of variables, constants and coefficients. According to (Herawati & Kadarisma, 2021) algebra is one of the many materials that play an important role in understanding students' concepts to simplify problems.

Factors that influence students' mathematical reasoning include: (1) internal factors such as intelligence, talent, motivation; (2) external factors in the form of learning that is still teacher-centered (Nabahan, 2020). Factors for low algebraic reasoning causing difficulties for students include: lack of understanding of the problem, lack of thoroughness in working on the problem and lack of interest in the material (Ratu & Halim, 2016).

The reasoning abilities of students who have differences in solving math problems can be caused by gender factors (Prajono et al., 2021). Gender also means a trait that exists

in men and women which is described culturally and socially as women are softer and emotional while men are considered strong and rational (Awalyah et al., 2022).

Algebraic reasoning is the process of finding patterns from mathematical problems by constructing generalizations and manipulations (Ratu & Halim, 2016). Mathematical reasoning ability in performing mathematical tricks in producing valid proofs and statements (Fadillah et al., 2023). Algebraic reasoning involves generalizing, formalizing ideas with symbols (Raharjo et al., 2020). Researchers are interested in discussing algebraic reasoning because there are suggestions from other researchers to examine more broadly algebraic reasoning in terms of gender (Indraswari & Fitriyah, 2019).

METHODS

The method used in this research is qualitative research with a descriptive approach which aims to describe algebraic reasoning abilities in terms of students' gender differences. According to (Fadli, 2021) qualitative research is a study aimed at understanding human and social problems. The main instrument is the researcher himself and the supporting instruments are tests and interviews. This study chose four subjects, two female students and two male students from 31 students, Junior High School (SMP) class VIII, one of the schools located in Jakarta. The technique of taking subjects in research is based on the results of moderate score levels on the written test about a System of linear equations of two variables (SLETV) with indicators of algebraic reasoning ability. The data analysis technique in this study was to reduce data by analyzing students' answers to SLETV questions based on indicators of algebraic reasoning ability, presenting data from the results of algebraic reasoning tests on moderately capable subjects because male subjects and female subjects met the algebraic reasoning ability indicators at moderate scores and draw conclusions by describing Shiva's algebraic reasoning process in solving SLETV problems.

The data collection instruments used in this study included: test sheets given by students related to 3 questions on a system of two-variable linear equations to obtain data on students' algebraic reasoning abilities in answering these questions and interview guidelines submitted after analyzing the data that had been collected to strengthen the results of the answers subject algebraic reasoning ability. Algebraic reasoning indicators according to (Herbert & Brown, 2020) is *pattern seeking*, *pattern recognition* , *generalizing*.

Tabel 1. Algebraic Reasoning Ability Indicator

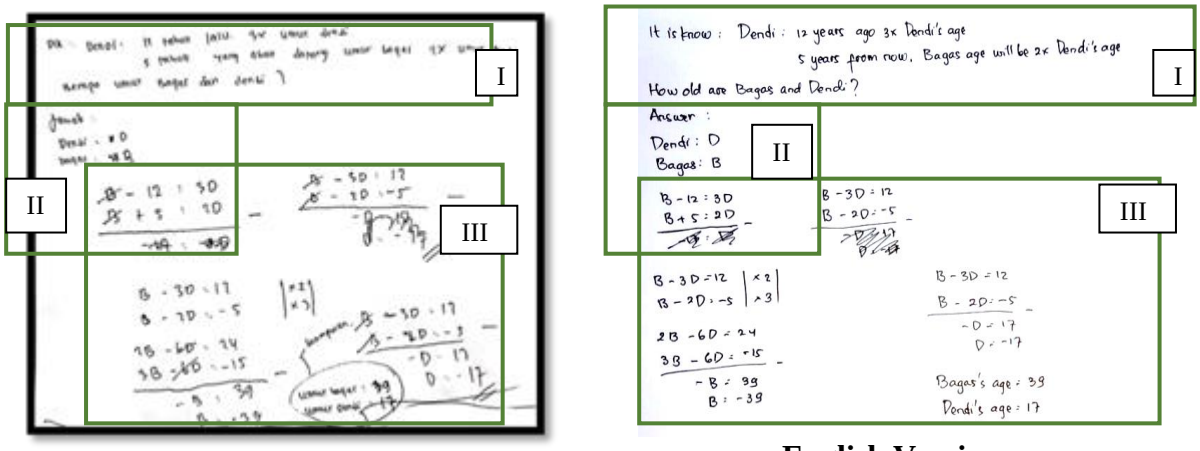
No	Indicator	Characteristic
I	Finding patterns or information	Determine the information that is known and asked in the form of words, symbols or graphics appropriately.
II	Pattern recognition	Know the pattern relationship by applying the mathematical model of each information appropriately.
III	Generalization	Operates variables into proper general form

RESULT AND DISCUSSION

The research results came from the results of the two-variable linear equation system test questions and interviews. The following shows the subject's algebraic reasoning ability in solving problems of a system of linear equations of two variables in terms of gender differences can be described as follows.

> Bagas has a nephew named Dendi. Twelve years ago Bagas' age was three times Dendi's age. In five years, Bagas' age will be 2 times Dendi's age. How old are Bagas and Dendi now?

Problem number 1 includes indicators of finding patterns, recognizing patterns and generalizations



English Version

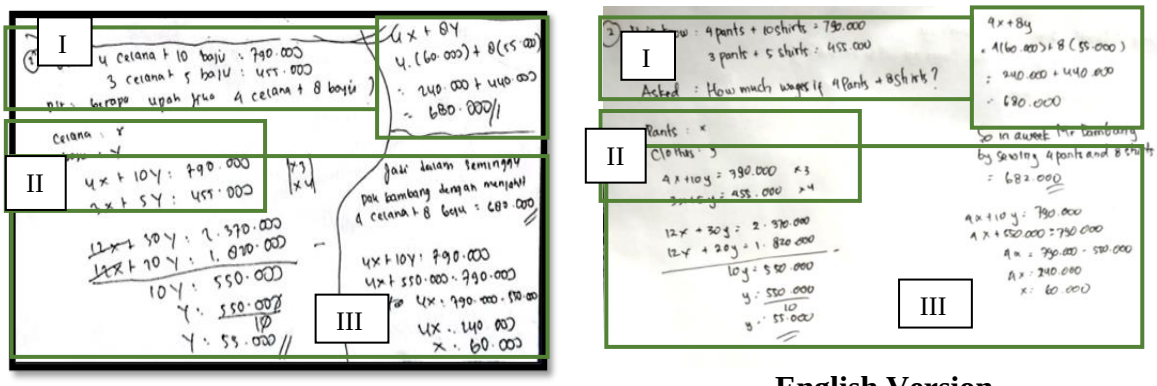
Figure 1. Female Subject Test Results (LZ) Number 1

The results of solving in number 1 show that the female subject has been able to find information correctly and what is asked in questions that are included in indicator I. This can be seen in figure 1 subject (LZ) writes down what is known and asked in the questions. In the pattern recognition indicators (II) and generalization (III) it can be seen that the subject has not been able to find out the pattern relationship by applying a

mathematical model but the model written is not quite right and for the completion step only uses logic because he forgot the formula to be used. Based on the results of the interview the subject was not sure about answer number 1 which was done because he did not find a concept to answer the question and the results of the age of Bagas and Dendi obtained inaccurate results.

> Mr. Bambang gets a sewing fee of Rp. 790,000.00 for 4 pants and 10 shirts. Meanwhile, for 3 pants and 5 shirts, he gets IDR 455,000.00. How much wages will Pak Bambang get if he sews 4 pants and 8 shirts in a week at a sewing shop?

Problem number 2 includes indicators of finding patterns, recognizing patterns and generalizations



English Version

Figure 2. Female Subject Test Results (LZ) Number 2

The results of problem solving in number 2 show that the female subject (LZ) has been able to find information on the problem including indicator I. In the pattern recognition indicator (II) it appears that the subject has been able to find out the pattern relationship by applying a mathematical model which proves that the subject is confident in the answer written according to the results of the interview. Generalization indicator (III) the subject is able to complete the questions in detail and the answers obtained are correct. Based on the results of interviews obtained by researchers with the following research subjects.

Researcher (R) : How can you be sure that the answer written is correct?

Subject (LZ) : I checked step by step, if the steps are correct I'm sure the answer Is correct

Researcher (R) : How do you change the given questions given to in mathematical models?

Subject (LZ) : I read it first and put it into a mathematical model and used the

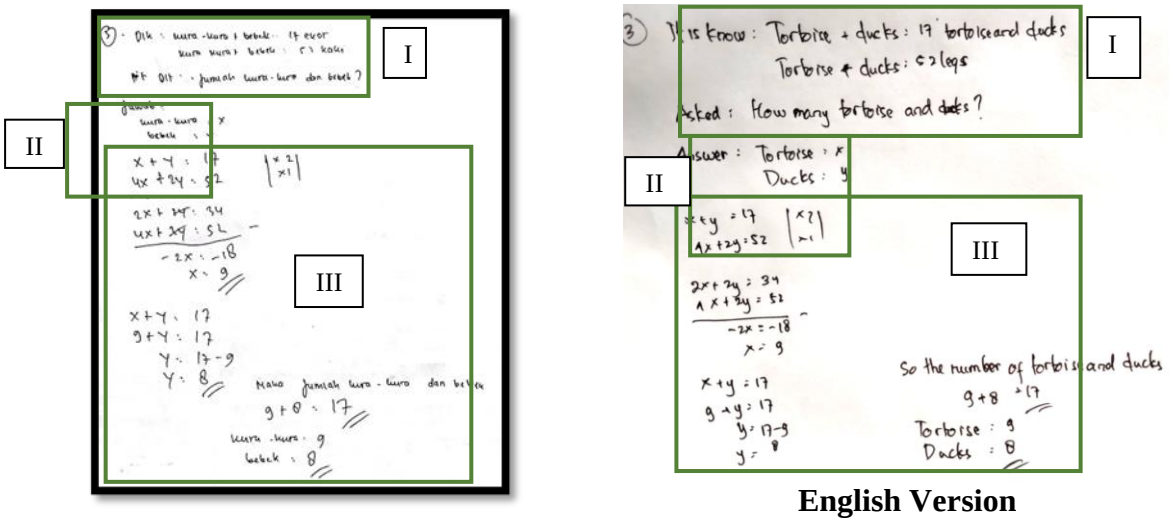
method of elimination and substitution to find the price obtained if sewing 4 pants and 8 shirts

Researcher (R) : What method do you use? And why did you choose to use this method?

Subject (LZ) : Using elimination and substitution methods because schools teach these methods

Nabila has a pond next to her parents' house. Inside the pond there are 17 turtles and ducks. If the number of animals (turtles and ducks) in the pond is 52 feet, then the number of turtles and ducks is...

Question number 3 includes indicators of finding patterns, recognizing patterns and generalizations



English Version

Figure 3. Female Subject Test Results (LZ) Number 3

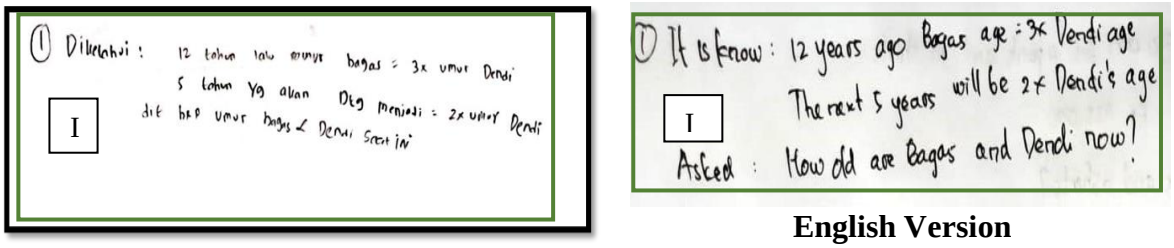
The results of solving the subject matter in number 3 show that the subject (LZ) has been able to find information on the problem including indicator I. In the pattern recognition indicator (II) it can be seen that the subject has been able to find out the pattern relationship by applying a mathematical model and generalizing it (III) into general form which is proven that the subject is sure of the answers written in accordance with the results of the interview. Based on the results of interviews with researchers with research subjects as follows

Researcher (R) : What are the steps to solving the problem?

Subject (LZ) : I read the problem first and put it into a mathematical model and used the method of elimination and substitution to find the number of ducks and the number of turtles

Researcher (R) : What is the conclusion of solving the problem?

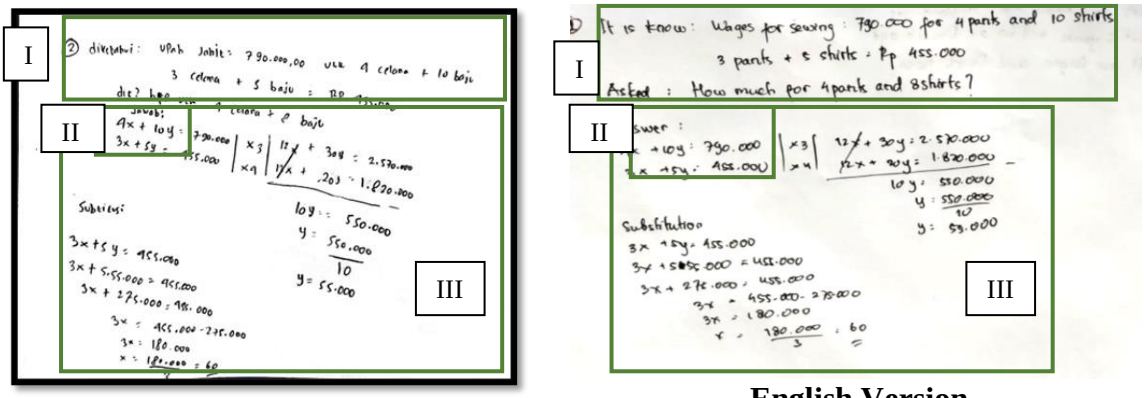
Subject (LZ) : I used an example for the number of turtles and ducks 17 so I made an equation $x + y = 17$ and for the 4-legged turtle and the 2-legged duck I made an equation $4x + 2y = 52$ after that using the elimination and substitution method



English Version

Figure 4. Male Subject Test Results (YN) Number 1

The results of solving the subject matter (YN) in number 1 showed that the male subject was able to find information correctly and what was asked in the question was included in indicator I (find a pattern). This can be seen in Figure 4 that the subject (YN) writes down what is known and what is asked in the question. In the pattern recognition indicators (II) and generalization (III) it can be seen that the subject has not been able to know the pattern relationship and apply the mathematical model because the subject does not provide a mathematical model and does not apply the completion steps so that he has not been able to reach the conclusion stage. Based on the interview results, the subject did not understand how to solve the problem.



English Version

Figure 5. Male Subject Test Results (YN) Number 2

The results of problem solving in number 2 show that the male subject (YN) has been able to find information on the problem including indicator I. In the pattern recognition indicator (II) it appears that the subject has been able to find out the pattern relationship by applying a mathematical model but the subject is unable complete the questions to the conclusion stage so that the generalization indicator (III) of the subject

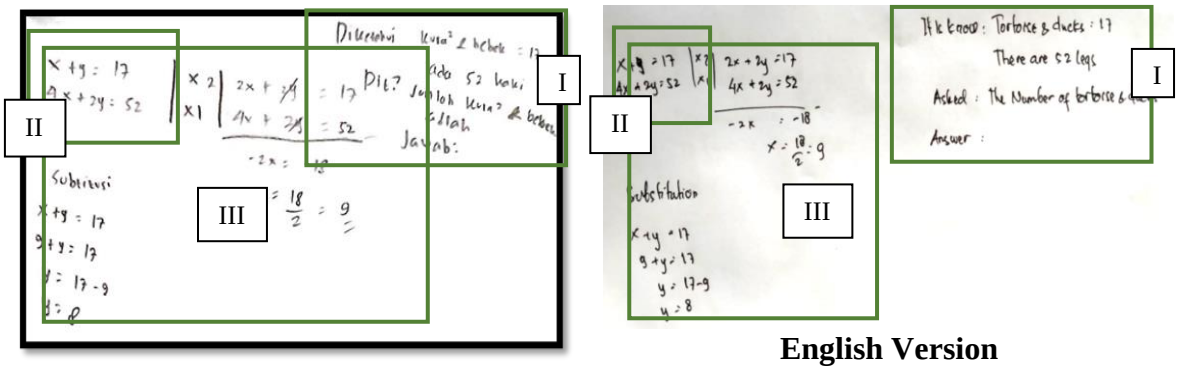
does not meet these indicators. However, the subject was able to continue answering based on the results of the interview.

Researcher (R) : What information is in the question?

Subject (YN) : Mr. Bambang's wages are 790,000 for 4 pants and 10 shirts, and 455,000 for 3 pants and 5 shirts, and for questions that are obtained when sewing 4 pants and 8 shirts

Researcher (R) : How do you write the example in the problem?

Subject (YN) : I suppose x is pants and y is a shirt



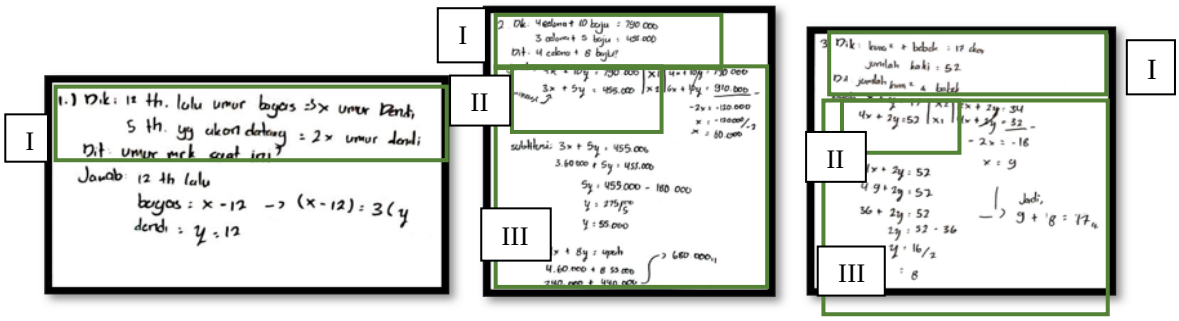
English Version

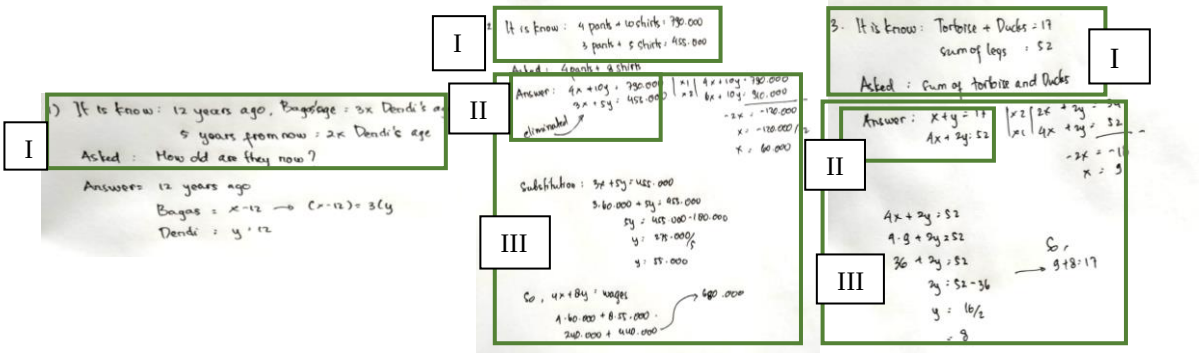
Figure 6. Male Subject Test Results (YN) Number 3

The results of solving the subject matter in number 3 show that the male subject (YN) has been able to find information on the problem including indicator I. In the pattern recognition indicator (II) it can be seen that the subject has been able to find out the pattern relationship by applying a mathematical model and generalizing it (indicator III) into a general form but the subject forgot to write down the conclusion of solving the problem. However, the subject is able to provide conclusions through interviews. Based on the results of interviews obtained by researchers with the following research subjects.

Researcher (R) : How many turtles and ducks each?

Subject (YN) : The total number of turtles is 9 turtles and 8 ducks, so that the total number of ducks and turtles is 52 feet.

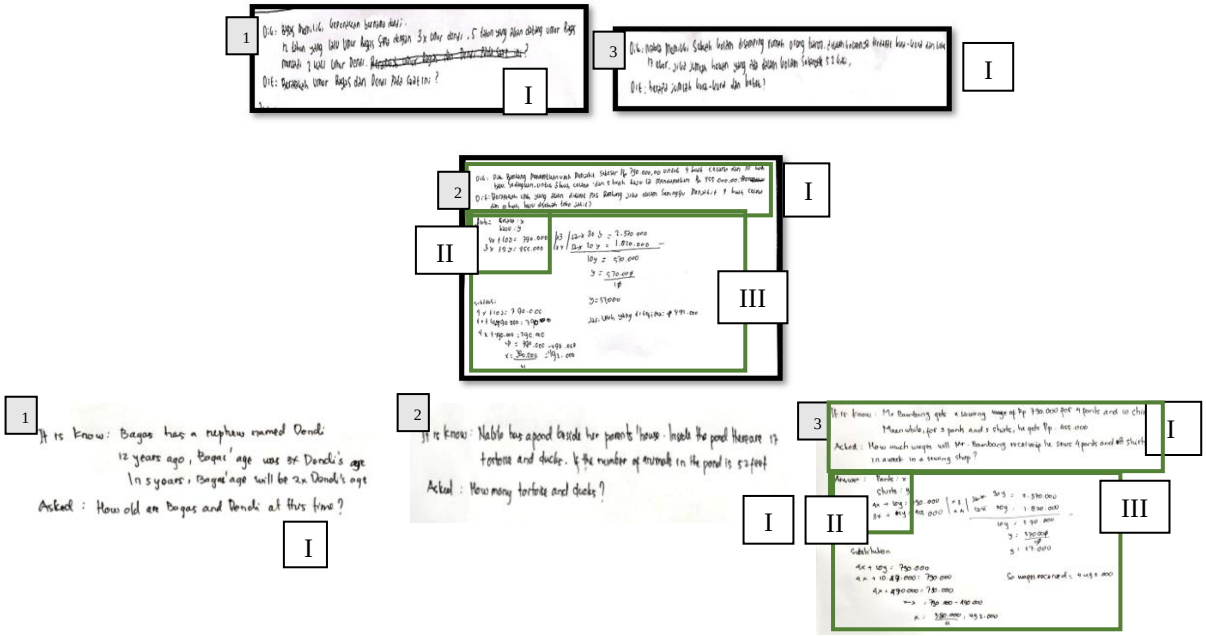




English Version

Figure 7. Female Subject Test Results (LH) Numbers 1, 2 and 3

The results of solving the subject matter (LH) on the three numbers above show that the female subject has been able to find information on the problem. It can be seen that in Figure 7 the subject (LH) wrote down the information asked for in the problem. In the pattern recognition indicator, it can be seen that the subject is able to find out the pattern relationship by applying a mathematical model and generalizing it into a general form, but at number 1 the mathematical model made by the subject is not quite right. However, the subject was able to provide conclusions and completion steps from numbers 2 and 3, so that the subject was able to fulfill all indicators.



English Version

Figure 8. Male Subject Test Results (MG) Numbers 1, 2 and 3

The results of solving the subject matter (MG) in the three numbers above show that the subject (MG) has been able to find information on the questions included in indicator I. In figure 8, answer number 2 for the indicator of introducing patterns (indicator II) shows that the subject is able to know the relationship between the pattern and apply a

mathematical model and generalize it (indicator III) into a general form but the answers given are miscalculations so that the conclusions given are not appropriate.

Based on the discussion above, there are differences in the reasoning abilities of female subjects and male subjects. In the indicator of finding patterns, female and male subjects fulfill this indicator because they can write down what is known and asked about questions in questions number 1, 2 and 3. This is contrary to research (Hariyanti & Khotimah, 2022) that only women are able to present information while male students are incomplete in writing down what is known and asked in the questions.

In the pattern recognition indicator, female subjects and male subjects (YN) in questions number 2 and 3, subjects were able to fulfill this indicator because they could write down the mathematical models in the questions. This agrees with Authary and Nazariah (2019); Pradana and Murtiyasa (2020) which states that female and male subjects are able to make examples of objects and are able to make equations in solving System of linear equations of two variables problems. For male subjects (MG) they were unable to write examples and mathematical models in number 2, while male subjects (YN) and female subjects (LH) were less able to recognize patterns in number 1 so they could not write down the steps for solving them. Likewise on the pattern recognition indicator in number 1 the female subject (LZ) was able to make an equation but was wrong in making the equation so that the results obtained were inaccurate. This agrees with research Sianipar (2020) states that female and male subjects are less able to make equations in mathematical models precisely.

In the generalization indicator, female subjects fulfill this indicator because they are able to solve questions correctly in numbers 2 and 3. This agrees with research (Prajono et al., 2021) stated that female students were better in terms of generalization. For male subjects (YN) they are unable to generalize because the answers given are incomplete in number 2 but in number 3 the male subject is able to fulfill these indicators. The male subject (MG) was less able to generalize. It was seen that there was an incorrect calculation so that the answers given were not quite right. This agrees with (Arum Nissa & Mahmudi, 2022) which stated that male subjects were less able to generalize a problem in mathematics.

Based on the explanation above, the algebraic reasoning ability of female subjects (LZ and LH) has a higher ability than male subjects (YN and MG) of class VIII junior high school students. This is in line with the opinion (Nurjanah et al., 2019). In terms of the intended indicators, the female subject fulfills all the indicators of algebraic reasoning

more in terms of finding patterns, recognizing patterns to the generalization stage. This agrees with the research opinion which says that female students are able to fulfill all indicators (Fauziah et al., 2021). Meanwhile, the algebraic reasoning ability of male subjects fulfills two indicators in the form of finding patterns by writing down what is known and asked in questions and recognizing patterns by making mathematical models, but on the generalization indicator male subjects are less able to fulfill indicators because there are errors in calculations so the final answer obtained is not quite right. This is contrary to research (Iswanto et al., 2022) which says that male subjects fulfill all indicators of reasoning.

CONCLUSION

Based on the results of tests and interviews on four research subjects in solving the problem of a system of linear equations of two variables to describe students' algebraic reasoning abilities in terms of gender differences that the algebraic reasoning abilities of female subjects were higher than those of male subjects. The female subject fulfills three indicators in answering two questions correctly and one question inaccurately in finding patterns by finding information that is known and asked about the problem, recognizing patterns by making examples with a variable and making a mathematical model, and generalizing by applying solving steps questions and for male subjects being able to fulfill two indicators in solving two questions but not in detail on the indicators of finding patterns and recognizing patterns, male subjects were less able to generalize indicators. The subject's difficulty in answering the questions was due to forgetting the formulas that had been taught and not being thorough in working on the questions.

REFERENCES

Akhwan, A., Zulkarnain, I., & Kamaliyah, K. (2019). Kemampuan Pemahaman Konsep Aljabar Siswa Kelas VII SMPN 1 Gambut. *EDU-MAT: Jurnal Pendidikan Matematika*, *7*(2), 159–167. https://doi.org/10.20527/edumat.v7i2.7377

Andriani, P. (2015). Penalaran Aljabar Dalam Pembelajaran Matematika. *Beta: Jurnal Tadris Matematika*, *8*(1), 1–13. https://jurnalbeta.ac.id/index.php/betaJTM/article/view/20

Antafani, H. D., & Purwanti, K. Y. (2021). Efektivitas Model Pembelajaran Think Pair Share Berbantuan Media VBSC untuk Meningkatkan Penalaran Siswa SD/MI. *Dawuh Guru: Jurnal Pendidikan MI/SD*, *1*(2), 149–162. https://doi.org/10.35878/guru.v1i2.299

Arum Nissa, A. D., & Mahmudi, A. (2022). Analisis Kemampuan Penalaran Aljabar Siswa Dengan Model Pembelajaran Masalah (PBL) Dalam Menyelesaikan Masalah Matematika. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *11*(2),

1400–1410. https://doi.org/10.24127/ajpm.v11i2.4835

Authary, N., & Nazariah, N. (2019). Penalaran Aljabar: Suatu Pelevelan Berbasis Taksonomi Solo Pada Pemecahan Masalah Persamaan Linier Dua Variabel. *Delta-Pi: Jurnal Matematika Dan Pendidikan Matematika*, *8*(2), 1–13. https://doi.org/10.33387/dpi.v8i2.1280

Awalyah, S., Nuraida, I., & Sunaryo, Y. (2022). Kemampuan Literasi Matematis Siswa SMP Dilihat Dari Perspektif Gender. *J-KIP (Jurnal Keguruan Dan Ilmu Pendidikan)*, *3*(1), 71–80. https://doi.org/https://doi.org/10.25157/j-kip.v3i1.6697

Aziz, H. E., & Hidayati, N. (2019). Analisis Kemampuan Penalaran Matematis Siswa SMP Pada Materi Aritmatika Sosial. *Prosiding Seminar Nasional Matematika Dan Pendidikan Matematika*, *2*(1c), 824–828. https://journal.unsika.ac.id/index.php/sesiomadika/article/view/2500

Fadillah, M., Maimunah, M., & Hutapea, N. M. (2023). Analysis Of Mathematical Reasoning Ability in Terms of Mathematical Self-Efficacy of MAN 2 Pekanbaru Students. *Mathline: Jurnal Matematika Dan Pendidikan Matematika*, *8*(2), 641–660. https://mathline.unwir.ac.id/index.php/Mathline/article/view/443

Fadli, M. R. (2021). Memahami desain metode penelitian kualitatif. *Humanika: Kajian Ilmiah Mata Kuliah Umum*, *21*(1), 33–54. https://doi.org/10.21831/hum.v21i1.38075

Fauziah, I. A., Saputri, K. D., Faradillah, A., & Alyani, F. (2021). Analisis Kemampuan Penalaran Siswa SMK dalam Menyelesaikan Soal Matematika Berdasarkan Gender. *Prosiding Seminar Nasional Pendidikan Matematika Universitas Pattimura*, *2*(1), 70–77. https://ojs3.unpatti.ac.id/index.php/mathedu/article/view/4190

Febriyanti, R., Ilmayasinta, N., & Wati, D. F. (2022). Eksplorasi Pengetahuan Calon Guru Matematika Tentang Proses Penalaran Matematis Siswa. *Jurnal Pembelajaran Matematika Inovatif*, *5*(6), 1619–1626. https://www.journal.ikipsiliwangi.ac.id/index.php/jpmi/article/view/12950

Handayani, A. D. (2013). Penalaran Kreatif Matematis. *Jurnal Pengajaran Matematika Dan Ilmu Pengetahuan Alam*, *18*(2), 161–166. https://ejournal.upi.edu/index.php/jpmipa/article/view/36131

Hariyanti, H., & Khotimah, R. P. (2022). Kemampuan Penalaran Matematis Siswa Dalam Menyelesaikan Soal Materi Bangun Ruang Sisi Datar Ditinjau Dari Perbedaan Gender Di Kelas VIII SMP Negeri 1 Bendosari. *Jurnal Pembelajaran Matematika Inovatif*, *5*(3), 681–692. http://journal.ikipsiliwangi.ac.id/index.php/jpmi/article/view/10474

Herawati, E., & Kadarisma, G. (2021). Analisis Kesulitan Siswa SMP Kelas VII dalam Menyelesaikan Soal Operasi Aljabar. *Jurnal Pembelajaran Matematika Inovatif*, *4*(2), 355–364. http://journal.ikipsiliwangi.ac.id/index.php/jpmi/article/view/3658

Herbert, K., & Brown, R. H. (2020). Patterns as Tools for Algebraic Reasoning. *Teaching Children Mathematics*, *3*(6), 123–128. https://doi.org/10.5951/tcm.3.6.0340

Indraswari, N. F., & Fitriyah, L. M. (2019). Penalaran Aljabar Mahasiswa dalam Menyelesaikan Masalah Relasi Rekursif Ditinjau dari Gaya Kognitif. *SIGMA: Kajian Ilmu Pendidikan Matematika*, *4*(2), 38–44. http://ejournal.unira.ac.id/index.php/jurnal_sigma/article/view/591

Iskandar, A. P., & Leonard, L. (2019). Modifikasi Model Pembelajaran Tipe Numbered Heads Together (NHT) dengan Strategi Pembelajaran Tugas dan Paksa Terhadap Kemampuan Penalaran Matematika Siswa. *Jurnal Mercumatika: Jurnal Penelitian Matematika Dan Pendididkan Matematika*, *4*(1), 1–13. http://ejurnal.mercubuana-yogya.ac.id/index.php/mercumatika/article/view/801

Iswanto, A., Putri, C. V., Rizkia, P. A., Faradillah, A., & Hadi, W. (2022). Analsisis Kemampuan Penalaran Siswa Sekolah Menengah Atas dalam Menyelesaikan Matematika Berdasarkan Gender dan GeoGebra. *Jurnal GeoGebra Indonesia*, *2*(1), 37–51. https://journal.geogebra.id/index.php/IGJ/article/view/21

Nabahan, S. A. (2020). Analisis Kemampuan Penalaran Matematis Siswa Melalui Model Problem Based Learning. *Jurnal Genta Mulia*, *11*(1), 6–12. https://ejournal.stkipbbm.ac.id/index.php/gm/article/view/212

Noviar, N., Zulkarnaen, R., & Ardiyanti, Y. (2019). Peningkatan Kemampuan Penalaran Matematis Siswa SMP Melalui Model Problem Based Learning. *Prosiding Seminar Nasional Matematika Dan Pendidikan Matematika*, *1*(1a), 492–498. https://journal.unsika.ac.id/index.php/sesiomadika/article/view/2137

Nurjanah, S., Kadarisma, G., & Setiawan, W. (2019). Analisis Kemampuan Penalaran Matematik dalam Materi Sistem Persamaan Linear Dua Variabel Pada Siswa SMP Kelas VIII Ditinjau dari Perbedaan Gender. *Journal On Education*, *1*(2), 372–381. https://jonedu.org/index.php/joe/article/view/77

Permata, A., Sugianto, S., & Ahmad, D. (2019). Kemampuan Koneksi Matematis Dalam Materi Kubus dan Balok Dikaji dari Kreativitas Siswa di SMP. *Jurnal Pendidikan Dan Pembelajaran Khatulistiwa*, *8*(9), 1–14. https://jurnal.untan.ac.id/index.php/jpdpb/article/view/35600

Pradana, D. A. Y., & Murtiyasa, B. (2020). Kemampuan siswa menyelesaikan masalah berbentuk soal cerita sistem persamaan linear ditinjau dari kemampuan penalaran. *PYTHAGORAS: Jurnal Pendidikan Matematika*, *15*(2), 151–164. https://doi.org/10.21831/pg.v15i2.35419

Prajono, R., Rahmat, R., Maryanti, E., & Salim, S. (2021). Kemampuan Penalaran Matematis Siswa Ditinjau dari Gender. *JNPM (Jurnal Nasional Pendidikan Matematika)*, *5*(2), 208–218. https://doi.org/10.33603/jnpm.v5i2.3641

Quintasari, D., Budayasa, I. K., & Sulaiman, R. (2021). Profil Penalaran Siswa dalam Memecahkan Masalah Matematika Ditinjau dari Gender. *MATHEdunesa*, *10*(3), 490–496. https://doi.org/10.26740/mathedunesa.v10n3.p490-496

Raharjo, S., Pradja, B. P., & Istiqomah, D. (2020). Analisis Kemampuan Penalaran Aljabar Siswa SMP dalam Pemecahan Masalah Pola Bilangan. *JIPMat: Jurnal Ilmiah Pendidikan Matematika*, *5*(2), 147–158. https://doi.org/10.26877/jipmat.v5i2.6546

Ratu, M. D. C., & Halim, F. A. (2016). Penalaran Aljabar melalui Pengamatan Pola untuk Siswa Kelas VII. *PRISMA, Prosiding Seminar Nasional Matematika*, 585–590. https://journal.unnes.ac.id/sju/index.php/prisma/article/view/21697

Shodikin, A., Rohim, A., & Mustofah, M. (2020). Analisis Kemampuan Penalaran Matematis dalam Menyelesaikan Soal pada Materi Kubus dan Balok Ditinjau dari Gaya Kognitif Field Independent dan Field Dependent. *Inspiramatika: Jurnal Inovasi Pendidikan Dan Pembelajaran Matematika*, *6*(1), 50–59. https://doi.org/10.52166/inspiramatika.v6i1.2040

Sianipar, S. G. E. (2020). Analisis Kesalahan Siswa dalam Menyelesaikam Soal Cerita Sistem Persamaan Linear Dua Variabel Menggunakan Fase Newman. *MATHEdunesa*, *9*(3), 478–486. https://doi.org/10.26740/mathedunesa.v9n3.p478-486

Tukaryanto, T., Hendikawati, P., & Nugroho, S. (2018). Peningkatan Kemampuan Penalaran Matematik dan Percaya Diri Siswa Kelas X Melalui Model Discovery Learning. *PRISMA, Prosiding Seminar Nasional Matematika*, *1*, 656–662. https://journal.unnes.ac.id/sju/index.php/prisma/article/view/20211

Wijaya, A. (2016). Aljabar: Tantangan Beserta Pembelajarannya. *Jurnal Gantang*, *1*(1), 1–14. https://doi.org/10.31629/jg.v1i1.1