

Kemampuan Numerasi Peserta Didik Dalam Menyelesaikan Masalah Aljabar Ditinjau dari Gender

Shiska Putri Astuti¹, Supiat²

^{1,2}Pendidikan Matematika, Universitas Muhammadiyah Prof. Dr. Hamka, Indonesia

E-mail: shiskaptr18@gmail.com¹ supiat@uhamka.ac.id²

Abstrak

Numerasi merupakan keterampilan dalam menggunakan berbagai macam simbol-simbol yang berkaitan dengan matematika dasar. Kemampuan numerasi menjadi penting untuk diterapkan dalam kegiatan belajar mengajar di sekolah untuk dapat menyelesaikan masalah matematika. Tujuan dari penelitian ini adalah untuk mengetahui kemampuan numerasi peserta didik laki-laki dan perempuan dalam menyelesaikan masalah aljabar. Metode penelitian menggunakan metode kualitatif dengan pendekatan deskriptif. Teknik pengambilan subjek menggunakan *purposive sampling*, subjek terdiri dari 3 peserta didik laki-laki dan 3 peserta didik perempuan. Teknik pengumpulan data pada penelitian ini menggunakan tes tulis, wawancara, dan dokumentasi. Hasil penelitian ini menunjukkan bahwa kemampuan numerasi peserta didik laki-laki dan perempuan dengan tingkat kemampuan tinggi mampu menganalisis informasi, membuat dan melakukan langkah penyelesaian, serta mampu membuat simpulan jawaban dengan tepat. Peserta didik laki-laki dengan tingkat kemampuan sedang mampu membuat dan melakukan langkah penyelesaian, serta mampu membuat simpulan jawaban dengan tepat. Peserta didik perempuan dengan tingkat kemampuan sedang mampu membuat dan melakukan langkah penyelesaian. Peserta didik laki-laki dengan tingkat kemampuan rendah hanya mampu membuat langkah penyelesaian namun belum mampu melakukan langkah penyelesaian, peserta didik perempuan dengan tingkat kemampuan rendah hanya mampu menganalisis informasi pada soal. Berdasarkan analisis tersebut dapat disimpulkan bahwa kemampuan numerasi dalam menyelesaikan masalah aljabar pada peserta didik laki-laki dan perempuan berbeda.

Kata Kunci: aljabar, *gender*, kemampuan numerasi

Students' Numeracy Ability in Solving Algebra Problems in View of Gender

Abstract

Numeracy is a skill in using various kinds of symbols related to basic mathematics. Numerical ability is important to be applied in teaching and learning activities in schools to be able to solve math problems. The purpose of this study was to determine the numeracy skills of male and female students in solving algebra problems. The research method uses qualitative methods with a descriptive approach. The subject taking technique used purposive sampling, the subject consisted of 3 male students and 3 female students. Data collection techniques in this study used written tests, interviews, and documentation. The results of this study indicate that the numeracy skills of male and female students with a high level of ability are able to analyze information, make and carry out solving steps, and are able to draw conclusions about answers correctly. Male students with moderate ability levels are able to make and carry out completion steps, and are able to make conclusions about answers correctly. Female students with moderate ability levels are able to make and carry out solving steps. Male students with a low level of ability are only able to make steps for completion but have not been able to take steps for completion, female students with low levels of ability are only able to analyze the information in the problem. Based on this analysis it can be concluded that the numeracy skills in solving algebra problems in male and female students are different.

Keywords: algebra; gender; numeracy skills

INTRODUCTION

Education is a place to shape students to become human beings who can develop according to their potential. According to Mariamah, Suciwati, & Hendrawan (2021) education also plays an important role in developing students' self-potential to shape knowledge, skills, and also the character of students in the learning process at school, one of which is mathematics. In education there are learning activities which of course there are several problems that can occur, including in learning mathematics at school (Rahmawati & Anawati, 2021). Mathematics is part of science and a subject taught in schools. Mathematics is studied to train thinking skills as a basis for scientific development (Simbolon, Noer, & Gunowibowo, 2020). Learning mathematics is a process related to the ability to count, reason and understand the concepts of arithmetic, algebra, geometry, etc (Nurcahyandi & Ariyanto, 2022). Learning mathematics has a goal that does not only require students to be able to work on the math problems given, but to (1) understand concepts, (2) make ideas and statements (3) solve problems, (4) use symbols, tables, and diagrams and (5) understanding the benefits of mathematics in everyday life (Kamarullah, 2017).

An important factor in learning mathematics is the effort to improve students' numeracy skills in solving mathematical problems (Rohendi, 2022). Numeracy is a skill make use of various symbols related to mathematics (Han et al., 2017). Numeracy skills are the abilities to manage data and numbers to solve problems in various contexts of everyday life (Via, Tatag, & Abadi, 2021). Numeracy can be interpreted as the ability to apply the concept of numbers and arithmetic operations in everyday life (Mahmud & Pratiwi, 2019). Skills are needed to help students understand the role of mathematics in solving real-life problems (Salvia, Sabrina, & Maula, 2022). Numeracy abilities are important to be applied in teaching and learning activities in schools because numeracy skills are related to solving mathematical problems in everyday life (Pangesti, 2018). PISA test results held in 2018 by *Organisation for Economic Cooperation and Development* (OECD) found that Indonesia obtained an average score of 379 in mathematics. The values obtained to decrease from the test results in 2015 (OECD, 2019). Based on the results observations of students' numeracy abilities, after analyzing students' answers, it can be seen that the numeracy skills of male and female students are still low in algebra material, students still have difficulty solving the problems given. This is in line with research (Ate & Ledede, 2022) that students' numeracy abilities are still in the less and less category due to students' lack of skills in using mathematical symbols to solve problems in various contexts in everyday life. Meanwhile, according to Sanvi & Diana (2022) that students' numeracy abilities do not meet problem solving indicators so that the procedures for working on questions are less systematic.

Solving problems in mathematics is an important aspect so that students can use their knowledge and skills in solving a problem (Rezky & Jais, 2020). Students have to the ability to solve problems, because the purpose of learning in mathematics is solving problems related to everyday life (Maulidina, 2019). Problem solving stage according to Polya (1973) that is understanding, planning, carrying out plans, and re-examining a problem. According to Fauziah, Roza, & Maimunah (2022) states that problem solving is a way of solving mathematical problems by applying concepts and methods mastered by students. Algebra is one of the branches in learning mathematics that uses mathematical statements to describe a relationship and as a tool to solve various problems in mathematics. According to Ananda & Khabibah (2021) that in the material algebra discusses about symbols and mathematical symbols related to connecting numbers and simplifying a number. Algebra material is material that has a close connection with everyday life that aims to solve problems accurately using the student numeracy skills (Rahmawati & Anawati, 2021).

In learning mathematics each individual has different problem-solving abilities. According to Rosania, Mujib, & Suri (2019) that gender differences can affect students' psychological differences in learning which makes differences between male and female students in understanding mathematics. According to Lestari, Kusmayadi, & Nurhasanah (2021) there are differences between male and female students in solving a problem so that differences arise in obtaining mathematical knowledge. Male and female students have different steps in solving math problems (Pellokila, Amsikan, & Mamoh, 2020). This can also be related to the level of students' self-evaluation of the different problem-solving skills shown by student (Salsabilah & Kurniasih, 2022).

Students in solving problems need to be trained to relate the material studied to problems in everyday life (Nurcahyandi & Ariyanto, 2022). One of the applications of algebra in everyday life is a system of two-variable linear equations (Rahmawati, Hartatiana, & Muslimahayati, 2021) This subject is in the form of a narrative that requires students to complete the narrative form of questions into a mathematical model. In accordance with research (Pratiwi, 2018) that a system of two-variable linear equations is still related to everyday life that needs to be understood with good numeracy skills. Based on the importance of the numeracy skills above, no research has yet been found that describes how students' numeracy abilities solve algebra problems in terms of gender. Therefore, researchers will conduct research by analyzing the numeracy abilities of male and female students at the junior high school level.

METHOD

This research uses qualitative research methods with a descriptive approach. Qualitative research is a research method *naturalistic* because the research was carried out in as-is conditions (Abdussamad, 2021). Subject recruitment techniques use *purposive sampling*, which consists of 3 male students and 3 female students in class VIII at SMPN 32 Tangerang who have been categorized into high, medium, and low numeracy ability. Categories are grouped based on the value obtained by each student in solving a given problem. Data collection techniques in the form of numeracy skills tests, interviews, and documentation. The instruments tested on students have been validated by 2 experts, namely mathematics education lecturers. The numeracy ability test is grouped into 3 categories which can be seen in the following table.

Table 1. *Value Interval of Numeracy Ability Category*
(Khoirudin, Dwi Styawati, & Nursyahida, 2017)

Category	Interval Value
High	71-100
Currently	41-70
Low	≤ 40

The data analysis technique used is data reduction, data presentation, and drawing conclusions. The data reduction techniques are as in the following table.

Table 2. *Numeracy Indicator*

No.	Numeracy Indicator	Work Indicator of Numeracy Ability
1	Analyze	The subject analyzes the information on the problems presented
2	Planning	The subject makes solving steps by using numbers or symbols related to basic mathematics
3	Decipher	The subject explains the completion steps that have been made before
4	Evaluate	The subject makes a conclusion of the answer from the results of the solution that has been made

(Sari & Wijaya, 2017)

To check the accuracy of the results of this study, researchers used triangulation which aims to increase the theoretical, methodological and interpretive strengths of this study (Mekarisce, 2020). Researchers used the triangulation method through tests and interviews. The data obtained from the test was then checked again by conducting interviews to obtain valid data. Interviews were conducted with subjects in each category to find out in more depth all the processes that have been carried out by students in solving the problems given.

RESULTS

Test results write conducted on 30 students, it was found that male and female students had numeracy skills which could be categorized into high, medium and low-level numeracy abilities seen from the process of doing the tests given. Of the 30 students selected, 3 male students and 3 female students to explore more in-depth information in this study. Subjects are divided into 3 categories, namely high, medium, and low. Male subject with high category is LKT, medium category is LKS, and low category is LKR. while the female subjects in the high category were domestic workers, the medium category was PRS, and the low category was PRR. The researcher conducted interviews with each of these subjects to find out how the students' numeracy skills were in solving algebra problems.

High Numeracy Ability

$$\begin{aligned} \text{dik} &= 5 \text{ pulpen} + 5 \text{ buku tulis} = \text{Rp. } 200.000 & \text{dik} &= 7 \text{ pulpen} + 3 \text{ buku tulis} = ? \\ &= 7 \text{ pulpen} + 4 \text{ buku tulis} = \text{Rp. } 175.000 \end{aligned}$$

$$\begin{aligned} x &= \text{pulpen} \\ y &= \text{buku tulis} \end{aligned}$$

$$\begin{array}{r|l} 5x + 5y = 200.000 & \times 4 \quad 20x + 20y = 800.000 \\ 7x + 4y = 175.000 & \times 5 \quad 35x + 20y = 875.000 \\ \hline & 15x = 75.000 \\ & x = 75.000 : 15 \\ & x = 5.000 \end{array}$$

$$\begin{aligned} 5x + 5y &= 200.000 \\ 5(5.000) + 5y &= 200.000 \\ 25.000 + 5y &= 200.000 \\ 5y &= 200.000 - 25.000 \\ y &= 175.000 : 5 \\ y &= 35.000 \end{aligned}$$

$$\begin{aligned} 1 \text{ pulpen} &= 5.000 & \times 7 &= 35.000 \\ 3 \text{ buku tulis} &= 35.000 & \times 3 &= 105.000 \\ \hline & & &= 140.000 \end{aligned}$$

jadi harga 7 pulpen dan 3 buku tulis = 140.000

→ analyze information
 → make steps solution
 → explain the solution steps
 → make inferences

Figure 1. Answers from male LKT subjects in the high category

According to the answers of students' s in solving algebra problems, it can be seen that LKT students in answering questions have been able to fulfill indicators of analyzing information on a given problem by writing down what information is known from the problem accordingly. LKT is also able to fulfill indicators using numbers or symbols related to basic mathematics by writing a mathematical model of the problem. LKT is able to meet the indicators to determine the steps of completion used, namely the method of elimination and substitution in solving the problem properly. Furthermore, LKT is able to fulfill the indicators of writing conclusions on the answers to the results of problem solving by concluding the final results according to the problem given. From the interview results it was found that LKT was able to mention what was known from the questions and what was asked from the questions, LKT was able to write down a mathematical model like that because he understood what was given in the problem, LKT described information like that so it was easy to calculate it, and LKT was also more liked the substitution elimination method in solving the given problem so that LKT could conclude the final result according to the question. So based on the results of the numeracy skills test and the results of the interviews, it can be concluded that the LKT subjects have been able to fulfill the four indicators, namely analyzing, designing, describing, and evaluating in solving algebra problems correctly.

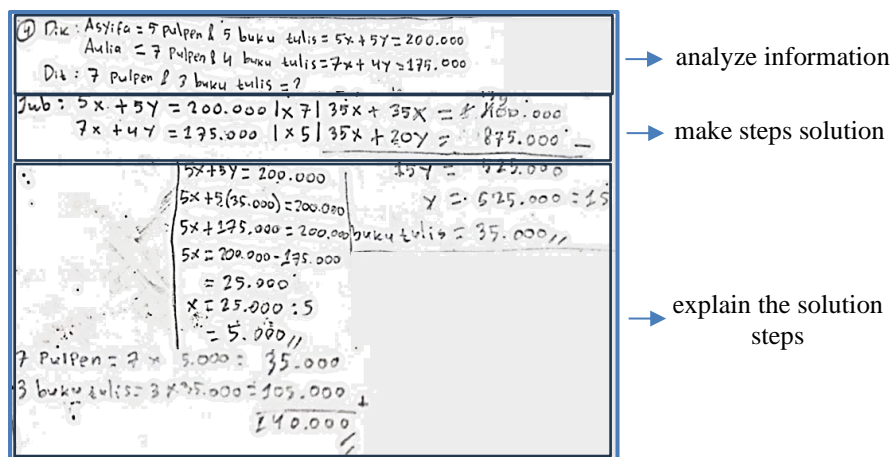


Figure 2. Female domestic worker subject answers in the high category

According to the answers of students' s in solving algebra problems, it can be seen that PRT students in answering questions have been able to fulfill indicators of analyzing information on a given problem by writing down what information is known from the problem accordingly. Domestic workers are also able to fulfill indicators using numbers or symbols related to basic mathematics by writing a mathematical model of the problem. Domestic workers are able to meet the indicators determining the steps for solving the problem used, namely the method of elimination and substitution in solving the problem properly. Furthermore, domestic workers have not been able to fulfill the indicators of writing conclusions on the answers to the results of problem solving by concluding the steps taken to solve the problem. In accordance with the results of the interviews, it was found that the homeworker was able to state what was known and asked about the questions, the homeworker was also able to explain why he was able to solve problems like that because according to him he considered that the word "and" in the questions given he interpreted as a plus symbol, so according to him he could easily change the story questions into a mathematical model, then the homeworker was able to explain the conclusions from the steps he was taking to solve them. So based on the results of the numeracy skills test and the results of the interviews, it can be concluded that the domestic worker subject has been able to fulfill the three indicators, namely analyzing, designing, describing in solving algebra problems correctly.

Average Numeracy Ability

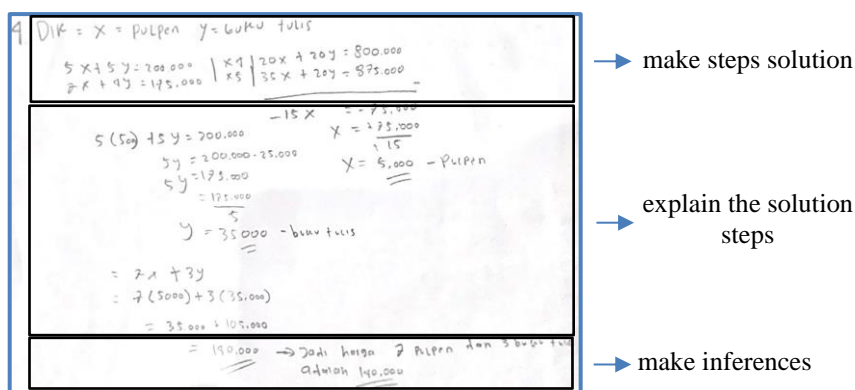


Figure 3. Answers to male LKS subjects in the medium category

According to the answers of students' s in solving algebra problems, the LKS subject was able to solve the given algebra problem, but only fulfilled a few indicators. LKS subjects have not been able to analyze the information provided, LKS only provides examples of questions with certain variables. LKS subjects are able to make steps and complete the completion steps using elimination and substitution methods in solving a given problem. Then provide additional explanations to

According to the answers of students' s in solving algebra problems, it can be seen that LKR subjects in solving problems are less able to fulfill indicators of analyzing information on a given problem by not writing down what information is known from the problem accordingly. LKR is quite capable of fulfilling indicators using numbers or symbols related to basic mathematics by writing a mathematical model of a known problem. LKR is quite capable of fulfilling the indicators of determining the settlement steps used by writing the problem-solving process even though it is not quite right. Furthermore, the LKR subject is less able to write a conclusion of the answer from the results of solving the problem accordingly. Thus, the LKR subject is only able to fulfill one indicator of numeracy ability. In accordance with the results of the interviews that have been conducted, the LKR has not been able to state what is known and asked about the questions so that he has not been able to write down the information contained in the questions, then the LKR subject also states the reasons why he did not complete the answers to the conclusion stage because he was confused about continuing the calculations which he has written. So, from the results of the numeracy skills test and the results of the interviews, it can be concluded that the LKR subject is able to fulfill one indicator, which is to describe in solving algebra problems.

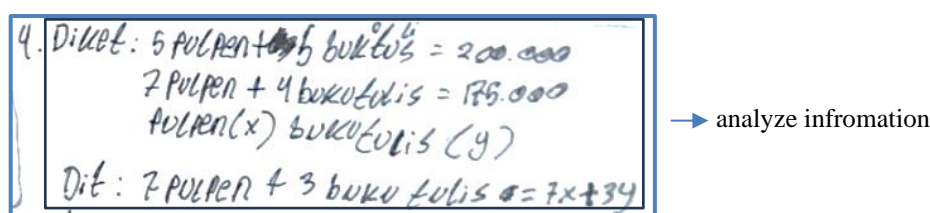


Figure 6. Answers from female PRR subjects in the low category

According to the answers of students' s in solving algebra problems, it can be seen that the PRR subject in answering the questions has been able to fulfill the indicators of analyzing information on a given problem by writing down what information is known from the problem accordingly. PRR is less able to meet indicators using numbers or symbols related to basic mathematics by not writing down a mathematical model of a known problem. PRR was less able to meet the indicators to determine the settlement steps used in solving the problem so that he could not find a solution to the problem given. Furthermore, PRR subjects were also less able to fulfill the indicators of writing conclusions on the answers to the results of problem solving. Thus, PRR was only able to fulfill one indicator of numeracy ability. According to the interview conducted by PRR, he had difficulty in making a mathematical model of the problem because he did not know how to convert the problem into a mathematical form, so he only wrote down the information he got from the problem. PRR subjects also have not been able to explain directly how the process is in solving these problems. So from the results of the numeracy skills test and the results of the interviews it can be concluded that the PRR subjects were able to fulfill one indicator, namely analyzing in solving algebra problems.

DISCUSSION

In accordance with the results of the answers and interviews conducted with 6 students with 3 categories in solving the problems given, each category was represented by 1 male student and 1 female student. The research findings discuss students' numeracy abilities based on 3 categories, namely high, medium, and low. Male students with high numeracy skills are able to fulfill the 4 indicators of numeracy ability, namely, analyzing, designing, describing, and evaluating in solving a given problem. Female students with high numeracy skills have been able to fulfill 4 indicators of numeracy skills with numeracy skills, namely, analyze, design, describe, and evaluate in solving the given problem, but on the evaluation indicator female students with high numeracy skills are only able to explain their conclusions verbally during interviews. This is because women have higher scores in oral skills, where women are able to use their potential abilities in language as measured through knowledge of vocabulary and word relations (Firmanti, 2017). In this study it was found that both women and men had no differences in numeracy skills in solving algebra problems. This is in line with

research (Baharuddin, Sukmawati, & Christy, 2021) that students who have high numeracy skills, both male and female students, are able to fulfill the 4 indicators by writing the correct answers.

Male students with moderate numeracy skills have been able to fulfill 3 indicators of numeracy ability, namely designing, describing, and evaluating. Male students have not been able to write down information from the problems given, while female students are also able to fulfill 3 indicators of numeracy ability, namely designing, describing, and evaluating, but when evaluating the results, the female student does not do it correctly because she makes a calculation error. This is consistent with research Nurhayati, Asrin, & Dewi (2022), that students who have moderate numeracy skills are unable to perform arithmetic operations correctly because students are not careful in calculating the final result of the answers given. This difference was also stated by Suryapran, Suparta, & Suharta (2016) which stated that the numeracy skills of male and female students were different with regard to arguments in solving problems that were owned by male students better than female students.

Male students with low numeracy skills are only able to fulfill 1 indicator, which is describing and female students are able to fulfill 1 indicator, namely analyzing. In accordance with research Sari, Lukman, & Muharram (2021) that students who have low numeracy skills find it difficult to solve problems because students do not understand the information provided and have difficulty solving problems so they are unable to draw conclusions on answers to the questions given.

In this study it was found that women also cannot be said to be better than men because the processes of men and women in solving problems also have differences in the level of understanding and also the accuracy in solving problems. In general, male and female students have different abilities in solving a problem (Jumarniati, Baharuddin, & Firman, 2021). In the results of previous studies, it was found that the numeracy abilities of men and women differ in solving the problems given, which according to Kartini & Maulana (2019) these differences are very important for distinguishing the roles, responsibilities, functions, and spaces for every human activity. In the world of education, gender also has a role to see the ability of male and female students to solve a problem. In accordance with research Afifah, Septiarini, & Afifah (2019) if gender differences have an influence on learning mathematics. Emphasized by Prakoso, Sugiyanti, & Happy (2021) that each gender has a variety of ways to solve a problem. Meanwhile, according to Umar & Widodo (2022) that female students also show better results when compared to male students in solving math problems. The numerical abilities of male and female students in solving math problems can be said to be different due to an understanding of the problems that each student has based on gender in the process of solving the problem he is doing.

CONCLUSION

Based on the research that has been done by researchers, it is found that male and female students have different ways of solving the problems given. This can be seen in the process of students in solving the given problem where male and female students who have high numeracy skills in solving problems have the same numeracy ability characteristics, namely, being able to analyze the information provided by writing down what is known from the problem but not being able to use mathematical symbols correctly. Male and female students who have moderate numeracy skills in solving problems have different characteristics of numeracy abilities, that is, male students are able to make and explain steps for solving, and are able to draw appropriate conclusions from answers, while female students have not been able to make conclude the answers accordingly. Male students who have low numeracy skills in solving problems have not been able to take steps to solve them, and female students are quite capable of analyzing the information provided.

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