

ANALYSIS OF STUDENTS' MATHEMATICAL COMMUNICATION SKILLS BASED ON GENDER IN SOLVING SOCIAL ARITHMETIC PROBLEMS

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Abstract

Students must master mathematical abilities, one of which is mathematical communication skills. The purpose of this study is to describe how the description of students' mathematical communication skills based on gender differences in solving social arithmetic problems. The subjects of this study were three female students and three male students who had studied social arithmetic in class. The method used in this research is qualitative method. The research was conducted at SMPN 35 Bandung. Qualitative methods are used in this research. The results of this study are that gender differences in solving social arithmetic problems can affect students' mathematical communication abilities. Female students as a whole have a greater percentage of scores on all indicators of mathematical communication skills than male students.

Keywords: Mathematic Communication, Gender, Arithmetic Social

Abstrak

Siswa wajib menguasai kemampuan matematis salah satunya yaitu kemampuan komunikasi matematis. Adapun tujuan dari penelitian ini yaitu untuk mendeskripsikan bagaimana gambaran kemampuan komunikasi matematis siswa berdasarkan perbedaan gender dalam menyelesaikan soal pada materi aritmatika sosial. Subjek dari penelitian ini ada enam yaitu tiga siswa perempuan dan tiga siswa laki-laki yang telah belajar aritmatika sosial di kelas. Penelitian dilakukan di SMPN 35 Bandung. Metode kualitatif digunakan dalam penelitian ini. Adapun hasil dari penelitian ini ialah perbedaan gender dalam menyelesaikan soal aritmatika sosial dapat mempengaruhi kemampuan komunikasi matematis siswa. Siswa perempuan secara keseluruhan lebih unggul dalam kemampuan komunikasi matematis karena memiliki presentase nilai lebih besar pada semua indikator kemampuan komunikasi matematis dibandingkan dengan 'siswa laki-laki.

Kata kunci: Kemampuan Komunikasi Matematis, Gender, Aritmatika Social

INTRODUCTION

Based on Permendikbud No. 58 of 2014 on curriculum, 2013 states that one of the objectives of Mathematics subjects is to communicate reasoning, ideas, and be able to compile mathematical evidence into tables, complete sentences or other symbols in order to clarify a problem. Mathematics is a symbolic language so when people who are going to study mathematics must have the ability to communicate these symbols (Qohar, 2011).

Mathematical communication can facilitate student make voice their opinions in mathematical knowledge (Andriani et al., 2018). As for the notion of ability, communication mathematics is the ability for students to express their ideas, describe, and present mathematical concepts coherently and clearly (Lomibao et al., 2016) and mathematical

communication is a clarification of understanding and a way of sharing ideas about learning mathematics (Suryadi, 2012). According to (Buhaerah et al., 2022) ability communication students' mathematics can be seen when students can express images into mathematical models, linking ideas mathematics to the form of images, as well as linking mathematical models to written form and (Abdi, 2018) also said that to see the ability communication mathematical students can through the ability to write, draw and express mathematics student. In the world especially education mathematics, communication is one of the general requirements that must be mastered students (Hodges & Hunger, 2011) and Mathematical communication has an important role to help students when communicating mathematical ideas and can develop skills in students' thinking abilities and understanding of mathematics.

Students have difficulty communicating and presenting their own mathematical language as well students experience confusion when presented with a context problem (Tong et al., 2021). According to (Tong et al., 2021) for mathematical communication One of the students is by making mathematical material contextually. The mathematical material presents questions regarding daily life and contextual, namely social arithmetic (Azzahra & Herman, 2022; Swastika et al., 2022). Based on research (Yulianti et al., 2018) students have an understanding of social arithmetic seen based on the use of appropriate mathematical language, explanations in giving mathematical steps that can be used in solving problems, drawing reasons used to solve problems which include the relationship between numbers used. From the results of these studies prove that by having the ability to communicate mathematically, can understand the math material being studied.

According to (Kamid et al., 2020) there are differences in abilities communication mathematics in female students with male student. As in research (Kamid et al., 2020) that mathematical abilities in explaining strategies and making steps in solving problems are clearer and structured than female students compared to male students. Then research (Islami & Priatna, 2020) states male students tend to solve problems by expressing them in sketches while female students tend to solve problems by restating them in their own language. As well as based on an interview with one of the teachers Mathematics at SMPN 35 Bandung said that there were differences in mathematical abilities, especially communication skills between the girls' class and the boys' classes. Based on the research

above and the results of interviews, that can be seen in female students have the ability communication path is better than ability communication mathematical male student.

Based on the description above, make researchers want to research more about how capabilities communicate mathematical students based on gender differences in answering problems in social arithmetic material. The purpose of this study is to describe how the picture and female students male students in communicating their mathematical ideas on social arithmetic material.

METHODS

Qualitative research was used in conducting this research. According to (Suryana & Jurusan Administrasi Pendidikan, 2007), the stages carried out in this study were 1) preparation, 2) fieldwork and 3) data analysis. At the preparatory stage, the researcher observed the locations to be studied and the criteria whether students are in accordance with the objectives of the research based on the results of interviews with one of the teachers mathematics at SMPN 35 Bandung. Then at the stage of work in the field, the researcher determines the subject to be studied. Subject selection is taken by using techniques purposive *sampling* i.e. determine randomly by condition students who have studied social arithmetic material according to the initial procedure for selecting subjects research is choosing female students male students as well as based on recommendations from teachers. One of the class VII SMP at SMPN 35 Bandung will be taken again 6 students to get more in-depth information. The subjects of this research are three female students and three male students. The subject in question is students who have studied social articulation at school. In this study, all subjects were given social arithmetic questions. Social arithmetic questions are made from ability indicators communication mathematically according to (Putra Imam Wijaya et al., 2016) namely (1) being able to express mathematical ideas through written form; (2) able to understand and interpret ideas mathematical in written form into the form of symbols or symbols of mathematics; and (3) able to use mathematical notations to convey ideas as well as relationships with model the situation into written form. Following are the guidelines for scoring students' mathematical communication abilities.

Table 1 Guidelines for Scoring Students' Mathematical Communication Ability

Indicator	Score	Information
Able to express mathematical ideas in written form	0	There is no answer, even if there is one, it only shows that they do not understand the concept so that the information provided is meaningless
	1	The explanation is mathematically correct but incomplete
	2	The explanation is mathematically correct and complete
Able to write a complete answer and a clear explanation of a problem	0	There is no answer, even if there is one, it only shows that they do not understand the concept so that the information provided is meaningless
	1	Make pictures, diagrams or tables according to the concept but incomplete
	2	Create appropriate and complete drawings, diagrams or tables
Able to express daily events in language or mathematical symbols	0	There is no answer, even if there is one, it only shows that they do not understand the concept so that the information provided is meaningless
	1	Few of the mathematical approaches are correct
	2	Making the right mathematical approach, but wrong in getting the solution
	3	Making the correct mathematical approach, correct solution, but missing steps
	4	Make a mathematical approach correctly, then perform calculations or get a complete and correct solution
5	Make a mathematical approach correctly, then perform calculations or get a complete and correct solution and be able to write conclusions correctly	

(Damayanti et al., 2020)

After all subjects completed the questions, the answers from all subjects were analyzed. To observe abilities communication mathematical Students can be observed with the process

of how the test is done and the results that are done student. In addition, it is equipped with the results of interviewing students more deeply about how it works.

Reducing data, presenting data, and making conclusions are data analysis techniques in this study. According to (Sugiyono, 2013) one technique for investigating the credibility of a data is triangulation which includes interviews, observations of the subject's work in mathematical communication tests.

RESULTS AND DISCUSSION

Results

Based on the results of the ability test communication math that has been done by 3 female students with 3 male students based on ability indicators communication mathematical and gender differences obtained the following data.

Table 2. Average Ability Score Communication Mathematics of female and male students

No	Ability indicator communication mathematical	Average score of female students (%)	Average score of male students (%)
1	Able to express mathematical ideas through written form	93,3	72,7
2	Able to understand and interpret mathematical ideas in written form in the form of mathematical symbols or symbols	80	67,7
3	Able to use mathematical notations to convey ideas and relationships with models situation in written form	80	73,3

84,4

71,2

In table 1, it can be seen that female students are more prominent in all indicators compared to male students as well as for the grand total female students get 84.4% greater compared to only 71.2% male students.

Discussion

To describe abilities of communication mathematics in social arithmetic material based on gender differences, a more detailed analysis is carried out on the results of the answers students based on ability indicators communication mathematical students as follows.

1) Able to express mathematical ideas through written form

Based on the data in Table 1, in the first indicator, the average value is obtained female students are greater than male students, seen from the percentage of the average value of 93.3% for female students while 72.7% for male student. Selected subject one male students with the results of the answers in Figure 2 and female students with the results of the answers in figure 1 for question number 2.

2. Diketahui : Ibu Linda ingin membeli beras dengan harga per-kilo lebih murah.

Ditanya : Beras merek apa yang Ibu Linda beli berdasarkan berat bersih (netto)?

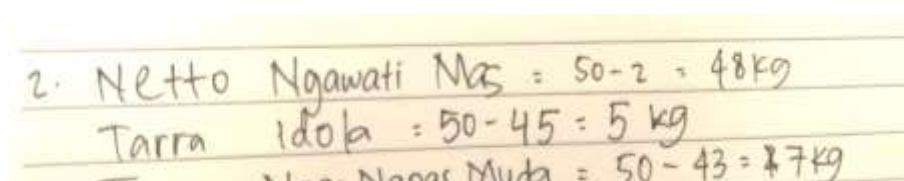
Jawab :

Merek Beras	Harga	Bruko	Netto	Tara
Ngawiti Mas	Rp 768.000,00	50 kg	$B-N = 50 - 2 = 48 \text{ kg}$	2 kg
...	Rp 1.200.000,00	50 kg	45 kg	$B-T = 50 - 45 = 5 \text{ kg}$

Figure 1 Results of Female Student Answers

The image above shows the results of the answers female students are more structured and clear such as rewriting information on questions, question questions, compared to the

results of answers from male student. The characteristics of the subjects in the first indicator are that female subjects are very accurate and detailed in expressing mathematical ideas in written media compared to male subjects. This is in accordance with the results of research (Kamid et al., 2020) that the mathematical ability to explain strategies and make problem solving steps clearer and more structured than female students compared to male student. This shows that in the first indicator of mathematical communication is being able to express mathematical ideas through written form, female students have met these indicators compared with male student.



Handwritten mathematical calculations on lined paper:

$$\begin{aligned} 2. \text{ Netto Ngawati Ngas} &= 50 - 2 = 48 \text{ kg} \\ \text{Tarra Idola} &= 50 - 45 = 5 \text{ kg} \\ \text{Netto Nanas Muda} &= 50 - 43 = 7 \text{ kg} \end{aligned}$$

Figure 2 Results of Male Students' Answers

2) Able to understand and interpret mathematical ideas in written form in the form of mathematical symbols or symbols

Based on the data in Table 1 that in the second indicator, the average value is obtained female students are greater than male students, based on the percentage of the average value of 80% for female students while 67.7% for male student. Selected subject one male students with the results of the answers in Figure 2 and female students with the results of the answers in Figure 1 for question number 2. Based on the results of the answers to Figure 1 and Figure 2, it shows that female students are able to translate a mathematical problem into a concrete model such as mathematical symbols rather than male gender students. The picture shows female students to write gross, net, tara, 'female students symbolize with letters while male students immediately write answers.

3) Able to use mathematical terms or notations to convey ideas or relationships with situational models in written form

Based on the data in Table 1, in the third indicator, the average score obtained by female students is greater than male students, based on the percentage of the average value

of 80% for female students while 73.3% for male student. Selected subject one male students with the results of the answers in Figure 4 and female students with the results of the answers in figure 3 for question number 4.

4. Dik = Pak Eko menabungkan uang di bank
 sebesar Rp 500.000
 Bunga 6% per tahun
 Dit = Berapa bunga yang dimiliki pak Eko
 selama 8 bulan?
 Jawab : Bunga = Modal \times % Bunga \times Bulan
 $\frac{12}$

$$\text{Bunga} = 50000 \times \frac{6}{100} \times \frac{8}{12}$$

$$\text{Bunga} = 20000$$
 Jadi, Bunga yang dimiliki pak Eko selama 8 bulan
 sebesar Rp 20.000

Figure 3 Results of Female Student Answers Number 4

4. Bunga?

$$B = \text{Modal} \times \text{Persen} \times \frac{\text{Bulan}}{12}$$

$$= 50000 \times 6\% \times \frac{8}{12}$$

$$= 50000 \times \frac{6}{100} \times \frac{8}{12}$$

$$= 20000$$

Figure 4 Results of Male Student Answers Number 4

The third indicator is being able to use mathematical terms or notations in conveying ideas and relationships with the situation model in written form. On this indicator, based on Figure 4, male students use more disorganized steps in answering questions and more than a few strokes that do not match the purpose of the questions, and write answers without steps and mathematical terms. This is in accordance with the results of research from (Putra Imam Wijaya et al., 2016) that male students tend to write in ability communication random math, has more than a few strokes and doesn't care about aesthetics for writing. Meanwhile on female students, in the results of the answers to figure 3, female students provide many explanations, answer questions in a structured sequence and rigid steps.

Female students for all indicators the average score of mathematical communication as a whole is 84.4% greater than that of male students who obtained 71.2%. It can be concluded, female students

are superior in ability communication mathematical in solving social arithmetic problems compared to male student.

CONCLUSION

The formulation of the problem in this study is how mathematical communication skills are based on gender in solving social arithmetic problems. In this study, ability communication mathematical female and male students of class VII SMPN 35 Bandung it can be concluded that gender differences in solving questions on social arithmetic material can affect the ability communication mathematical student. Female students have a percentage of scores on ability indicators communication mathematical students are bigger than male student. The indicators of mathematical communication ability are (1) being able to express mathematical ideas through written forms such as writing information on questions; (2) being able to understand and interpret mathematical ideas in written form into mathematical symbols or symbols such as calculating interest percentages; and (3) being able to use mathematical terms or notations to convey ideas and relationships with situational models in written form such as gross, net, tara notations. This study only analyzes the communication skills of female students and male students so it does not conclude what causes the ability of female students to be superior to male students. Suggestions for researchers to further examine what causes gender differences can affect students' mathematical communication abilities.

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