

MATHEMATICS COMMUNICATION ABILITY OF JUNIOR HIGH SCHOOL STUDENTS BASED ON GENDER IN TERMS OF SOLO TAXONOMY

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ARTICLE INFO

Article history:

Received Dec 25, 2021
Revised Dec 27, 2021
Accepted Dec 31, 2021

Keywords:

Mathematics
Communication Ability
Solo Taxonomy
Gender

ABSTRACT

This study aims to determine mathematics communication ability of junior high school students based on gender in terms of solo taxonomy. In order to do so, we used qualitative method with interviews and tests. The instrument in the study was a communication skill test with 4 items of description based on a solo taxonomy and interview. We conducted the instrument to 30 junior high school students with 15 male students and 15 female students.. The results of this study indicate the percentage of student response quality in completing the written test about the set including male students at the prestructural level as many as 4 students or 26.7%, unistructural level as many as 1 student or 6.6%, multistructural level as many as 4 students or 26, 7%, at the relational level as many as 5 students or 33.3% and at the extended abstract level there is no while for female students at the prastructural level as many as 1 student or 6.7%, the unistructural level as much as 1 student 6.7%, multistructural level 4 students or 26.6%, the relational level is 7 students or 64.6% and the extended abstract level is 2 students or 13.4%. Based on the result, we conclude that the quality of the responses of male and female students in solving mathematics are in the relational level, which female students have a higher percentage than male students. They already able to relate the information to solve the problems given by accurate and draw conclusions.

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How to Cite:

Mumtaha, N., Aripin, U. (2021). Mathematics Communication Ability of Junior High School Students based on Gender in Terms of Solo Taxonomy. *JIML*, 4(4), 188-197.

INTRODUCTION

According to Lestari, n.d.(2015) that mathematics is a science regarding the logic of form, structure, goals, and concepts which are divided into several branches in each study that is logical, systematic, and consistent. So mathematics is a structure or arrangement of concepts,

logic, and propositions that have proven validity and apply systematically and logically in every study of science.

According to Diningrum et al., (2018) the relationship between mathematics and students' mathematical communication skills can affect their learning style which is no longer only glued to the notes given by the teacher. Therefore, to get good mathematics learning outcomes, students need to have good mathematical communication skills as well. Mathematics learning is a complex process, because learning activities always integrate various components and activities, namely students with the learning environment to obtain behavioral changes (learning outcomes) in accordance with the expected goals.

According to Putri & Manoy, (2011) SOLO taxonomy is used to measure the ability of students to respond to a problem that is classified into five distinct and hierarchical levels namely Prestructural, Unistructural, Multistructural, Relational, and Abstract expanded.

Level of student thinking response is likened to a staircase students have to climb during learning. This corresponds to Where is constructivism learning theory students have to build their own knowledge in his mind and the teacher can provide convenience for the process this, by giving students opportunity to find and implement their own ideas, and teach students by aware of using their strategy alone to study (Desyana, 2020).

The role of mathematical communication in everyday life according to Mahmudi, (2006) The communication process can help students build their understanding of mathematical ideas and make them easy to understand. When students are challenged to think about mathematics and communicate it to other people/students orally or in writing, they are indirectly required to make mathematical ideas more structured and convincing, so that the ideas become easier to understand, especially by themselves. Thus, the communication process will be beneficial for students in their understanding of mathematical concepts.

NCTM, (2020) Sets standards for students' mathematical communication skills, namely so that students can: (i) Organize and consolidate their mathematical thinking through communication, (ii) Communicate their mathematical thinking coherently and clearly to friends, teachers, and others, (iii) Analyze and evaluate the mathematical thinking and strategies of others, and (iv) Use mathematical language to express mathematical ideas appropriately. In this study, the authors focus on the aspect of determining the context of an idea or mathematical model using oral, written, concrete, graphic, and algebraic methods; aspects of performing mathematical manipulations, aspects of explaining and making questions about the mathematics that has been studied, aspects of making conclusions by compiling evidence, and aspects of checking the correctness of solutions by providing strong arguments.

Through communication, students can explore and consolidate mathematical thinking, knowledge and development in solving problems using their mathematical language (Awaliyah et al., 2019). So mathematical communication skills are the most important part in learning mathematics to express ideas or strategies in solving problems.

Likewise, according to Fatmasuci, (2017) in his research, he got a picture of the weakness of students' communication skills because in mathematics learning so far they have not given more attention to the development of communication skills.

Meanwhile, in the research of Munawaroh et al., (2018) there are still many junior high school (SMP) students who have quite a bit of difficulty in learning geometry. Based on the results of the researcher's interview with one of the Mathematics teachers at the research object school, on the quadrilateral subject the results of the average learning of class VII students in the previous academic year were 70, while the KKM was 75. This indicates that the average score of student learning outcomes on the material. Based on the explanation above, it can be concluded that the analysis of student errors in doing math problems can be used as a good alternative and quite useful in improving mathematics learning. So that in the future teachers can use more appropriate strategies in learning related to quadrilateral and triangle questions.

Based on Hodiyanto, (2017) indicators used to measure mathematical communication skills in this study are:

1. Expressing a situation or mathematical idea in the form of a picture and solve it (drawing).
2. Express a situation or mathematical idea in the form of symbols or mathematical model and solve it (mathematical expression).
3. Express and explain an image or mathematical model in the form of mathematical ideas (written texts).

According to Fakhri (Santoso, 2015) Biological difference is God's nature which is permanently different from the notion of gender. Gender is a socially constructed difference in behavior between men and women, namely differences created by humans (not nature) through a long social and cultural process.

According to MZ, (2013) based on psychological research shows that there are differences in students' mathematical abilities from the gender aspect. The difference lies in how male students and female students solve problems, in This is the ability to solve spatial problems. Thus, there is a diversity of views about the students' mathematical abilities and anxiety from the gender aspect. Girl shown to have lower levels of out-of-school spatial experience than boys, Many girls never explore their potential for spatial thinking unless Spatial thinking is taught in the school curriculum. Although there are differences that show boys' superiority in spatial skills, there is an important variation, which includes a number of girls with high spatial potential.

Therefore, based on the explanation above, the purpose of this study was to determine the mathematical communication skills of class VII SMP in terms of a solo taxonomy based on gender. to determine mathematical communication skills by giving 4 questions and analyzing the results of students' answers using a solo taxonomy.

METHOD

The type of research used in this research is descriptive. While the subject the research consisted of 30 students (15 male students) and (15 female students) in class VII.

Written test results data seen from working on math problems for class VII B students at MTs Darul Fikri Cipongkor for the 2021/2022 school year. With this test, researchers can measure students' communication skills in solving math problems on set material. There are 4 essay questions on set material.

The research instrument used in this research is the communication ability test mathematically.

Data analysis techniques to be used by researchers while in the field is to use the Miles and Huberman model (Febiyanti et al., 2020) :

1. Data reduction

Data reduction leads to process haven't been able to finish with selecting, focus, simplify, abstract and transform raw data written in field notes. First, determine the quality of the responses given by students based on the level of SOLO taxonomy ability. The descriptors of the SOLO taxonomic level are as follows. Regarding the student response indicators based on the SOLO taxonomy which is the reference source used in this study, according to Biggs and Collis (Febiyanti et al., (2020) explaining five levels in responding to a question. The following is an explanation of the SOLO taxonomy level:

a. Prestructural

Students refuse to engage in an assignment, are confused, inconsistent, and repeat questions. In this case the students did not succeed in linking the information to the questions.

b. Unstructural

Students have an information that is connected and able to tie it in working on the problem.

c. Multistructural

Students have two or more pieces of information and are able to apply it in solving problems. But students are not able to relate the information.

d. Relational

Students have two or more information and are able to relate the information in order to solve the problem correctly.

e. Extended Abstract

Students have two or more information and can relate the information correctly. Also, students are able to generalize the relationship into a new concept.

2. Presentation of data

Presentation of data is done by shows and displays a collection of data or information that has been organized and categorized, thus enabling a conclusion or action.

3. Drawing conclusions

Drawing conclusions in this study carried out from the results of student work. From this activity a conclusion can be drawn at the level of students in responding or providing an answer based on the SOLO taxonomy, so that the problems and objectives of this research can be answered.

Frequency of choice student answers are calculated based on percentage of students' answers which corresponds to the response level determined for each question number by using the following equation this:

$$A = \frac{X}{n} \times 100\%$$

Description:

A = Percentage of student responses

X = Number of students who reach level specified response.

n = Number of student who took the test

Using the solo taxonomy method to make it easier to measure the level of students' communication skills.

RESULTS AND DISCUSSION

Results

As the description of the completion of the first student, the questions were distributed well. The prestructural level is the level where students have very little unrelated knowledge. then it does not build a concept at all and does not have any meaning. In the questions that were completed, most of the students made mistakes in understanding the questions so that they were unable to communicate their knowledge into each item.

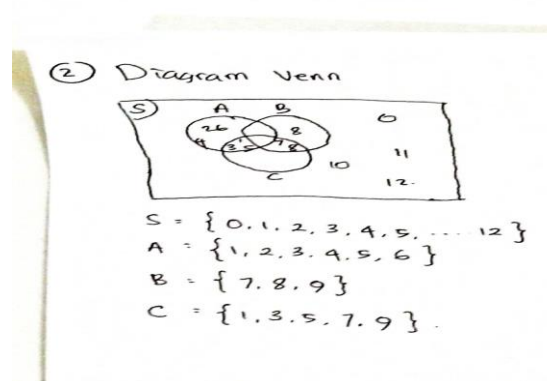


Figure 1. Student Answer

The student's response in the figure 1 shows the relational level where students have two or more information from the data and can relate the information to solve the problem correctly. At this level students are able to communicate their knowledge well.

Next, the researcher grouped each remaining answers which had almost the same processing. Therefore, the researchers obtained the percentage of student response levels in completing the written test of mathematical communication skills based on gender can be seen in table 1:

Tabel 1. Presentation table of the quality level of students in solving mathematical communication test questions male student

Response Rate	Number of students	Percentage	Category
Prastructural	4	26,7 %	Very Less
Unistructural	1	6,6 %	Not Enough
Multistructural	4	26,7 %	Good
Relational	5	33,3 %	Very Good
Extended Abstract	1	6,7 %	Good
Amount	15	100 %	

Seen in table 1, it was found that the response of male students' mathematical communication skills got the highest score at the relational level of 33.3%. where students have two or more data and are able to connect information to solve problems correctly.

Tabel 2. Presentation table of the quality level of students in solving mathematical communication test questions female student

Response Rate	Number of student	Percentage	Category
Prastructural	1	6,7 %	Not Enough
Unistructural	1	6,7 %	Not Enough
Multistructural	4	26,6 %	Good
Relational	7	46,6 %	Very Good
Extended Abstract	2	13,4 %	Good
Amount	15	100 %	

While in table 2 it is found that the response of female students' mathematical communication skills gets the highest score at the relational level of 46.6%. where students have two or more data and are able to connect information to solve problems correctly.

Discussion

Based on Table 1 and Table 2 occurred the difference is that the male students are at most Student responses are at the Relational category, which very good, while female students are at the relational category very good. However, at the level extended abstract, the number of male student responses as much as good and female student responses as much as good. It could be said that the student's response reach the level of extended abstract more female students more than male students.

Based on the results of the data analysis carried out from the results of answers and student interviews in solve math communication problems on each level in the SOLO taxonomy is as follows:

1. Prestructural Level

The response of the male student who is at the prestructural category on the test was very less. While the response of female students at the prestructural level was not enough. Overall, the response of male students at the prestructural category was very less. hereby states that the number of male students' responses at the prestructural level is more than that of female students.

At this level, students have not been able to understand the concept, so the written answer does not have any meaning, so that the student's response at the prestructural level: (1) students can use the information obtained from the questions but the process used is not correct, (2) students cannot form a unified concept and have no meaning. whatever based on the answer given, (3) students do not have the skills used to complete assignments so students cannot do assignments properly, (4) students do not understand the problem at all and don't know what to do, students use some or all of the data, create a process that does not have any meaning.

Research results Andesty, (2017) to shows that students at the prestructural level have not been able to in solving ability test questions and cannot mentions known information with the problem to be solved. also not able to connect some knowledge in determine strategies and problem solving procedures, students have not able to apply the concepts of numbers and do not understand the material.

2. Unistructural Level

Response of male students who are at unistructural category on not enoght the test, while the response of female students at the unistructural category as much as Not enough. In this case, the number of student responses that are at level unistructural for both male and female students daughters have something in common.

Indicators of student response at the unistructural level in solving mathematical communication problems are: (1) students only use at least one information and use concepts or a known process, (2) students only use one concept or the right process but the conclusions obtained are irrelevant, (3) students use the process based on the data selected correct but the conclusions obtained are irrelevant, (4) students do not understand concept but can apply it so that it can get the right answer.

While the results of the study according to (Febiyanti et al., 2020) that the unistructural level is that students with the quality of this response are able to understand the problem by using some information but can't yet planning and solving problems well. At this level it appears that clear and simple relationship between one concept to another but the core the concept is not widely understood.

3. Multistructural Level

The male student's response is at level multistructural in the test as much as good. While student responses son who is at the multistructural level at test as much as good. Based on the results above, it can be seen that the number of students who are at level multistructural there are more male students than female students but not much different.

Indicators of student response in solving problem solving problems, showing that the responses of students who are at the multistructural level: (1) students are able to express the purpose of the questions, (2) students have two or more information and are able to relate them in solving problems, (3) students are able to describe answers correctly, but cannot make connections from some of the information correctly.

In line with research (Febiyanti et al., 2020) multistructural level with the quality of the response this student already understands questions well and able to plan correctly but can't do it yet questions correctly and well.

4. Relational Level

Response of male students who are at level relational test as much as very good. Meanwhile, the response of female students who are at the relational level as much as very good. Student who are at this level, both in female students as well as male students experienced an increase from test . However, there is a difference which is quite significant, namely there are more female students than male students.

Indicators of students who are at relational level: (1) students are able to express the purpose of the questions, (2) students are able to complete answers correctly, and are able to make connections from some information correctly, (3) students understand concepts, plan how to solve problems and carry out the planning.

According to research results (Febiyanti et al., 2020) At the relational level In this way, students can show understanding several components of a single unit concept, understand the role of the parts for overall and have been able apply a concept to similar circumstances. At this level not found the location of the error, type errors, and factors causing errors.

5. Level Extended Abstract

Response of male students at the extended level abstract test as much as good. Meanwhile, female students' responses at the extended level abstract test as much as good. Based on the description, it can be seen that the responses of students who are at level extended abstract more female students than male students.

Responses of students who are at the level of extensioned abstract shows: (1) students are able to explain the meaning of the problem, (2) students have two or more information and apply it in solving problems, (3) students are able to convey answers correctly and are able to describe the relationship of some information, are also able to generalize it into a new topic.

In line with the results of the research (Ekawati et al., 2013) that at the extended abstract level students are able to use information well and can relate it to the question in question to obtain an appropriate result and be able to re-examine the answer according to the question request concept that will be used for troubleshooting, error in write the final answer that is the subject no able to use the information obtained to write the final answer appropriately.

In line with (Febiyanti et al., 2020) in his research, Based on the analysis of the answer descriptions for class IV B SD Negeri Mancogeh compared to the solo taxonomy, the level of response quality for class IV B students in solving math problems consists of 5 levels, namely prastructural, unistructural, multistructural, relational and extended abstract. Overall shows that the responses of class IV B students tend to be at the relational level, where students can understand the questions well and are able to solve problems properly and correctly.

CONCLUSION

The dominant male students' responses were at the prestructured, multistructural and relational levels for female students at the multistructural, rational and expanded abstract levels. Because the thinking level of male students is more logical and when they get information they are less able to communicate it well and for female students' thinking if they get information, it is understood first and then connected with the intent of the question and can answer questions correctly.

ACKNOWLEDGMENTS

Researchers are very aware that during the preparation of the article, there was a lot of help from various parties. Therefore, on this occasion the researcher is very grateful to the head of the two parents who always provide encouragement and support, not forgetting the principal of MTs Darul Fikri, mathematics teacher, and all students of class VII B. With the support of all parties, the researcher was able to complete research and writing of this scientific article.

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