

Analysis of Mathematical Communication Skills of Junior High School Students Reviewed from Gender and School Origin

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Abstract—This study aims to analyze and describe the mathematical communication skills of junior high school students reviewed from gender and school origin. This reaserch is a qualitative descriptive study, with the subject of the study being the eighth grade students of Pasir Sakti State 2 Junior High School, which subject of study eight students, namely 4 students from State elementary schools (2 males and 2 females) and 4 students from Private elementary schools (2 males and 2 females). The data collection technique was mathematical communication skills tests used the data presentation material consisting two questions. The research data was collected by researchers directly. Technique of data analysis in this study are Data Reduction, Data Display, and Conclusions Drawing/Verification. The results showed: The mathematical communication skills of junior high school students overall are (1) The ability of female students were higher than male students with a difference of 11.11%. (2) The ability of students from public elementary schools were higher than students from private elementary schools with a difference of 2.78%. (3) The ability of students in Drawing aspect were higher than Written Text aspect, and Mathematical Expression aspect.

Keywords: *mathematical communication skills, gender, school origin*

I. INTRODUCTION

Mathematics is complex science where its delivery can be in the form of spoken language, symbols, tables, graphics, and others media. Mathematics has a role as a symbolic language that enables the realization of accurate communication [1]. Communication used in mathematics can be in the form of symbols. For example the symbol "+" represents the sum, the symbol "-" represents the reduction,

the symbol " π " represents Pi, the ratio of the circumference of a circle to its diameter, the symbol " \int " represents the inverse of the derivative operation and the limit of the sum or an area of a certain area, and others. Students' understanding of these symbols shows that students have understood communication well in mathematics.

Mathematical communication is one of the abilities students must have. National Council of Teachers Mathematic (NCTM) establishes five standard abilities that students must have in learning mathematics. This ability consists of the ability to problem solving, reasoning, connections, communication, and representation [2]. One of the abilities that support mathematical language expression is mathematical communication skills. NCTM explains that mathematical communication is the student ability to describe algorithm and the unique way to solve the problems [3]. The student's ability is to construct and to explain the graphical phenomena of the real world, words/sentences, equation, table, and physically, or the student's ability to conjecture the hypothesis about picture geometry.

In other words, thinking is a dialogical effort, where one asks questions, investigate possible solutions and reflect upon them [4]. Schoenfeld said, to making decision in life, on the job, and in matters of public are increasingly for quantitatively sophisticated reasoning. More than ever before, now students need to learn to thinking reason and communicate using mathematical skill ideas [5].

Brendefur dan Frykholm argument that it is important for teacher educators to be aware of teachers' conceptions of communication as a vehicle for developing learners' mathematical understanding [6]. Than NCTM said that communication standard which purpose in Instructional programs to enable all students to communicate their mathematical thinking to peers, teachers, and others with

way coherently and clearly; to study how to analyze and evaluate the mathematical thinking and strategies of others and use the language of mathematics to express mathematical ideas perfectly [2]. Pourdavood and Wachira add that by mathematical communication and literature, teachers can foster student activity and participation while focusing on the deep conceptual understanding for in the Common Core of mathematics standards [7].

Cotton said that communication is an essential part of mathematics and mathematics education. give opportunities for students to apply, examine, prove and communicate mathematics give meaning to the discipline, and develop a deeper understanding of mathematics [8]. Sundayana explains that Mathematical communications are a central skill for students to formulating concepts and strategies in mathematical problem, success for students on approach and completion in scientific exploration and investigation, and a means for students in communicating with others to obtain information, share thoughts and inventions, brainstorm, appraise, and sharpen ideas to convince others [9].

There are several components in mathematical communication according to Cai, Lane, and Jacobsinn :

- Written Text is the ability to provide mathematical explanations with language that is easily understood.
- Drawing is the ability to express mathematical ideas in the form of drawings, diagrams, and tables completely and correctly.
- Mathematical Expression is the ability to model mathematical problems correctly so that the calculation of problem solving is complete and correct [10].

Generally, the mathematical communication skills of students in junior high school are relatively bad. According to Pane et al some students have mathematical communication skills that are still low in mathematics. There are many factors that cause the low mathematical communication skills of students, among them; students are less able to connect pictures and diagrams into mathematical ideas and symbols. Also there are still many students who are less enthusiastic about learning mathematics [11]. Furthermore, Hasibuan dan Amry (2017) also reinforces this statement by stating that once the importance of mathematical communication ability in mathematics, but the facts encountered with the field shows that the still low ability of students ' mathematical communication . The low of students' mathematical communication ability is a importance of mathematical communication skill in mathematics, but the real encountered with the field shows that the low ability of ' mathematical communication students . The low of students' mathematical communication skills are present by many factors, there are how to teach a teacher in the learning process, education orientation in Indonesia generally handle the students as an object, the teacher as the highest authority on science and subject-oriented matter [12].

Disasmitowati dan Utami add that while students with cognitive and psychomotor aspects are low, the students' mathematical communication skill is also low. Therefore, in the learning process students with low communication skills in the learning process needs special guidance [13].

From the opinions above, it can be concluded that mathematical communication is a very important ability. Mathematical communication skills are the ability to communicate mathematics verbally, visually, and in written form, using appropriate mathematical vocabulary and various appropriate representations, as well as paying attention to mathematical rules. Mathematical communication skills include aspects of Written Text, Drawing, and Mathematical Expression

There are many factors in learning and solving mathematical problems including student readiness, student innate factors, or other external factors. Differences in student psychology can trigger differences in learning readiness and solving mathematical problems. Likewise with gender differences. Indrawati and Tasni say that related to the influence of cognitive aspects which is one of the innate aspects of male and female that can change and develop at any time [14]. Therefore cognitive aspects include ways of thinking including gender differences. Linberg et al conduct gender differences research used meta-analyzed data from 242 studies published between 1990 and 2007, representing the testing of 1.286.350 people. The result indicating no gender difference. Taken together, these findings support the view that males and females perform similarly in mathematics [15].

In the other slide, there are two important things that were discovered by Fryer and Levitt that first, there are no mean differences between boys and girls in school, but girls are lose one-fourth of a standard deviation relative to boys over the first six years of school. Second, they evidence show that the gender math gap (gender) is especially large among children who attend private schools, have highly-educated mothers, and have mothers working in math-related occupations. All factors that one understood and think under some theories would be conducive to girls' success in mathematic [16]. Hyde et al in their study explains that the results of meta-analyses complex of gender differences in attitudes and affect specific in mathematics. Overall, effect were small and were similar in size to gender differences in mathematics performance. When differences be present, the pattern is for females to hold more negative attitudes. Gender differences in self-confidence and general mathematics attitudes are larger among high school and college students than among younger students. The effect sizes for mathematics anxiety different depending upon the sample (highly selected or general) [17].

Therefore gender differences are one of the factors that can influence the resolution of mathematical problems. With the variations in the results of previous studies can be an interesting reference to be explored further. Besides gender

differences, many external factors influence for example the way students to receive their lessons. Admission of junior high school students can come from various elementary schools. These different elementary schools are likely to influence students' ability to solve math problems in junior high school.

Primary schools are divided into two type's namely public primary schools and private primary schools. Public Schools are schools provided by the state (Government) with all free facilities, ranging from classes to teachers being paid by the government to provide facilities to the people. While private schools are not managed by the government. Private Schools are managed in foundation forms. They have the right to select students and are funded in whole or in part by charging school fees to students. But students can still get scholarships to enter private schools with the talent they have.

Saifulloh and Hermanto said that reality at this time, there are many teachers who have mastered learning strategies and models, but the reality in our field is that there are still many teachers who are still impressed teaching only implement obligations, many lectures (telling methods) and less help developing student activities can be found in almost all schools, both in public and private schools, are no exception in Islamic-based schools [18].

In learning mathematics, we are familiar with the data. Students must at least be able to read data. The concentration of knowledge that studies about how to plan, collect, analyze, present is statistics. In learning statistics, begins with the introduction of data, which is learning to present data. Data presentation material is taught to students of class VII in second semester. Material of data presentation is very important because students learn from reading data, observing, gathering information, and solving problems related to the type of data and its presentation. Therefore, researchers are interested in making this research.

II. RESEARCH METHODS

This type of this study is descriptive qualitative with the aim of describing the mathematical communication ability/skills of junior high school students reviewed from gender and school origin. The subjects of the study were eighth grade students of Pasir Sakti State 2 Junior High School in the first semester of the 2019/2020 academic year, totaling 8 students. There are 4 students who come from state elementary schools (2 males and 2 females) and 4 students who come from private elementary schools (2 male and 2 female).

The data collection technique was mathematical communication skills tests used the data presentation material consisting two questions. The research data was collected by researchers directly. Technique of data analysis in this study are (1) Data Reduction: is done by grouping and selecting data from the result of tests so that it leads to the focus of the study. The grouping and selecting data based on

aspects mathematical communication skill in each gender and school origin. (2) Data Display: is the data display of the result of tests that is presents clearly and systematically making it easier for researchers to make decision. Data display based on each aspects mathematical communication skill in each gender and school origin with systematically. The percentage of abilities is made based on gender and school origin. (3) Conclusions Drawing/Verification: is the effort to obtain conclusions based on data that has been through the process of reduction and presentation of data. Researchers made conclusions based on percentage of abilities subject.

III. RESULTS AND DISCUSSION

A. Results

The result of mathematical communication skills of junior high school students conducted by eight students are presented below.

TABLE 1. THE RESULT OF MATHEMATICAL COMMUNICATION SKILLS OF JUNIOR HIGH SCHOOL STUDENTS REVIEWED FROM GENDER AND SCHOOL ORIGIN

Aspect	% Male Score	% Female Score	% Public ES Score	% Private ES Score
<i>Written Text</i>	50	58,33	58,33	50
<i>Drawing</i>	62,5	83,33	75	70,83
<i>Mathematical Expression</i>	25	29,17	25	29,17
Total Average	45,83	56,94	52,78	50

Note:

ES = Elementary School

From Table 1 it is found that the Written Text aspect for female students is higher than male students. The percentage of the ability of male students in Written Text aspects was 50% while the percentage of female student abilities was 58.33%, so the difference was 8.33%. The Drawing aspect for female students is higher than male students. The percentage of the ability of male students in the Drawing aspect is 62.5% while the percentage of the ability of female students is 83.33%, so the difference is 20.83%. The Mathematical Expression aspect for female students is higher than for male students. The percentage of male student abilities in the Mathematical Expression aspect is 25% while the percentage of female student abilities is 29.17%, so the difference is 4.17%.

Overall mathematical communication skills of female students are higher than male students. The average total ability of male students was 45.83 while female students were 56.94 with a difference of 11.11%. For mathematical communication skills, it is known that the highest aspect of Drawing is then followed by the Written Text, and Mathematical Expression aspects of both male and female students.

Based on the table above it is also found that the Written Text aspect for students from public elementary schools is higher than for students from private elementary schools. The

percentage of students' ability from public elementary schools in the Written Text aspect was 58.33% while the percentage of students' abilities from private elementary schools was 50%, so the difference was 8.33%. The Drawing aspect for students from public elementary schools is higher than students from private elementary schools. The percentage of students' ability from public elementary schools in the Drawing aspect is 75% while the percentage of student abilities from private elementary schools is 70.83%, so the difference is 4.17%. But on the Mathematical Expression aspects for students from private elementary schools are higher than students from public elementary schools. The percentage of student abilities from public elementary schools on the Mathematical Expression aspect is 25% while the percentage of student abilities from private elementary schools is 29.17%, so the difference is 4.17%.

Overall mathematical communication skills of students from public elementary schools are higher than students from private elementary schools. The average total ability of students from public elementary schools was 52.78% while students from private elementary schools were 50% with a difference of 2.78%. For mathematical communication skills, it is known that the highest Drawing aspect is then followed by the Written Text aspect and the Mathematical Expression aspect both in students from the Public Elementary School or from the Private Elementary School.

B. Discussion

The results of the first study showed that the mathematical communication skills of junior high school students overall the ability of female students were higher than male students with a difference of 11.11%. This is in accordance with the opinion of Lianawati and Purwasih, that mathematical connection ability of female students is much better than from the other students. In gender factors are found other factors that can affect the achievement of the ability of connection of the ready with students and teachers in learn, basic skills and basic knowledge students of mathematical concepts [19]. Beside it, according to Evans, international assessments such as the Trends in Mathematics and Science Study's (TIMSS) and Program for International Student Assessment (PISA), agreed that boys do not always outperform girls in math. But the results of study show that gender is not a significant factor of mathematics achievement [20]. Liu, Wilson, and Paek add that however girls are found to perform equally well as boys in mathematics, they are consistently outperformed on standardized math tests. Quantity showed the least amount of gender difference, which may be explained by the argument that girls perform are better on tasks that they are familiar with through practice [21].

According to Dickerson, Valente, and McIntosh that the gap cannot be explained by gender differences in the observed characteristics. Although, the gender gap varies greatly with regional characteristics. Variations indicate with a simple genetic explanation is not enough [22]. White et al

add that gender inequality persists in social contexts characterized by traditional culture in the education of girls that lead certain parents to prioritize sons' education over daughters' education. Educational inequality may also be due to a hidden cost of engaging girls in home activities (e.g. providing sitter for younger siblings) that have economic value for the family, especially for girls in rural areas and lowest income families [23].

The results of the second study showed that overall the ability of students from public elementary schools were higher than students from private elementary schools with a difference of 2.78. The difference in ability is relatively small in the two types of students and even almost no significant difference. This is in accordance with the opinion of Sundari that mathematics learning achievement, written tests of primary schools qualitatively and quantitatively, from the samples taken better (35.71%) compared to non-superior schools only (17.85%) although the same low score. Seen from the overall achievements even though the superior school has complete infrastructure supported by the use of good methods and added with additional lessons and professional teachers the results are not so far from the non-superior schools. This proves that mathematics is still considered a difficult student [24]. According to Desrina et al the test results of the difference between public elementary school and elementary school based Islam known that column *T-Test for Equality of Means* on the variables of individual factors, environment and memory have a significant value <0.05 ($p < 0.05$), individual factors of 0.007, environmental factors 0.026 and memory of 0.015 where all the variable values <0.05 , it means that there are differences. As for the object factor, the significant value is 0.717 ($P > 0.05$), that are means that there is no difference in the object factors between public elementary school and elementary school based Islam [25].

Mongi and Hatidja in their research stated that there was no difference between public schools and private schools based on the average National Test scores and accreditation [26]. According to Verdiyani there are two types of factors that are considered by the community in choosing primary schools, namely the first location of schools, security, school performance, facilities, learning approaches, educators, and school fees. The second factor that is considered by the community is the portion of religious education, security, school performance, learning approaches, and discipline [27].

IV. CONCLUSION

The results showed that the mathematical communication skills of students in junior high school overall the ability of female students were higher than male students with a difference of 11.11%. Overall the ability of students from public elementary schools were higher than students from private elementary schools with a difference of 2.78%. In mathematical communication skills show that for all students, the highest ability was Drawing aspect then Written Text aspect, and Mathematical Expression aspect.

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