

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 research 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 " f " 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 1.283.350 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]. Besides, 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 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.

REFERENCES

- [1] Ramellan P, Musdi E, Armiati 2012 Kemampuan Komunikasi Matematis Dan Pembelajaran Interaktif. *Pedagogy: Jurnal Pendidikan Matematika*, 1(1) (UNP) pp 77-82
- [2] NCTM 2000 Principles and Standards for School Mathematics (Reston, VA: NCTM)
- [3] NCTM 1991 Professional Standards for Teaching Mathematics. (Reston, VA: NCTM)
- [4] Kaya D and Aydin H 2016 Elementary Mathematics Teachers' Perceptions and Lived Experiences on Mathematical Communication. *Eurasia Journal of Mathematics, Science & Technologi Education Vol 10(6)* (Turkey: Eurasia) pp 1619-1629
- [5] Schoenfeld A H 2002 Making Mathematics Work for All Children: Issues of Standards, Testing, and Equity. *SAGE Journal Education Researcher Vol. 31 No.1* (University of California Berkeley: SAGE Journal) pp 13-25
- [6] Brendefur J L and Frykholm J 2000 Promoting Mathematical Communication In The Classroom: Two Preservice Teachers' Conceptions And Practices *Journal of Mathematics Teacher Education Vol 3(2)* (Netherland: Kluwer Academic Publishers) pp 125-153
- [7] Pourdavood R G and Wachira P 2015 Importance of Mathematical Communication and Discourse in Secondary Classrooms *Global Journal of Science Frontier Research: F Mathematics and Decision Sciences Volume 15 Issue 10 Version 1.0* (USA: Global Journal Inc) pp 8-20
- [8] Cotton K H 2008 Mathematical Communication, Conceptual Understanding, and Students' Attitudes Toward Mathematics *Action Research Project* (Nebraska: University of Nebraska Lincoln) pp 1-51
- [9] Sundayana R, Herman T, Dahlan J A, and Prahmana R C I 2017 Using ASSURE learning design to develop students' mathematical communication ability. *World Transactions on Engineering and Technology Education Vol.15, No.3* (WIETE) pp 245-249
- [10] Cai J, Jakabcsin M S, Lane S 1996 Assessing Students' Mathematical Communication *Journal School Science and Mathematics Vol 96(5)* (University of Delaware) pp 238-246
- [11] Pane N S, Jaya I, and Lubis, M S 2018 Analisis Kemampuan Komunikasi Matematis Siswa Pada Materi Penyajian Data Di Kelas VII Mts Islamiyah Medan T.P 2017/2018 *AXIOM: Vol. VII, No. 1* (Medan: AXIOM) pp 97-109
- [12] Hasibuan I S and Amry Z 2017 Differences Of Students Mathematical Communication Ability Between Problems Based Learning, Realistic Mathematical Education And Inquiri Learning In SMP Negeri 1 Labuhan Deli. *IOSR Journal of Research & Method in Education (IOSR-JRME) Vol 7 Issue 6 Ver. 1* (University of Medan) pp 54-60
- [13] Disasmitowati E and Utami A S 2017 Analysis Of Students' Mathematical Communication Skill For Algebraic Factorization Using Algebra Block *Proceedings International Conference on Research in Education* (Sanata Dharma University) pp 72-84
- [14] Indrawati N and Tasni N 2016 Analisis Kemampuan Pemecahan Masalah Berdasarkan Tingkat Kompleksitas Masalah dan Perbedaan Gender *Jurnal Saintifik Vol.2 No.1* (Universitas Sulawesi Barat: Neliti) pp 16-25
- [15] Linberg S M, Hyde J S, and Petersen J L 2010 New Trends in Gender and Mathematics Performance: A Meta Analysis. *Psychol Bull 136(6)* (USA: HHS Public Access) pp 1123-1135
- [16] Fryer R G and Levitt S D 2009 An Empirical Analysis of the Gender Gap in Mathematics *American Economic Journal: Applied Economics, American Economic Association, vol. 2(2)* (NBER Working Paper) pp 210-40
- [17] Hyde J S, Fennema E, Ryan M, Frost L A, and Hopp C 1990 Gender Comparisons of Mathematics Attitudes and Affect: A Meta-Analysis. *SAGE Journal Vol 14, Issue 3*. (American SAGE)
- [18] Saifulloh M Z and Hemanto M 2012 Strategi Peningkatan Mutu Pendidikan Di Sekolah. *JSH Jurnal Sosial Humaniora, Vol 5 No. 2* (LPPM-Institut Teknologi Sepuluh Nopember) pp 206-218
- [19] Lianawati I and Purwasih R 2018 Analysis Ability of Mathematical Connection of SMP students in Comparative Material in Review of Gender Differences. *Daya Matematis: Jurnal Inovasi Pendidikan Matematika Vol 6 No.1* (Universitas Negeri Makassar) pp 14-24
- [20] Evans J A 2015 Gender, Self-Efficacy, and Mathematics Achievement: An Analysis of Fourth Grade and Eighth Grade TIMSS Data from the United States *Education Studies Dissertation* (Lesley University) pp 1-93
- [21] Liu O L, Wilson M, and Paek I 2008 A Multidimensional Rasch Analysis of Gender Differences in Pisa Mathematics *Journal of Applied Measurement, 9(1)* (USA) pp 18-35
- [22] Dickerson A, Valente C, and McIntosh S 2015 Do the Math: An Analysis of the Gender Gap in Mathematics in Africa *Economic of Education review Vol 46* (Elsevier: University of Sheffield) pp 1-22
- [23] White G, Ruther M, Kahn J R, and Dong D 2016 Gender Inequality Amid Educational Expansion In India: An Analysis Of Gender Differences In The Attainment Of Reading And Mathematics Skills. *Journal of Research in Gender Studies 6(2)* (New York: Addleton Academic Publishers) pp 153-182
- [24] Sundari N 2008 Perbandingan Prestasi Belajar Antara Siswa Sekolah Dasar Unggulan dan Siswa Sekolah Dasar Non-Unggulan di Kabupaten Serang. *Jurnal Pendidikan Dasar no.9.* (JPD) p 5
- [25] Desrina, Mutiawati E, and Yusuf T R 2018 Comparison Of The Remember Of Children In Integrated Islamic School And Basic School Of Elementary School *Journal Ilmu Keperawatan (2018) 6:1* (Banda Aceh: Universitas Syiah Kuala) pp 1-15
- [26] Mongi C E and Hatidja D 2016 Perbandingan SMA Negeri Dan SMA Swasta Berdasarkan Nilai Akreditasi Dan Nilai Ujian Nasional Menggunakan Uji-T Di Kota Manado *Jurnal Ilmiah Sains Vol. 16 No. 2.* (Manado) pp 91-97
- [27] Verdiani R 2016 Analisis Animo Masyarakat Dalam Memilih Sekolah Anak di SD Wuluhadeg dan SD IT Assalaam. *Jurnal Pendidikan Guru Sekolah Dasar Edisi 23 Tahun ke-5* (UNY) pp 2262-2269

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