



Describing Mathematical Communication Ability, Logical Thinking and Student Learning Outcome of Class V Elementary School in Sombaopu Makassar

Agustan Syamsuddin^{✉1}, Armanda Bahtiar², Irwan Akib³

^{1,2,3} Magister Pendidikan Dasar, Program Pascasarjana Universitas Muhammadiyah Makassar, Makassar, Indonesia

✉ agustan@unismuh.ac.id

Abstract. This study aims to determine (1) the influence of mathematical communication skills on students' learning outcomes, (2) the influence of logical thinking on students' learning outcomes, (3) the influence of mathematical communication skills and logical thinking on learning outcomes. This research was a correlational ex-post-facto study. The sample of this study were 160 students of grade V elementary school students in Sombaopu, Gowa in the academic year of 2017/2018, who were obtained through proportionate stratified random sampling technique. Data collection was done by providing tests of mathematical communication skills, tests of logical thinking and tests of student learning outcomes. The analysis technique used is descriptive statistics by finding the maximum, minimum, mean, and standard deviation values. The results of this study indicate: (1) there is a significant influence between mathematical communication skills and students' learning outcomes. (2) there is a significant influence between logical thinking and students' learning outcomes. (3) there is a significant influence between mathematical communication skills and logical thinking with students' learning outcomes.

Keywords: mathematical communication, logical thinking, learning outcome

INTRODUCTION ~ The 21st century forms a new paradigm in the midst of society better known as the era of globalization among others with the occurrence of changes that are fast and complex, concerning both changes in values and structures related to human life, and therefore the Indonesia needs to be equipped with education oriented to the demands of the 21st century (Ratna, 2015).

In Law Number 20 of year 2003 concerning the National Education System, Article 1 paragraph 1 states that education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and the skills needed by themselves, society, and

nation. Specifically, it is explained in article 37 that emphasizes the importance of mathematics mastery at the level of primary and secondary education as a compulsory subject. This indicates that mathematics is one of the subjects that must be mastered by students in elementary school.

The purpose of learning mathematics in schools in Permendiknas No. 22 of year 2006 concerning content standards is that students are taught mathematics so that they are able to (1) understand mathematical concepts, explain the interrelationships of concepts and apply concepts or algorithms flexibly, accurately, efficiently, and precisely in problem solving; (2) use reasoning on patterns and properties, carry out mathematical manipulations in making generalizations,



ICEE-2

compiling evidence, or explaining mathematical ideas and statements; (3) solve problems that include the ability to understand problems, design mathematical models, finish models, and interpret the solutions obtained; (4) ideas of communication with symbols, tables, diagrams or other media to clarify the situation or problem; (5) have an attitude of appreciating the usefulness of mathematics in life, namely having curiosity, attention, and interest in learning mathematics, as well as being tough and confident in problem solving (Nugraha, and Mahmudi, 2015).

Mathematics is a basic science that underlies the development of other sciences. Therefore mathematics becomes one of the important subjects to be taught in school. As a basic science, in learning mathematics especially at the elementary school level it is necessary to understand the psychological condition of students. Thinking development stage at elementary school age is still in the stage of concrete thinking so that it requires concrete steps according to the child's development to make them understand something or abstract subject matter. According to Piaget in Jufri (2017), the development stage of elementary school children who enter the age of 7-11 years is in the phase of starting to think logically. Concrete operational stage is where students begin to think logically against the concrete objects, leave their egocentric nature, be able to think, learn, remember, and

communicate. It shows that the experience gained is expected that students can sort, classify, communicate and use symbols and concepts in mathematics. Thus, through real experience students can sharpen the mastery of the concept in an effort to improve thinking skill, the reasoning power to be able to solve problems encountered in daily life. (Widyastuti, and Pujiastuti, 2014).

According to Muharom, (2014) learning that is carried out today still uses conventional learning and direct learning models that only emphasize curriculum demands so that in practice students are passive in the learning process, student involvement tends to be minimized so as to result in mathematical reasoning and communication skill students are not well developed. In practice, teachers become the ones who are more active in the learning process compared with students. It makes students become passive and feel bored in the learning process. This saturation can be seen from the reception of the material because they tend to be silent and do not dare to deliver opinions. It happens because of the monotony of learning carried out so that student thinking ability is not explored to the maximum. According to Lestari and Yudhanegara (2016), mathematical communication skill is the ability to convey mathematical ideas/opinions both verbally and in writing as well as the ability to understand and accept mathematical



ICEE-2

ideas/opinions of others in a careful, analytical, critical, and evaluative manner to sharpen understanding.

Students must be able to solve mathematical problems, develop thinking power so that students are able to think rationally in learning mathematics. Widyastuti and Pujiastuti (2014) state that the ability to think rationally or think logically is the ability to think that needs to be developed to optimize the development of the left brain. The ability to think logically is needed to solve mathematical problems or those in everyday life. The ability to think logically is the ability of student to think to draw legitimate conclusions according to the rules of logic. One example of logical thinking at the elementary school level is being able to make conclusions and prove that the conclusions are true or not in accordance with the experiences that have been obtained by student before. Understanding the concepts and ability to think logically requires knowledge of experience by students themselves. Therefore the role and effort of the teacher to motivate, train and explore all the abilities and knowledge of students are needed.

Logical thinking is very necessary for a student in learning mathematics because by thinking logically the understanding of students will be higher. For example, students are asked to answer the question "what is the answer of 5×6 ." For students who are accustomed to memorizing, of

course they can answer directly 30. However, if asked why the answer is 30, the students will be confused because they only draw memories of 30. For students who are accustomed to thinking logically, they often get the question. Even students try to understand the meaning of the multiplication. Students have captured the meaning or understanding of the problem. By paying attention to the problems in mathematics learning it can be stated that student logical thinking is still low. To overcome this problem, in mathematics learning process teachers should hone and train student logical thinking skill so that they can improve learning outcomes while facilitating student's understanding in solving mathematical problems in learning mathematics. (Sirait, 2017).

METHOD

This research was an ex-post facto research which was causality. Ex-post facto research here was designed to explain the existence of a causal relationship. The researchers in this case explored the causal relationship of several predetermined research variables, among others, finding relationships among mathematical communication ability, logical thinking and mathematical learning outcomes. The population in this study was all fifth grade elementary school students in Sombaopu Sub-District, Gowa Regency, academic year 2017/2018. Based on data obtained from Gowa Regency Education Office, the number of public elementary schools in Somba Opu Sub-district was 53 schools, and the



ICEE-2

number of students from each of these schools especially class V was 1513 male students and 1396 female students. Thus the population in this study totaled 2909 students. Furthermore, the research sample was determined using proportionate stratified random sampling technique, which was sampling from the population randomly and proportionally, namely the characteristics of the population tended to be heterogeneous. From the sampling technique, 160 students as the samples were obtained.

Research data collection technique was carried out by giving tests to students who were as the research samples. The instrument used was in the form of test where the tests were arranged based on indicators of mathematical ability and logical thinking ability that had been constructed before. Data collection related to mathematical communication ability and student logical thinking ability were obtained by giving written test to students in which the test was in the form of essay questions consisting of 10 items. The data collection for mathematics learning outcome variables was obtained from the results of even-semester final test given to students and the data were obtained from the homeroom teachers or their mathematics teachers. Before being

used, the research instrument was first validated to obtain a valid instrument. The data obtained were then analyzed using descriptive analysis to see a picture of mathematical ability, logical thinking and mathematics learning outcomes.

RESULTS AND DISCUSSION

Data that had been obtained through measurement of mathematical communication test and logical thinking test and mathematics learning outcomes of fifth grade elementary school students in Sombaopu Sub-district was then explained in detail to describe the ability of students to solve mathematical problems given that described the mathematical communication ability of students, logical thinking and students' mathematics learning outcomes.

To categorize mathematical communication ability, logical thinking and students' mathematics learning outcomes, scoring guidelines adopted from the categorization according to Arikunto (2011) was used. They are described in detail as in the following Table 1.

Table 1. Assesment Criteria

Score	Categorization
80-100	Very good
66-79	Good
56-65	Moderate



ICEE-2
40-55
<40

Poor
Very poor

The following will be presented an overview related to the description of students' abilities related to mathematical communication, logical thinking ability and learning outcomes of the fifth grade elementary school students in Sombaopu sub-district, Makassar.

Mathematical Communication Ability

Based on the results of research conducted, data related to students' mathematical communication abilities are obtained as described in the following Table 2.

Table 2. Mathematical Communication Ability Test Results

Ability of Students	N	Maximum	Minimum	Mean	Std. Deviation
Mathematical communication abilities	160	97.5	52.5	72.1	9.90762

From the table above, it can be explained that the results of the mathematical communication ability test from 160 students tended to be in good category where the data above shows that the maximum score of the mathematical communication ability test given to students was 97.5, while the minimum score obtained by students was 52.5, the average score of students' mathematical communication ability was 72.1 and the standard deviation was 9.90762. By using the assessment criteria table (Table 1) as a

reference in categorizing students' mathematical communication abilities, it can be concluded that the average of students' mathematical communication abilities is in the good category.

Logical Thinking

Based on the results of logical thinking test given to elementary school students in Sombaopu Sub-District, Gowa Regency, Makassar, South Sulawesi, it is obtained an overview of the results of students' logical thinking tests which is described in the following Table 3.

Table 3. Logical Thinking Test Results

Ability of Students	N	Maximum	Minimum	Mean	Std. Deviation
Logical thinking abilities	160	95	47.5	70.5	10.8



The table of the results of the logical thinking ability test above gave information that the maximum score of student logical thinking ability was 95, while the minimum score was 47.5. The average score of students' logical thinking abilities was 70.5, and the standard deviation was 10.8. Based on the assessment criteria described in Table 1, it can be concluded that the average of students' logical thinking abilities is in the good category

Mathematical Learning Outcomes

The data of student mathematics learning outcomes were obtained based on the results of the semester test taken from school through the homeroom teacher of each student who was as the research sample in this study. The following is presented an overview of mathematics learning outcomes of elementary school students in Sombaopu Sub-District, Gowa Regency, Makassar, South Sulawesi in Table 4.

Table 4. Mathematical Learning Outcomes

Ability of Students	N	Maximum	Minimum	Mean	Std. Deviation
Mathematical learning outcomes	160	98	60	73.7	8.9

Based on mathematics learning outcomes data of 160 students it can be seen that the maximum score of student learning outcomes was 98, while the minimum score of students was 60, the average score of student learning outcomes was 73.7, and the standard deviation was 0.89. By using Table 1 as a reference to determine the assessment criteria for student mathematics learning outcomes.

It can be concluded that the average of students' mathematics learning outcomes is in the good category.

To see the comparison of the three students' abilities, namely mathematical communication ability, logical thinking ability and student mathematics learning outcome, the following research data are described in the following Table 5.

Table 5. The Comparison of Students' Abilities

Ability of Students	Mean of Score	Categorization of Student Abilities
Mathematical communication	72.1	Good



Logical thinking	70.5	Good
------------------	------	------

Mathematical learning outcomes	73.7	Good
--------------------------------	------	------

Based on comparative data on mathematical communication ability, logical thinking, and student learning outcome it can be explained that by using Table 1 as a reference to determine the categorization of student abilities, it can be concluded that the student average score of the three variables studied in this study is in the range between 66- 78. Thus, mathematical communication ability, logical thinking, and student learning outcome are in good category.

DISCUSSION

The results of this study illustrate that both mathematical communication, logical thinking ability and mathematics learning outcomes of students are in the good category which means that the three influence each other. This is in line with the results of the study of Nartani, Hidayat, & Sumiyati (2015) that the ability of students in mathematical communication had effect in improving students' achievement for Elementary School. The same thing stated by Afiani (2016) that mathematical communication skills affect mathematics learning achievement.

In addition, Nurzaelani & Wibowo (2015) stated that there is a positive relationship between logical thinking and interpersonal communication. Furthermore, Mirna (2017)

stated that the ability to think logically influences student learning outcomes in mathematics learning. This is in line with the results of research Ratna (2015) stated that the ability to think logically affects student learning outcomes. Thus it can be explained that the three variables affect each other.

When students were asked to complete the questions or tests given, their solutions provide vary considerably. This is in line with Sari's research (2017) which stated that there are differences in the characteristics of the way students answer questions, even though the questions or tests of learning outcomes provided are the same. In addition, when solving problems, students were able to convey their ideas or mathematical ideas that describe their understanding of the mathematical concepts needed to solve the problem. This is in accordance with the opinion of Rachmayani (2014) that through communication, students can apply mathematics and express their understanding of mathematical concepts and processes they learn. This is also in line with the results of Darkasyi, Johar, & Ahmad's research (2014) that one form of mathematical communication is understanding mathematics.



ICEE-2

From some of the previous explanations it can be stated that the results of learning mathematics can be increased by improving students' mathematical communication skills and logical thinking.

CONCLUSION

Based on the description of the study results and the discussion about of the fifth grade elementary school students in Sombaopu Sub-District, Gowa Regency, Makassar, it can be concluded that student mathematical communication ability has an average score of 72.1. It indicates that mathematical communication ability of students is in good category. For the logical thinking ability, the average score is 70.5 indicating in the good category. Meanwhile, the description of student mathematics learning outcomes with an average score of 73.7 is also in the good category.

Thus, it can be stated that there is a positive effect between mathematical communication ability and student logical thinking ability on student mathematics learning outcome. If the mathematical communication ability and student logical thinking ability are good, then there is a tendency for students to learn mathematics well too. Therefore, special attention is needed related to student mathematical communication ability and student logical thinking ability in learning mathematics to maximize student learning outcomes in elementary school.

ACKNOWLEDGMENT

We would like to express our deepest appreciation to all those who provided us the possibility to complete this report. A special gratitude we give to Kemenristek dikti and LLDIKTI Wilayah IX who had funded this research in the scheme "Penelitian Tesis Magister" based on decree number 7/E/KPT/2019 and agreement/ contract number 115/SP2H/LT/DRPM/2019; 1632/L9/AK/2019 and 001/KONTR-PENL/V/1440/2019, May 15, 2019.

REFERENCES

- Afiani, N. (2017). Pengaruh Kemampuan Komunikasi Matematis dan Kemandirian Belajar terhadap Prestasi Belajar Matematika. *JKPM (Jurnal Kajian Pendidikan Matematika)*, 2(1), 1-13.
- Arikunto, S. (2011). Dasar-dasar Evaluasi Pendidikan (edisi revisi). *Jakarta: Bumi Aksara*.
- Darkasyi, M., Johar, R., & Ahmad, A. (2014). Peningkatan kemampuan komunikasi matematis dan motivasi siswa dengan pembelajaran pendekatan quantum learning pada siswa SMP Negeri 5 Lhokseumawe. *Jurnal Didaktik Matematika*, 1(1).
- Ikasmah, I. (2016). *Pengaruh Pelaksanaan Model Pembelajaran Kooperatif*



ICEE-2

- Tipe Student Teams Achievement Divisions (STAD) terhadap Hasil Belajar Matematika SD Negeri 11 Pangkajene* (Doctoral dissertation, Universitas Negeri Makassar).
- Inayah, N. (2016). Pengaruh Kemampuan Penalaran Matematis (Mathematical Reasoning) dan Gaya Kognitif terhadap Kemampuan Komunikasi dan Koneksi pada Materi Statistika Siswa Kelas XI IPA SMA Negeri di Kota Palu. *Journal of Educational Science and Technology (EST)*, 2(2), 74-80.
- Jufri, A. W. (2017). Belajar dan Pembelajaran Sains Modal Dasar Menjadi Guru Profesional. *Bandung: Pustaka Reka Cipta*.
- Lestari, K. E., & Yudhanegara, M. R. (2015). Penelitian pendidikan matematika. *Bandung: PT Refika Aditama*.
- Mirna, M. (2017). *Pengaruh Kemampuan Berpikir Logis, dan Kesiapan Belajar Terhadap Hasil Belajar Matematika Melalui Partisipasi Siswa dalam Pembelajaran pada Siswa Kelas VIII SMP Negeri di Kecamatan Pitumpanua Kabupaten Wajo* (Doctoral dissertation, Universitas Negeri Makassar).
- Muharom, T. (2013). *Pengaruh Pembelajaran dengan Model Kooperatif Tipe Student Teams Achievement Division (STAD) terhadap Kemampuan Penalaran dan Komunikasi Matematik Peserta Didik di SMK Negeri Manonjaya Kabupaten Tasikmalaya* (Doctoral dissertation, Universitas Terbuka).
- Muhsin, A. 2015. *Pengaruh Pelaksanaan Model INSTAD Terhadap Hasil Belajar Matematika Peserta Didik Kelas V SD Negeri Kakatua Makassar*. (Doctoral dissertation, Universitas Negeri Makassar).
- Nartani, C. I., Hidayat, R. A., & Sumiyati, Y. (2015). Communication in Mathematics Contextual. *International Journal of Innovation and Research in Educational Sciences*, 2(4), 284-287.
- Nayazik, A. (2016). Peningkatan kemampuan komunikasi matematis mahasiswa dengan model ideal problem solving mata kuliah kapita selekta matematika 1. *Math Didactic: Jurnal Pendidikan Matematika*, 2(1), 47-51.
- Nugraha, T. S., & Mahmudi, A. (2015). Keefektifan pembelajaran berbasis masalah dan problem posing ditinjau dari kemampuan berpikir logis dan kritis. *Jurnal Riset*



ICEE-2

- Pendidikan Matematika*, 2(1), 107-120.
- Nurhadi, Z. F. (2017). *Teori Komunikasi Kontemporer*. Prenada Media.
- Nurzaelani, M. M., Arief, Z. A., & Wibowo, S. (2014). Hubungan Antara Kecerdasan Logis-Matematis dan Komunikasi Interpersonal dengan Hasil Belajar Mata Pelajaran Matematika (Survei Pada Peserta Didik Kelas XI SMK Geo Informatika). *Jurnal Teknologi Pendidikan*, 3(2).
- Rachmayani, D. (2014). Penerapan Pembelajaran Reciprocal Teaching untuk meningkatkan kemampuan komunikasi matematis dan kemandirian belajar matematika siswa. *JUDIKA (Jurnal Pendidikan Unsika)*, 2(1).
- Ratna, M. (2015). Pengaruh Metode Ctl Dan Kemampuan Berpikir Logis Terhadap Hasil Belajar IPA Siswa Kelas IV Sekolah Dasar Negeri 114 Palembang. *Jurnal Pendidikan Dasar*, 6(2), 254-265.
- Riduwan, K. E., & Kuncoro, E. A. (2014). Cara Mudah Menggunakan dan Memakai Path Analysis (Analisis Jalur). Bandung (ID): Alfabeta.
- Ruslan, R. (2008). *Metodologi Penelitian Public Relations dan Komunikasi*. Jakarta: PT RajaGrafindo Persada.
- Sanjaya, W. (2012). *Media komunikasi pembelajaran*. Jakarta: Kencana Prenada Media Group.
- Sari, D. M. (2017). Analysis of Students' Mathematical Communication Ability By Using Cooperative Learning Talking Stick Type. *Infinity Journal*, 6(2), 183-194.
- Soemanto, W. 2012. *Psikologi Pendidikan*. Jakarta: Rineka Cipta.
- Sirait, A. R. (2017). Perbedaan Kemampuan Berpikir Logis Siswa Dengan Pendekatan Konstruktivis Dan Pendekatan Klasikal pada Siswa SMP Terpadu Al Bukhari Muslim Medan.
- Sugiyono. (2016). *Metode penelitian pendidikan: (pendekatan kuantitatif, kualitatif dan R & D)*. Bandung: Alfabeta.
- Sugiyono. (2017). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: Alfabeta.
- Ummah, M. K. (2017). *Pengaruh Pelaksanaan Model Pembelajaran Kooperatif Type Jigsaw Terhadap hasil Belajar Matematika Siswa SD Inpres Kassi-Kassi Kota Makassar*.



ICEE-2

(Doctoral dissertation, Universitas
Negeri Makassar).

realistik indonesia (PMRI) terhadap
pemahaman konsep dan berpikir
logis siswa. *Jurnal Prima
Edukasia*, 2(2), 183-193.

Widyastuti, N. S., & Pujiastuti, P. (2014).
Pengaruh pendidikan matematika