

# A Literature Review of Indonesian Students' Mathematical Communication Ability in Geometry Materials

Rayinda Khaerul Wiladah Bahrún\* & Dadan Dasari

*Mathematics Education Study Program, Department of Education and Mathematics and Natural Science,  
Universitas Pendidikan Indonesia (UPI) Bandung 40154, Indonesia*

---

## Abstract

The purpose of this study is to identify and examine students' written mathematical communication skills in geometry subject over the last five years. This study is a literature review that was conducted by looking for and assessing similar previous studies. Several stages were completed in this research: (1) identifying articles that discussed communication skills in geometry material, (2) analyzing student mathematical communication abilities in working geometry questions, and (3) identifying similarities in mathematical communication inhibiting factors. According to the findings of the study's six articles, pupils had difficulties articulating ideas, mathematical circumstances in writing with visuals, and algebra, expressing ideas or mathematical situations in everyday life in algebraic form. Students' mathematical communication abilities have not achieved their full potential. Of course, there are numerous elements that influence this, including pupils' lack of desire to describe or comprehend the challenges or problems they confront. Students do not understand the fundamental principles involved in answering these questions. Some pupils also do not understand the context of the questions, resulting in carelessness factor in communicating it mathematically.

*Keywords:* Communication Mathematics, Mathematical Communication, Geometry.

---

## 1. Introduction

In the 21<sup>st</sup> century, students are expected to master several skills and abilities such as critical thinking, creativity, problem solving and communication skills. Mathematical communication skills are listed in the curriculum and are one of the objectives of learning mathematics. Communication is one of the important processes in mathematics. Students who can communicate well in learning have a better understanding of the conceptual foundations of mathematics, as well as being better problem solvers (Brenner, 1998). There are several reasons why students must have mathematical communication skills, namely, (1) mathematics is basically an organized symbol and analytical ability, (2) mathematical communication is the essence of the teaching and learning process, (3) the main strength in formulating strategies and concepts, (4) is the main basis for exploring creativity for social activities, and (5) is often used in various mathematics content and other fields of learning (Hendriana et al., 2017).

Isnaeni & Maya, (2014) stated that learning mathematics and developing mathematical communication are the result of learning mathematics which will form a strong impetus for students to think about mathematics. The importance of this was also stated by Lindquist and Elliot (Nuraeni & Luritawaty, 2018) who stated that we need communication in learning mathematics if we want to achieve social goals. Without communication in mathematics, we will not have information and facts about students' understanding of students' mathematics learning abilities.

Geometry is one of the materials in learning mathematics that is related to other materials. In addition, geometric material is also used in its application to everyday life. Learning geometry aims to make students able to become good problem solvers, able to communicate mathematics, and also gain confidence in their mathematical abilities (Sholihah & Afriansyah, 2017). In addition, studying geometry also allows students to connect between abstract mathematical concepts and concrete mathematical concepts so that the combination of the two can lead to a deeper understanding (Imami, 2023).

---

\* Corresponding author.

*E-mail address:* rayinda.khawil@upi.edu

Therefore, this study aims to identify and to analyze students' written communication skills on the geometry material they have learned.

## 2. Research Methods

This research is a literature review research or literature study based on previous studies. Study literature is a method used to collect data or sources related to the topic raised in a study (Habsy, 2017). The search for related articles was obtained through the Google Scholar database which was carried out through the Publish or Perish application and also Google Scholar directly.

This study aims to identify and analyze students' written communication skills in geometry material that happened in Indonesia. The selected articles are those related to communication skills and geometry material which are the results of the last five years of research, the period between 2018 - 2023. The selected literature is also Scopus or Sinta indexed articles.

**Table 1.** Selected Articles

No.	Author	Article Title	Year of Publication
1.	Siti Nurlaila, Ratna Satrianingsih, and Rippi maya	Analisis Kemampuan Komunikasi Matematis Siswa SMP Terhadap Soal-Soal Bangun Ruang Sisi Datar	2018
2.	Imaniar Ramadhan and Eva Dwi Minarti	Kajian Kemampuan Komunikasi Matematik Siswa SMP dalam Menyelesaikan Soal Lingkaran	2018
3.	Norma Nur Hikmawati, Novi Andri Nurcahyono, and Pujia Siti Balkist	Kemampuan Komunikasi Matematis Siswa Dalam Menyelesaikan Soal Geometri Kubus dan Balok	2019
4.	Wasilatul Murtafiah, Reza Kusuma Setyansah, and Dhea Alvita Nurcahyani	Kemampuan Komunikasi Matematis dalam Menyelesaikan Circle Problem Berdasarkan Self-Confidence Siswa SMP	2021
5.	Ninik Diah Wulandari, Sukoriyanto, and I Nengah Parta	Kemampuan Komunikasi Matematis Tulis Pada Materi Lingkaran Ditinjau Dari Self Efficacy Siswa	2023
6.	Adi Ihsan Imami	Students Mathematical Communication Ability on Transformation Geometry	2023

## 3. Results and Discussion

The results of the search obtained 6 articles that fit the criteria that have been set. The explanation of what was obtained in each of these articles will be explained below.

### 3.1. First Article

The first literature by Nurlaila et al., (2018), it shows students' mathematical communication abilities in the material of flat sided geometric shapes. This research was conducted on 18 grade VIII students at a junior high school in Bandung. In this study it was said that the factors that influenced the level of students' mathematical communication skills included students who were not careful in understanding the problems given, students did not understand the mastery of the concept of flat sided space, students did not have ideas in solving problems, so students were only able to understand the problem.

### 3.2. *Second Article*

Based on the second literature by Ramadhan & Minarti, (2018) it shows students' mathematical communication skills in junior high school circle material. This research was aimed at class IX students at one of the junior high schools in Cimahi. In this study, 6 tests of descriptive questions and interviews were used to see students' mathematical communication. In this study it was found that students' mathematical communication skills had not achieved maximum results, especially in the ability to explain ideas, mathematical situations in writing with pictures, and algebra; the ability to state everyday events in the language of mathematical symbols, and the ability to make conjectures, construct arguments and generalizations, and make questions about the mathematics that has been studied. The reason students do not have good mathematical communication skills is that students think writing down what is known and asked is not important. Students do not understand the basic concepts in carrying out arithmetic operations both in algebraic form and other mathematical arithmetic operations. Students tend to be careless in working on problems because they want to finish quickly and lack the concept of understanding the circle material.

### 3.3. *Third Article*

Based on the third literature by Hikmawati et al., (2019) it shows students' mathematical communication abilities in the material of cube and block geometry. This research was conducted on 30 grade VIII students in a school and then 6 students were taken back from each category of test results, namely students with high, medium, and low ability, 2 people each. From this study it was found that students with high abilities had fulfilled all aspects of mathematical communication skills, namely aspects of writing, drawing and mathematical expression. Students with moderate and low abilities were dominant in aspects of writing and drawing and had difficulty expressing their mathematical ideas into aspects of mathematical expression. Factors that are thought to influence mathematical communication skills are the learning process, students' attitudes and understanding, and the habit of giving practice questions.

### 3.4. *Fourth Article*

Referring to the fourth literature by Murtafiah et al., (2021) it shows the ability to communicate mathematically in circle material which is also reviewed from its self-confidence. This research was conducted on 36 grade VIII students at a junior high school in Madiun, Central Java. This study describes the differences in the mathematical abilities of students who have high self-confidence and low self-confidence. It was found that students with low self-confidence were less able to meet the indicators of mathematical communication ability both in writing and orally at the stages of understanding the problem, implementing plans, and re-examining it, while students with high self-confidence were able to do so. Students with high self-confidence are able to fulfill written and verbal mathematical communication indicators, while those who are low are less able to fulfill written mathematical communication indicators but are able to verbally at the planning stage of completion. High self-confidence is able to fulfill it while students who are low are less able to fulfill the indicators of mathematical communication skills in writing and orally at the stage of carrying out the completion plan. Students with high self-confidence are able to fulfill them, while students who are low are less able to fulfill the indicators of mathematical communication ability in writing and orally at the stage of re-checking the completion.

### 3.5. *Fifth Article*

Referring to the fifth literature by Wulandari & Parta, (2023) it shows students' mathematical communication skills in circle material which is also reviewed in terms of self-efficacy. Self-efficacy, or self-confidence is one of the psychological models that is most likely to be adopted into positive psychology, this is an optimistic self-confidence in our competencies or opportunities to successfully complete tasks and produce profitable results (Akhtar, 2018). This research was aimed at high school students in class XI MIPA which consisted of 32 students. In this study, students were distinguished by their level of self-efficacy which was obtained by means of a questionnaire. Students with high self-efficacy are able to formulate what is known and asked, write strategies or solutions associated with formulas or concepts, calculate and use mathematical operations, formulate conclusions obtained, present mathematical problems in the form of images or graphics and write mathematical symbols or notations. Students with moderate self-efficacy are able to formulate what is known and asked, write strategies or solutions associated with formulas or concepts, calculate and use mathematical operations while students with low self-efficacy are able to write strategies or solutions associated with formulas or concepts and calculate and use operations mathematics.

### 3.6. *Sixth Article*

In the last literature by Imami, (2023) shows students' mathematical communication skills in geometric transformation material. This research was conducted on 28 students of class XI at a high school in Karawang. From this study, it

was found that 49% of students or around 14 students could use symbols or mathematical ideas to express real-world events or the application of mathematics. In addition, there are 30% of students or around 8 students who are able to connect real events or the application of mathematics in everyday life through mathematical concepts. While students who can explain ideas, situations and mathematical relationships as outlined in writing by presenting pictures or mathematical graphs can only be done by 48% of students or around 13 students. It was concluded in this study that students' mathematical communication skills in connecting real events or the application of mathematics in everyday life in the form of mathematics need attention.

#### 4. Conclusion

Based on the 6 articles analyzed above, it is known that students still cannot meet the indicators that have mathematical communication skills. The average student has difficulty explaining ideas, mathematical situations in writing with pictures, and algebra, expressing ideas or mathematical situations in everyday life in algebraic form.

Students' mathematical communication skills have not reached maximum results. Of course, there are many factors that influence this, which can be due to the lack of motivation of students in explaining or interpreting the problems or problems they face. Students also do not understand the basic concepts in solving these questions. Some students also do not understand the context of the questions given so that there is a carelessness factor in communicating them mathematically.

#### References

- Akhtar, B. M. (2018). a What is self- efficacy ? Bandura ' s 4 sources of Efficacy Beliefs. *Positive Psychology*.
- Brenner, M. E. (1998). Development of mathematical communication in problem solving groups by language minority students. *Bilingual Research Journal*, 22(2–4). <https://doi.org/10.1080/15235882.1998.10162720>
- Habsy, B. A. (2017). Seni Memahami Penelitian Kuliitatif Dalam Bimbingan Dan Konseling : Studi Literatur. *JURKAM: Jurnal Konseling Andi Matappa*, 1(2), 90. <https://doi.org/10.31100/jurkam.v1i2.56>
- Hendriana, H., Rohaeti, E. E., & Sumarmo, U. (2017). Hard Skills dan Soft Skills Matematik Siswa. In *Refika Aditama*.
- Hikmawati, N. N., Nurcahyono, N. A., & Balkist, P. S. (2019). Kemampuan Komunikasi Matematis Siswa Dalam Menyelesaikan Soal Geometri Kubus Dan Balok. *Prisma*, 8(1), 68. <https://doi.org/10.35194/jp.v8i1.648>
- Imami, A. I. (2023). Students mathematical communication ability in geometry. *SJME (Supremum Journal of Mathematics Education)*, 7(1), 123–130. <https://doi.org/10.1088/1742-6596/1521/3/032016>
- Isnaeni, I., & Maya, R. (2014). Meningkatkan Kemampuan Komunikasi Dan Disposisi Matematik Siswa Sekolah Menengah Atas Melalui Pembelajaran Generatif. *Jurnal Pengajaran Matematika Dan Ilmu Pengetahuan Alam*, 19(2), 159. <https://doi.org/10.18269/jpmipa.v19i2.456>
- Murtafiah, W., Setyansah, R. K., & Nurcahyani, D. A. (2021). Kemampuan Komunikasi Matematis dalam Menyelesaikan Circle Problem Berdasarkan Self-Confidence Siswa SMP. *Jurnal Elemen*, 7(1), 130–145. <https://doi.org/10.29408/jel.v7i1.2785>
- Nuraeni, R., & Luritawaty, I. P. (2018). Mengembangkan Kemampuan Komunikasi Matematik Siswa melalui Strategi Think Talk Write. *Mosharafa: Jurnal Pendidikan Matematika*, 5(2). <https://doi.org/10.31980/mosharafa.v5i2.265>
- Nurlaila, S., Sariningsih, R., & Maya, R. (2018). Analisis Kemampuan Komunikasi Matematis Siswa Smp Terhadap Soal-Soal Bangun Ruang Sisi Datar. *JPMI (Jurnal Pembelajaran Matematika Inovatif)*, 1(6), 1113. <https://doi.org/10.22460/jpmi.v1i6.p1113-1120>
- Ramadhan, I., & Minarti, E. D. (2018). Analisis Kemampuan Komunikasi Matematis Siswa SMP dalam Menyelesaikan Soal Lingkaran. *Journal of Medives: Journal of Mathematics Education IKIP Veteran Semarang*, 2(2), 151. <https://doi.org/10.31331/medives.v2i2.624>
- Sholihah, S. Z., & Afriansyah, E. A. (2017). Analisis Kesulitan Siswa Dalam Proses Pemecahan Masalah Geometri Berdasarkan Tahapan Berpikir Van Hiele. *Mosharafa: Jurnal Pendidikan Matematika*, 6(2), 287–298.

[https://journal.institutpendidikan.ac.id/index.php/mosharafa/article/view/mv6n2\\_13](https://journal.institutpendidikan.ac.id/index.php/mosharafa/article/view/mv6n2_13)

Wulandari, N. D., & Parta, I. N. (2023). Kemampuan Komunikasi Matematis Tulis Siswa Pada Materi Lingkaran Ditinjau Dari Self Efficacy Siswa. *Cendekia: Jurnal Pendidikan Matematika*, 07(1), 269–277.