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# AN ANALYSIS OF MATHEMATICAL COMMUNICATION SKILLS BASED ON SELF-CONFIDENCE AMONG STUDENTS

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**ABSTRACT**
The importance of students' mathematical communication skills and good self-confidence can achieve a good level of communication. However, each student certainly has different self-confidence. The purpose of this study is to analysis mathematical communication skills based on students' self-confidence. This study uses qualitative. The subjects in this study were 6 students of class VII of SMP Negeri 3 Plered, data collection techniques used were self-confidence questionnaires, tests to measure mathematical communication skills, and interviews. The data obtained were then analyzed in 3 stages, namely data reduction, data presentation, and drawing conclusions. The results of the study showed that subjects with high self-confidence had high category mathematical communication skills by meeting 3 indicators of mathematical communication skills, namely stating everyday events into mathematical language or symbols and solving them, connecting real objects, images, and diagrams into mathematical ideas, explaining ideas, situations, and mathematical relations with real objects, images, graphs and algebra. Subjects with moderate self-confidence categories had high and moderate categories of mathematical communication skills. Subjects with a low self-confidence category have high category metamatic communication skills.
**Keywords**: analysis; mathematical communication skills; self-confidence

***ABSTRAK***
*Pentingnya kemampuan komunikasi matematis siswa serta* self-confidence *yang baik maka dapat mencapai tingkat komunikasi yang baik pula. Namun setiap peserta didik tentunya memiliki kepercayaan diri yang berbeda-berbeda. Adapun tujuan penelitian ini adalah analisi kemampuan komunikasi matematis berdasarkan dari* self-confidence *pada siswa. Penelitian ini menggunakan kualitatif. Subjek pada penelitian ini adalah siswa kelas VII SMP Negeri 3 Plered sebanyak 6 orang, teknik pengumpulan data digunakan berupa angket* self-confidence*, tes mengukur kemampuan komunikasi matematis, dan wawancara. Data yang diperoleh kemudian dianalisis dengan 3 tahapan yaitu reduksi data, penyajian data, dan penarikan kesimpulan. Hasil penilitian menunjukan bahwa subjek dengan self-confidence tinggi memiliki kemampuan komunikasi matematis kategori tinggi dengan memenuhi 3 indikator kemampuan komunikasi matematis yaitu menyatakan peristiwa sehari-hari ke dalam bahasa atau simbol matematika dan menyelesaikannya, menghubungkan benda nyata, gambar, dan diagram ke dalam ide matematika, menjelaskan ide, situasi, dan relasi matematik dengan benda nyata, gambar, grafik dan aljabar. Subyek dengan kategori* self-confidence *sedang memiliki kemampuan komunikasi matematis ketegori tinggi dan sedang. Subyek dengan dengan kategori* self-confidence *rendah memiliki kemampuan komunikasi metamatis kategori tinggi.*
***Kata kunci****: analisis; kemampuan komunikasi matematis;* self-confidence

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## Introduction

The world has entered the era of the Fourth Industrial Revolution, characterised by increased connectivity, interaction and the development of digital systems, artificial intelligence, and information and communication technology, which naturally has an impact on all aspects of life. One such impact is on the education system in Indonesia (Marliana & Jayanti, 2019). This undoubtedly presents a challenge for the education sector; from primary education through to higher education, the integration of ICT into learning should already be in place. The learning process in the 21st century encourages students not only to acquire the necessary knowledge and skills but also to identify sources for learning such knowledge and skills (Shahroom et al., 2018). The Fourth Industrial Revolution has led to increasingly fierce competition; individuals must develop their skills and potential by possessing the 4C skills, which include: (1) critical thinking ; (2) creativity and innovation; (3) communication; and (4) collaboration (Redhana, 2019). The 4C skills are essential for entering a global competitive landscape that grows increasingly fierce by the day.

Mathematical communication is the way in which learners share mathematical ideas that they have learnt and clarified in their understanding. Mathematics is both the queen of science and its servant (Yusriyah & Noordyana, 2021). Mathematics as the queen of science means that it is the source of all scientific disciplines and the key to scientific knowledge; in other words, whilst growing and developing for its own sake as a discipline, mathematics also serves the needs of scientific knowledge in its development and application (Lestari & Afriansyah, 2021). This definition implies that mathematics is a foundational science; both its applied and reasoning aspects play a crucial role in the pursuit of scientific knowledge and technology (Khairunisa & Basuki, 2021). Learners will communicate and learn to explain their ideas and opinions to others, both in writing and orally, using mathematical language accurately to convince others. Mathematical communication skills are one of the objectives of mathematics education (Dewi et al., 2020).

Mathematical communication skills serve not only as a means of conveying ideas, but also reflect the level of students' conceptual understanding of the material being studied. These skills are evident in how students represent mathematical ideas in various forms, such as symbols, graphs and verbal explanations, as well as how they relate these representations to the context of the problems they face. Thus, mathematical communication is not merely an expressive activity, but also a cognitive process that demonstrates students' ability to organise, interpret, and evaluate mathematical information in greater depth. This aligns with the findings of Öztaş and Güçlü (2023), who emphasise that mathematical communication skills are an integral part of modern mathematics learning outcomes. Furthermore, Calkins et al. (2020) state that collaborative reflection activities can enhance communication skills whilst deepening students' mathematical understanding. These findings also highlight that interaction and reflection in learning play a crucial role in developing mathematical communication skills more deeply.

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In line with the importance of mathematical communication skills, Ministry of Education and Culture Regulation No. 58 of 2014 states that the objectives of mathematics education include ensuring that learners possess the following abilities (Khairunisa & Basuki, 2021): 1) Understanding mathematical concepts and applying concepts and algorithms flexibly, accurately, efficiently, and appropriately in problem-solving; 2) To use patterns as hypotheses in problem-solving and to make generalisations based on existing phenomena or data; 3) To reason about properties; 4) Communicating ideas and reasoning, and being able to construct mathematical proofs using complete sentences, symbols, tables, diagrams, or other media to clarify situations or problems; 5) Demonstrating an appreciation for the usefulness of mathematics in daily life, characterised by curiosity, attention, and interest in studying mathematics, as well as perseverance and self-confidence in problem-solving; and others.

Mathematical communication skills are essential for students as they are one of the key competencies that can be developed in every mathematics lesson. Mathematical communication is an effective way to share ideas, concepts and knowledge that can be observed, refined and discussed either individually or in groups. Mathematical communication is important for students as it helps them convey information, solve mathematical problems converting word problems into symbolic forms and vice versa and transform word problems into tables, whilst also explaining problems presented in tabular form. Mathematical communication is undoubtedly essential and must be possessed by every learner in the mathematics learning process. Communication is one of the learners' abilities to convey what they know through dialogue or interactions occurring within the classroom environment, where the transfer of messages takes place (Aldila, 2022). The messages conveyed contain the mathematical material studied by the students, for example, in the form of formulae or strategies for solving a problem (Sholihah, 2022). The messages are conveyed both orally and in writing (Kanah et al., 2022).

In a global context, mathematical communication skills are also a key focus in various education systems, as they are regarded as essential 21st-century skills. A comparative study conducted by Ya-Amphan et al. (2024) shows that there are variations in the ways in which students communicate mathematical ideas across different countries; these variations are influenced by teaching approaches and learning cultures, and in turn influence how students develop and express their mathematical communication.

Self-confidence is a person's belief in and attitude towards their own abilities, accepting themselves as they are whether positive or negative which is formed and learned through a learning process with the aim of achieving personal happiness (Sholihah & Aulia, 2020). According to research by Susanti (2018), there are differences in mathematical communication skills depending on levels of self-confidence. Students must possess mathematical communication skills and self-confidence, as self-confidence and communication skills are of paramount importance.

Self-confidence in mathematics learning is closely linked to the concept of self-efficacy, which is an individual's belief in their ability to complete a specific task. Research shows that students with high levels of self-confidence tend to be more active in expressing ideas, participating in discussions, and demonstrating greater

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resilience when facing learning difficulties. Akbari and Sahibzada (2020) state that self-confidence has a significant influence on students' learning processes, whilst Tus (2020) found that self-concept and self-esteem also contribute to academic achievement. Thus, self-confidence not only influences affective aspects but also has a direct impact on students' cognitive performance. This is consistent with the findings of Voica et al. (2020), which show that self-efficacy plays a role in enhancing students' ability to solve problems more effectively and to communicate mathematical ideas.

Furthermore, the relationship between self-confidence and mathematical ability is not linear, but is influenced by various other psychological factors such as anxiety and motivation to learn. Research by Zhou et al. (2020) indicates that self-efficacy and mathematical anxiety act as mediators in students' problem-solving ability. This is supported by the findings of Suren and Kandemir (2020) and Gabriel et al. (2020), who state that high levels of mathematical anxiety can hinder student performance, even when they possess good cognitive potential. Therefore, it is important to understand mathematical communication skills not only from a cognitive perspective, but also from an affective perspective, such as students' self-confidence and psychological state. These findings also indicate that the relationship between affective factors and mathematical ability is mediated by self-efficacy and anxiety, and thus does not always follow a linear pattern.

Although various studies have shown that mathematical communication skills and self-confidence play a significant role in mathematics learning, research specifically examining the relationship between the two in the context of lower secondary school students remains limited, particularly in terms of in-depth qualitative approaches. Furthermore, most previous research has focused primarily on learning outcomes or problem-solving skills, whilst the aspect of mathematical communication has not been comprehensively examined in relation to students' levels of self-confidence. Therefore, research is needed that can provide a more in-depth understanding of how students' mathematical communication skills are influenced by their self-confidence.

Based on the results of observations and interviews with a mathematics teacher at SMPN 3 Plered in Cirebon Regency, it was found that Class VII students are still afraid of making mistakes when answering the maths questions posed by their teacher; students are hesitant to answer and express their ideas; students still do not understand questions presented in the form of a story, so they prefer to wait for their classmates to answer the question. The importance of students' mathematical communication skills and good self-confidence means they can achieve a good level of communication. However, every student naturally has varying levels of self-confidence. The aim of this study is to analyse students' mathematical communication skills in relation to their level of self-confidence among Class VII students at SMP Negeri 3 Plered, Cirebon Regency.

## Research Methods

This study employed a qualitative methodology. Qualitative research is a descriptive and analytical approach that involves detailing the information, events, phenomena and social situations under investigation (Waruwu et al., 2023). This study was conducted with 23 Class VII students at SMP N 3 Plered, Cirebon Regency.

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The students completed a questionnaire regarding self-confidence; the purpose of the questionnaire was to categorise the subjects into three groups: high self-confidence, moderate self-confidence, and low self-confidence. These categories were based on the data sources obtained by the researcher, comprising primary and secondary data. The primary data was obtained from the researcher's observations at SMP N 3 Plered, whilst the secondary data was derived from interviews conducted by the researcher with mathematics teachers regarding students' mathematical communication skills in relation to their self-confidence. In qualitative research, the researcher serves as the instrument; following the initial research, the instrument was further developed to achieve the desired outcomes (Sugiyono, 2022). The data collection techniques used comprised a self-confidence questionnaire, a mathematical communication skills test, and interviews. The aforementioned data collection techniques were combined using triangulation. Triangulation is a data collection technique that combines various existing data collection techniques and data sources.

The self-confidence questionnaire, test sheets and interview guidelines must, of course, be validated first; this validation employs construct validation in accordance with expert opinion. Therefore, the questionnaire, test sheets and interview guidelines must first be validated by validators until they are declared valid and suitable for use in the research. The data analysis technique involves analysing the collected data, which is then divided into three concurrent stages of activity (Hardani, 2020). These stages are: data reduction, data presentation, and drawing conclusions. The first step of this study is data reduction, which involves sorting the questionnaire results and test results; from these results, the scores of the students who completed the questionnaire and the test questions are extracted. The next step is data presentation: the data collected during the reduction phase is presented in a table containing the questionnaire results and the students' test scores. These student data results are then classified according to the criteria: students with high, moderate, and low self-confidence questionnaire scores, followed by interviews to clarify the findings. The subsequent step involved drawing conclusions; triangulation was applied to the final instrument results to enable conclusions to be drawn regarding the research findings.

## Results and Discussion

The data presentation describes the instruments used in the research, namely the self-confidence questionnaire, the mathematical communication skills test, and the interview. the formula for categorising students' scores on the self-confidence questionnaire can be shown in Table 1.

Table 1. Categorisation of students' self-confidence

| Criteria for students' self-confidence | Description |
|---|---|
| $x \geq (Mean + SD)$ | High |
| $(Mean - SD) < x < (Mean + SD)$ | Moderate |
| $x \leq (Mean + SD)$ | Low |

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Then Students' self-confidence categories can be shown in Table 2.

Table 2. Students' self-confidence categories

| No. | Initials Name | Gender | Survey Results | SC Category |
|---|---|---|---|---|
| 1. | EF | Male | 51 | High |
| 2. | HL | Female | 48 | High |
| 3. | AM | Female | 45 | Moderate |
| 4. | AA | Female | 38 | Moderate |
| 5. | L | Female | 31 | Low |
| 6. | MM | Female | 31 | Low |

Based on Table 2, the questionnaire results show that students EF and HN fall into the high self-confidence category, AM and AA into the moderate category, and L and MM into the low self-confidence category. Consequently, the results of the mathematical communication skills test will be taken from the above sample.

Based on the results of the questionnaire in Table 2, students in the high, medium and low self-confidence categories will undergo a test of their mathematical communication skills. The test consists of nine questions that have been validated by validators and are therefore suitable for use in this study. The Categorisation of students' self-confidence can be shown in Table 3.

Table 3. Categorisation of students' self-confidence

| Interval | Description |
|---|---|
| $> 66\ \%$ | High |
| $> 33\%\ up\ to\ 66\%$ | Moderate |
| $\leq 33\%$ | Low |

Table 3 above shows the results of the students, categorised according to the marks they achieved. If a student's mark is above 66%, they are classified as high; if it is between 33% and 66%, they are classified as moderate; and if it is below 33%, they are classified as low. Students' self-confidence categories can be shown in Table 4.

Table 4.

| No | Name | Value Results | | | | | | | | | Total | Category KKM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | |
| | EF | 4 | 4 | 3 | 2 | 4 | 2 | 3 | 3 | 2 | 27 | High |
| 1. | HL | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 35 | High |
| 2. | AM | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 3 | 2 | 14 | Moderate |
| 3. | AA | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 3 | 4 | 34 | High |
| 4. | L | 4 | 4 | 1 | 4 | 3 | 3 | 4 | 3 | 2 | 28 | High |
| 5. | MM | 4 | 4 | 1 | 4 | 2 | 3 | 4 | 3 | 2 | 27 | High |

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Table 4 shows that EF and HL students have high self-confidence and high mathematical communication skills; AM students have moderate self-confidence and moderate mathematical communication skills; whereas AM students with moderate self-confidence have high mathematical communication skills; and L and MM students have low self-confidence but high mathematical communication skills.

Subjects in the high self-confidence category performed better at solving mathematical representation problems than those with moderate and low self-confidence, as they were able to meet three indicators sufficiently well, whereas subjects in the moderate and low self-confidence categories have not yet met the three indicators of mathematical communication skills sufficiently well. This is consistent with the findings of a study conducted by (Bagus, 2018), which states that mathematical representation skills are crucial for understanding the material presented and solving problems; if mathematical representation skills are lacking, this leads to a lack of understanding regarding the material or problems provided. This is reinforced by the view of (Vandini, 2015) that self-confidence regarding mathematical learning achievement has a strong and significant influence. Thus, if students wish to achieve good learning outcomes, it is hoped that they will also possess good self-confidence. An improvement in self-confidence will be followed and accompanied by an improvement in their abilities.

These findings are consistent with various studies showing that self-confidence is closely linked to students' academic ability, particularly in mathematics. Students with high levels of self-confidence tend to feel confident in expressing their ideas, and are therefore more active in the process of mathematical communication. This is supported by Akbari & Sahibzada (2020), who state that self-confidence has a positive influence on students' engagement in the learning process. Furthermore, Öztürk et al. (2020) emphasise that self-efficacy in mathematics correlates with students' ability to solve problems, including in representing and communicating mathematical ideas.

Findings from the field indicate that not all subjects with moderate or low self-confidence were unable to solve mathematical communication problems. Based on the results of the mathematical communication ability test, subjects in the moderate and low self-confidence categories were able to complete the mathematical communication ability test reasonably well, as evidenced by the results obtained from their solutions. However, although there were some issues found to be less than ideal in solving these problems, this was demonstrated by the results of the mathematical communication ability test conducted on six student samples.

These findings suggest that the relationship between self-confidence and mathematical communication skills is not always linear. In some cases, students with low levels of self-confidence are still able to perform well when completing mathematical tasks. This indicates that student performance is determined not only by general self-confidence, but also by confidence in specific abilities to complete tasks (self-efficacy) and the ability to manage mathematical anxiety. Research by Zhou et al. (2020) shows that self-efficacy act as a mediator in this relationship, whilst Gabriel et al. (2020) emphasise that mathematical anxiety is related to students' self-regulation skills in learning.

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Students with moderate or low levels of self-confidence naturally require a process to boost their self-confidence, and every student has their own methods or processes in their lives. In this context, it can be said that high self-confidence does indeed aid the learning process and can enhance their abilities; however, students with moderate or low levels of self-confidence can certainly achieve success in line with their own abilities.

EF subjects with high self-confidence possess high-level mathematical communication skills and are able to meet the three indicators of mathematical communication skills: expressing everyday events in mathematical language or symbols and solving them; relating real objects, pictures, and diagrams to mathematical ideas; explaining mathematical ideas, situations, and relationships using real objects, pictures, graphs, and algebra. The first indicator for EF subjects demonstrates, through the results of the mathematical communication skills test, that they are able to translate an everyday event into mathematical symbols and solve it accurately and in accordance with the instructions. Subject EF is able to translate problems involving images into mathematical concepts and can identify them; whilst some of the written answers were not entirely accurate, subject EF has demonstrated the ability to link an image to a mathematical concept. Subject EF is able to explain mathematical ideas or problems using diagrams, graphs and algebra, as evidenced by test results showing that Subject EF depicts ideas and situations in the form of diagrams and graphs, and is able to express the results of these solutions in algebraic form; although the written results are still found to be somewhat inaccurate in their depiction, Subject EF is already able to solve the problems using their existing abilities. Subject EF's high level of self-confidence enabled them to complete the mathematical communication skills test with confidence, expressing positive ideas, opinions and self-concepts when taking decisions to determine the solution.

Subjects in the HL category with high self-confidence and high mathematical communication skills were able to meet the three indicators of mathematical communication skills: expressing everyday events in mathematical language or symbols and solving them; relating real objects, pictures and diagrams to mathematical ideas; and explaining mathematical ideas, situations and relationships using real objects, pictures, graphs and algebra. Based on the results of the mathematical communication skills test for the first indicator, subject HL demonstrated the ability to express everyday events in mathematical language or symbols and solve them; subject HL recorded the test results fully and accurately, including a clear and easily understandable solution process, describing an everyday activity and then transforming it into a mathematical concept. Subject HL demonstrated that the test results aligned with the second indicator providing a complete and systematic solution. Subject HL was able to transform a problem presented as an image into a mathematical concept, accompanied by a clear and easily understandable solution process. Based on Subject HL's test results for the third indicator, it is evident that Subject HL provided a complete response that met the third indicator, as demonstrated by their answers. Subject HL drew the instructed diagram, correctly depicted a rectangular prism, and drew a graph that was accurate and consistent with the instructions; furthermore, the solution process written down was clear and easy to understand. Thus, it can be proven that the HL

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subject was able to meet the third indicator; the HL subject was able to explain mathematical ideas and relationships using diagrams, graphs, and algebra. The high level of self-confidence possessed by the HL subject proves that high self-confidence enhances academic achievement. (Noviyana & Dewi, 2019) state that those with high self-confidence will achieve good results, as they have a positive outlook on their own abilities.

Subject AM, who falls into the 'moderate' self-confidence category, possesses 'moderate' mathematical communication skills, meeting only two indicators of mathematical communication ability: expressing everyday events in mathematical language or symbols and solving them, and relating real objects, pictures and diagrams to mathematical concepts. Based on the test results, Subject AM demonstrated the ability to express everyday events in mathematical language or symbols; although Subject AM's responses to the ability test were incomplete, they did express these events in mathematical form. Although the problem-solving process was not entirely accurate, Subject AM was able to write down answers in accordance with their own understanding. Based on the results of the test for the second indicator, subject AM demonstrated through their answers that they were able to link an image to a mathematical concept; however, the written answers still contained errors, both in terms of incomplete writing and an inaccurate solution process. The third indicator of mathematical communication skills: explaining mathematical ideas, situations, and relationships using real objects, images, graphs, and algebra. Subject AM's answers did not meet the criteria of the third indicator. Regarding the task for the third indicator which involves illustrating a mathematical idea, situation, or relationship Subject AM was unable to answer effectively; they did not illustrate the problem stated in the test item. As seen in question number eight, the AM subject depicted a cube and provided the correct definition, but they were incorrect in depicting a rectangular prism, thus demonstrating a misunderstanding regarding the distinction between the shapes of a rectangular prism and a cube.

Subject AA, who falls into the 'moderate' self-confidence category and possesses high-level mathematical communication skills, meets three indicators of mathematical communication ability: expressing everyday events in mathematical language or symbols and solving them; relating real objects, pictures and diagrams to mathematical ideas; and explaining mathematical ideas, situations and relationships using real objects, pictures, graphs and algebra. Subject AA, with their level of self-confidence, was able to demonstrate this through written answers that were appropriate and accurate; subject AA was able to express everyday events in mathematical language and solve them. Based on the test results, subject AA was able to demonstrate that their answers met the first indicator, namely the ability to link images and graphs to mathematical ideas, as evidenced by the solutions written by subject AA, which were complete, accurate and clear. Subject AA was also able to demonstrate through their answers that they met the third indicator, namely the ability to explain mathematical ideas, situations and relationships using diagrams, graphs and algebra. Subject AA was able to describe what was required in the given problems fully and appropriately; however, there were still errors in the depiction of the block. Subject AA's answers to questions eight and nine were very accurate in terms of the process of determining and solving them. The confidence displayed

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demonstrates that Subject AA possesses a high level of mathematical communication ability.

Subject L, who falls into the low self-confidence category, possesses high-level mathematical communication skills and meets three indicators of mathematical communication ability: expressing everyday events in mathematical language or symbols and solving them; relating real objects, pictures and diagrams to mathematical ideas; and explaining mathematical ideas, situations and relationships using real objects, pictures, graphs and algebra. Based on the results of the mathematical communication skills test for the first indicator, Subject L wrote out the solution completely and clearly; however, in question number three, Subject L provided an answer that was somewhat inaccurate in its solution. Subject L demonstrated the ability to express everyday events in mathematical symbols and language by converting an everyday event into mathematical language. For the second indicator of the mathematical communication skills test, Subject L demonstrated, through their complete and appropriate answers, the ability to link images and diagrams to mathematical concepts. Based on the subject's answers, Subject L was able to demonstrate compliance with the third indicator of mathematical communication skills; Subject L accurately drew the required diagram for question seven. For question eight, Subject L drew a cube using the correct algebraic solution process; however, the solid figure required in that question was a rectangular prism, so there was an error in the answer to question eight. Subject L was still somewhat inaccurate in drawing graphs, as well as in their explanations; however, Subject L demonstrated an effort to solve each problem thoroughly.

Subject MM, who falls into the low self-confidence category, possesses high-level mathematical communication skills and meets three indicators of mathematical communication ability: expressing everyday events in mathematical language or symbols and solving them; relating real objects, pictures and diagrams to mathematical ideas; and explaining mathematical ideas, situations and relationships using real objects, pictures, graphs and algebra. Based on the results of the MM subjects' answers, they wrote their answers completely and accurately in accordance with the problems presented in the questions; in the questions related to the first indicator, there was an inaccuracy in the process of solving question number three; however, the MM subjects demonstrated that they were able to express everyday events in mathematical language. Based on subject MM's answers regarding compliance with the second indicator, subject MM provided a complete answer; however, there was still an inaccuracy in the solution to question five. in question number six, subject MM provided a complete answer but there was an error in point d, where subject MM reversed the variables x and y; it can be concluded that subject MM is able to relate images and diagrams to mathematical concepts. Subject MM provided an answer regarding the third indicator; subject MM depicted a picture of a situation, mathematical ideas and relationships, but there was some inaccuracy in depicting a block and a graph; subject MM also provided a solution process for question number eight accurately and appropriately; in this regard, subject MM is able to understand a problem in the form of pictures, graphs and situations.

The findings of this study indicate that students' mathematical communication skills are not entirely determined directly by their level of self-confidence, but are

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influenced by the interaction of various affective factors. This is evident from the fact that some students with moderate and low levels of self-confidence were still able to demonstrate high-level mathematical communication skills. This suggests that other factors, such as belief in specific abilities (self-efficacy) and the ability to manage anxiety in mathematics learning, also play a role in shaping student performance. Thus, the results of this study confirm that the development of mathematical communication skills requires an approach that not only focuses on cognitive aspects but also considers the psychological dynamics of students in the learning process. These findings align with Calkins et al. (2020), who emphasise that interaction and reflection in learning can serve as important means for developing mathematical communication skills more deeply. This is also influenced by a learning environment that supports student interaction and active participation, as suggested by Attard and Holmes (2022) that students' perceptions of interactive learning can enhance engagement and self-confidence in communicating mathematical ideas.

The findings of this study indicate that students' mathematical communication skills are not entirely determined directly by their level of self-confidence, but rather result from the interaction of various interrelated affective factors. The fact that students with moderate and low levels of self-confidence were still able to achieve high proficiency levels suggests that other factors, such as self-efficacy and the ability to manage anxiety, play an equally important role in shaping students' performance. Furthermore, a supportive learning environment that encourages active participation and interaction also helps to strengthen students' ability to communicate mathematical ideas. Therefore, the development of mathematical communication skills needs to be understood as a multidimensional process, which focuses not only on cognitive aspects but also involves psychological dynamics and the learning context simultaneously.

## Conclusion and Suggestion

Based on the research findings, it can be concluded that students' mathematical communication skills vary according to their level of self-confidence. Students with high self-confidence tend to be able to meet all indicators of mathematical communication skills more consistently, particularly in expressing events through mathematical symbols, linking visual representations to mathematical ideas, and explaining ideas systematically through various forms of representation.

However, the research findings also indicate that students with moderate and low self-confidence are still capable of achieving good mathematical communication skills, although they do not consistently meet all the indicators. This suggests that mathematical communication skills are not entirely determined by the level of self-confidence, but are influenced by other factors such as self-efficacy and the ability to manage anxiety in mathematics learning.

Thus, the relationship between self-confidence and mathematical communication skills can be understood as a dynamic and multidimensional one. Therefore, the development of students' mathematical communication skills should not only focus on cognitive aspects but also take into account affective aspects and create a learning environment that supports students' active participation.

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This study provides an overview of students' mathematical communication skills as viewed through the lens of self-confidence among Class VII students at SMP Negeri 3 Plered, Cirebon Regency. However, further research is recommended to examine this variable at higher levels of education and to employ different approaches and methods in order to gain a more comprehensive understanding.

## Reference

Akbari, O., & Sahibzada, J. (2020). Students' Self-Confidence and Its Impacts on Their Learning Process. *American International Journal of Social Science Research*, *5*(1), 1–15. https://doi.org/10.46281/aijssr.v5i1.462

Aldila, E. (2022). Kemampuan Komunikasi Matematis Siswa Berdasarkan Self-efficacy pada Materi Segiempat dan Segitiga di Desa Sirnajaya. *Journal of Mathematics Science and Computer Education,* 2 (1), 20–43. https://doi.org/10.20527/jmscedu.v2i1.5127

Attard, C., & Holmes, K. (2022). An Exploration of Teacher and Student Perceptions of Blended Learning i. *Mathematics Education Research Journal*, *34*(4), 719–740. https://doi.org/10.1007/s13394-020-00359-2

Bagus, C. (2018). Analisis Kemampuan Representasi Matematis Siswa Dalam Menyelesaikan Soal Lingkaran Pada Kelas VII-B Mts Assyafi ' iyah Gondang. *Suska Jurnal of Mathematics Education* *4*(2), 115–124. http://dx.doi.org/10.24014/sjme.v4i2.5234

Calkins, S., Grannan, S., & Siefken, J. (2020). Using Peer-Assisted Reflection in Math to Foster Critical Thinking and Communication Skills. *Primus*, *30*(4), 475–499. https://doi.org/10.1080/10511970.2019.1608608

Dewi, R. S., Sundayana, R., & Learning, P. B. (2020). Perbedaan Peningkatan Kemampuan Komunikasi Matematis dan Self-Confidence antara Siswa yang Mendapatkan DL dan PBL. *MOSHARAFA: Jurnal Pendidikan Matematika*, 9(3), 463–474. https://doi.org/10.31980/mosharafa.v9i3.629

Gabriel, F., Buckley, S., & Barthakur, A. (2020). The Impact of Mathematics Anxiety on Self-Regulated Learning and Mathematical Literacy. *Australian Journal of Education*, *64*(3), 227–242. https://doi.org/10.1177/0004944120947881

Hardani et al. (2020). Metode Penelitian Kualitatif & Kuantitatif (Husnu Abadi (ed.). Yogyakarta: CV. Pustaka Ilmu Group Yogyakarta

Kanah & Mardiani. (2022). Kemampuan Komunikasi dan Kemandirian Belajar Siswa Melalui Problem Based Learning dan Discovery Learning. *PLUSMINUS : Jurnal Pendidikan Matematika,* *2*(2), 255–264. https://doi.org/10.31980/plusminus.v2i2.1102

Khairunisa & Basuki. (2021). Perbandingan Kemampuan Komunikasi Matematis Siswa antara Model Pembelajaran Kooperatif Tipe TPS dan CIRC. *PLUSMINUS : Jurnal Pendidikan Matematika* *1*(1), 113–124. https://doi.org/10.31980/plusminus.v1i1.881

Lestari & Afriansyah. (2021). Kemampuan Pemecahan Masalah Matematis Siswa SMP di Kampung Cibogo Pada Materi SPLDV. *SIGMA*: *Jurnal Pendidikan Matematika. 13*(2), 92–102. https://doi.org/10.26618/sigma.v13i2.5812

Marliana, W. & Jayanti. D. (2019). 4C dalam Pembelajaran Matematika Untuk Menggapai Era Revolusi Industri 4.0. *Prosiding Sendika*, *5*(1), 392–396.

Noviyana, I. N., & Dewi, N. R. (2019). Analisis Kemampuan Komunikasi Matematis

e-ISSN 2746-5594
p-ISSN 2746-5608

Siswa Ditinjau dari Self-Confidence. *PRISMA: Prosiding Seminar National Matematika, 2*, 704–709. https://journal.unnes.ac.id/sju/prisma/article/view/29241

Öztaş, E. T., & Güçlü, N. T. (2023). Investigation of the Learning Outcomes of the 2018 Middle School Mathematics Curriculum in Terms of Mathematical Communication Skills. *International Journal of Curriculum and Instructional Studies*, *13*(1), 224–248. www.ijocis.com

Öztürk, M., Akkan, Y., & Kaplan, A. (2020). Reading comprehension, Mathematics Self-efficacy Perception, and Mathematics Attitude as Correlates of Students' Non-routine Mathematics Problem-solving Skills in Turkey. *International Journal of Mathematical Education in Science and Technology*, *51*(7), 1042–1058. https://doi.org/10.1080/0020739X.2019.1648893

Redhana. (2019). Mengembangkan Keterampilan Abad-21 dalam Pembelajaran Kimia. *Jurnal Inovasi Pendidikan Kimia Universitas Negeri Semarang, 13(1).* 2239-2253 https://doi.org/10.15294/jipk.v13i1.17824 .

Sugiyono.(2022) Metode Penelitian Kuantitatif, Kualitatif, dan R&D. Bandung: Alfabeta

Shahroom, A. A., Hussin, N., Shahroom, A. A., & Hussin, N. (2018). *Industrial Revolution 4.0 and Education*. *International Journal of Academic Research in Business and Social Sciences*, *8*(9), 314-319.https://doi.org/10.6007/IJARBSS/v8-i9/4593

Sholihah & Aulia. (2020). Hubungan Self Concept dan Self Confidencem. *JURNAL PSIKOLOGI: Jurnal Ilmiyah Fakultas Pisikologi Universitas Yudharta Pasuruan*, *7* (1), 41–55. https://doi.org/10.35891/jip.v7i1.1954

Sholihah, B. (2022). Kemampuan Komunikasi Matematis Siswa dalam Menyelesaikan Masalah Open-Ended Ditinjau dari Self-Efficacy. *PLUSMINUS: Jurnal Pendidikan Matematika 2* (2), 243–254. https://doi.org/10.31980/plusminus.v2i2.1101

Suren, N., & Ali Kandemir, M. (2020). The Effects of Mathematics Anxiety and Motivation on Students' Mathematics Achievement. *International Journal of Education in Mathematics, Science and Technology*, *8*(3), 190–218. https://doi.org/10.46328/IJEMST.V8I3.926

Susanti, M. (2018). Analisis Kemampuan Komunikasi Matematis Siswa SMP ditinjau dari Self-concept. *Jurnal Ilmiah Ilmu Sosial Dan Humaniora*, *4*(2), 91-96. https://doi.org/10.30738/sosio.v4i2.2751

Tus, J. (2020). Self-Concept, Self-Esteem, Self-Efficacy and Academic Performance of the Senior High School Students. *International Journal of Research Culture Society*, *4*(10), 45–59. https://ijrcs.org/wp-content/uploads/IJRCS202010009.pdf

Vandini. (2015). Peran Kepercayaan Diri terhadap Prestasi Belajar Matematika Siswa. *FORMATIF : Jurnal Ilmiyah Pendidikan MIPA*, *5*(3), 210–219. http://dx.doi.org/10.30998/formatif.v5i3.646

Voica, C., Singer, F. M., & Stan, E. (2020). How Are Motivation and Self-Efficacy Interacting in Problem-Solving and Problem-Posing? *Educational Studies in Mathematics*, *105*(3), 487–517. https://doi.org/10.1007/s10649-020-10005-0

Waruwu. (2023). Pendekatan Penelitian Pendidikan: Metode Penelitian Kualitatif, Metode Penelitian Kuantitatif dan Metode Penelitian Kombinasi (Mixed

e-ISSN 2746-5594
p-ISSN 2746-5608

Method). *Jurnal Pendidikan Tambusai, 7*(12), 2896–2910. https://doi.org/10.31004/jptam.v7i1.6187

Ya-Amphan, D., Thinwiangthong, S., & Sythong, P. (2024). Comparative Study of Means of Mathematical Communication in Japan, Laos, and Thailand. *Journal on Mathematics Education*, *15*(1), 99–114. https://doi.org/10.22342/jme.v15i1.pp99-114

Yusriyah, Y., & Noordyana, M. A. (2021). Kemampuan Representasi Matematis Siswa SMP pada Materi Penyajian Data di Desa Bungbulang. *PLUSMINUS : Jurnal Pendidikan Matematika*. *1*(1), 47–60. https://doi.org/10.31980/plusminus.v1i1.870

Zhou, D., Du, X., Hau, K. T., Luo, H., Feng, P., & Liu, J. (2020). Teacher-Student Relationship and Mathematical Problem-Solving Ability: Mediating Roles of Self-Efficacy and Mathematical Anxiety. *Educational Psychology*, *40*(4), 473–489. https://doi.org/10.1080/01443410.2019.1696947