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PROFILE OF MATHEMATICAL COMMUNICATION SKILLS OF CLASS VIII MTS AL-KHAIRAAT TONDO STUDENTS ON RELATION AND FUNCTION MATERIAL IN TERMS OF SELF-CONFIDENCE

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Abstract

This research is a descriptive qualitative research with the subject of the research VIII grade students of MTs Al-Khairaat Tondo. The purpose of this study was to obtain an overview of the mathematical communication skills of class VIII A students on the material of relations and functions based on self-confidence. The subjects of this study were selected based on self-confidence questionnaire. The subjects of this study were 3 students from 17 students of class VIII A MTs Al-khairaat Tondo, each of whom had high, medium and low self-confidence. Data was collected using questionnaire, written test and interview methods. The data analysis techniques used are data condensation, data presentation and conclusion drawing. The results showed that high self-confidence subjects fulfilled three indicators, namely 1) expressing situations, images, or diagrams into mathematical language, symbols, or ideas/ideas appropriately both orally and in writing; 2) using mathematical representations (diagrams, graphs) to express mathematical information 3) communicating answer conclusions both orally and in writing. Moderate self-confidence subjects fulfilled two indicators, namely 1) expressing situations, images, or diagrams into mathematical language, symbols, or ideas/ideas appropriately both orally and in writing; 2) using mathematical representations (diagrams, graphs) to express mathematical information. Low self-confidence subjects fulfilled one indicator, namely 1) using mathematical representations to express mathematical information.

Keywords: Mathematical communication skills, Relations & Functions, Self-confidence

Abstrak

Penelitian ini merupakan peneltian deskriptif kualitatif dengan subjek peneltian Siswa kelas VIII MTs Al-Khairaat Tondo. Tujuan dari penelitian ini adalah untuk memperoleh gambaran kemampuan komunikasi matematis siswa kelas VIII A pada materi relasi dan fungsi berdasarkan *self-confidence.* Subjek penelitian ini dipilih berdasarkan angket *self-confidence.* Subjek penelitian ini adalah 3 orang siswa dari 17 siswa kelas VIII A MTs Al-khairaat Tondo, yang masing-masing memiliki *self-confidence* tinggi, sedang dan rendah. Data di kumpulkan dengan menggunakan metode angket, tes tertulis dan wawancara. Teknik analisis data yang digunakan yaitu kondensasi data, penyajian data dan penarikan kesimpulan. Hasil penelitian menunjukkan bahwa subjek *self-confidence* tinggi memenuhi tiga indikator yaitu 1) menyatakan situasi, gambar, atau diagram kedalam bahasa, simbol, atau gagasan/ide matematis dengan tepat baik secara lisan maupun tulisan; 2) menggunakan respresentasi matematika (diagram, grafik) untuk menyatakan informasi matematis 3) mengkomunikasikan kesimpulan jawaban baik secara lisan maupun tulisan. Subjek *self-confidence* sedang memenuhi dua indikator yaitu 1) menyatakan situasi, gambar, atau diagram kedalam bahasa, simbol, atau gagasan/ide matematis dengan tepat baik secara lisan maupun tulisan; 2) menggunakan respresentasi matematika (diagram, grafik) untuk menyatakan informasi matematis. Subjek *self-confidence* rendah memenuhi satu indikator yaitu 1) menggunakan respresentasi matematika (diagram, grafik) untuk menyatakan informasi matematis).

Kata Kunci: Kemampuan komunikasi matematis, relasi & fungsi, *self-confidence*

INTRODUCTION

Mathematics is a subject that is always found at every level of education, be it in elementary school, middle school or college. This is in line with what was stated by Naimah

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et al., (2022) that mathematics is a subject studied at all levels of education, from elementary school to high school and even college. Mathematics consists of many branches such as algebra, calculus to geometry. Of the many branches of mathematics, to be able to solve problems in everyday life, students must have good mathematical skills (Ulya et al., 2019)

Students must have several abilities in learning mathematics, one of which is mathematical communication skills. Mathematical communication skills are students' ability to express mathematical ideas orally or in writing using mathematical language in the form of graphs, diagrams or tables (Widiyanto & Yunianta, 2021). According to the National Council Teachers Of Mathematics (2000) states that mathematical communication skills are the ability to organize mathematical thoughts, communicate mathematical ideas logically and clearly to others, analyze and evaluate mathematical thoughts and strategies used by others, and use mathematical language to express ideas appropriately.

Mathematical communication skills are very important to cultivate because they can encourage students to be actively involved in learning and eliminate the thought that mathematics is a difficult and scary subject (Kusuma & Manoy, 2022). Learners need to be aware of the importance of mathematical communication skills, as strong communication skills can ensure that students succeed in mathematics. Having good mathematical communication skills will be advantageous for all aspects of learning, this can help students become more logical thinkers and better communicators (Tong et al., 2021).

Mathematics subjects in class VIII odd semesters contain material about relations and functions. A relation is a relationship between a set called a domain and another set called a codomain. While a function is a set that is paired with exactly one member on another set. Every function is a relation, but not all relationships are functions. To express relations and functions can use arrows and cartesian coordinates.

Previous research relevant to this study is research conducted by Sunaryo et al. (2022) in class XI IPA in one of the schools in Ciamis. The study described that students with high self-confidence ability fulfilled all indicators of mathematical communication ability shown from test and interview results. In students with moderate self-confidence ability, the subject can only fulfil two indicators. Then students with low self-confidence ability only

fulfilled one indicator. From the results of the study, it can be concluded that the higher the self-confidence, the higher the mathematical communication ability.

Mathematical communication skills are influenced by several things, one of which is self-confidence. This is in line with what was stated by Muniroh et al., (2018) that one way to improve mathematical communication skills is the need for personality development by increasing the student's self-confidence, because with confidence students can express thoughts or ideas more boldly and confidently in expressing their opinions. This is in line with what was stated by Rahmasuri, A. R., Dwijayanti, I., & Wulandari, (2022) that self-confidence is an attitude of trust and confidence in one's abilities. With a confident attitude, a person will feel confident when doing something and responsible for what is done. This can be a driver and expedite the process of learning mathematics because students can learn mathematics well if they have high self-confidence.

Different self-confidence can affect students' mathematical communication skills. This is in line with research conducted by Sunaryo, Y., Waluya, S. B., Wardono., W. Dewi, (2022) that the higher students' self-confidence, the students' mathematical communication skills will also increase. Students can be said to have high self-confidence if they have confidence in their own ability to overcome problems. Good self-confidence is needed to solve problems, because students who have high self-confidence tend not to be influenced by other people's answers (Yulinawati & Nuraeni, 2021)

Based on the exposure that has been delivered and the importance of mathematical communication skills, the researcher wants to describe students' mathematical communication skills on relation and function material based on self-confidence. Therefore, researchers are interested in conducting a study entitled “Profile of mathematical communication skills of class VIII MTs Al-khairaat Tondo students on relation and function material in terms of self-confidence”.

METHODS

The method used in this research is descriptive qualitative research with the type of case study, which is used to describe students' mathematical communication skills on relationship and function material based on self-confidence by looking at the subject's understanding and behaviour.. The subjects used in this study amounted to 3 students out of 17 students in class VIII A MTs Al-khairaat Tondo for the 2022/2023 school year, each of

whom had different levels of self-confidence, namely high, medium and low self-confidence. The data collection process used self-confidence questionnaires, written tests and interviews. Self-confidence questionnaires are used to determine students' levels of self-confidence which include high, medium or low self-confidence. Using a Likert scale consisting of four answer choices, namely strongly agree (SS), agree (S), disagree (TS) and strongly disagree (STS) consisting of 33 statements. The grouping of high, medium and low mathematical communication skills refers to the results of mathematical communication skills tests in the form of 2 description questions. Before use, the self-confidence questionnaire and test instruments used in this study had previously been validated by expert lecturers.

The indicators of mathematical communication skills used in this study based on the National Council Teachers Of Mathematics (2000) and (Tong et al., 2021) are as follows:

1. The ability of students to express a situation, picture, diagram into language, symbols or mathematical ideas / ideas correctly both orally and in writing.
2. The ability of students to use mathematical representations (diagrams, graphs) to express mathematical information.
3. The ability of students to communicate the conclusions of answers orally and in writing.

The data analysis techniques used according to miles and Huberman (Sugiyono, 2021) are data condensation, data presentation and conclusion drawing and verification. The technique of checking the validity of data in this study uses member check.

RESULTS AND DISCUSSION

The results of the research obtained in this study were in the form of self-confidence questionnaire results that had been conducted with 17 grade VIII A students. Based on the results of the self-confidence questionnaire, a classification of self-confidence grouping of students was obtained as the following table.

Table 1. Results of self-confidence questionnaire

No.	Self-confidence	Number of learners
1	High	3
2	Medium	9

3	Low	8

Based on the results of self-confidence questionnaire data conducted offline in class VII A, 3 subjects were selected from each category, namely 1 subject with high self-confidence, 1 subject with medium self-confidence and 1 subject with low self-confidence. The selected research subjects can be seen in table 2.

Table 2. **List of research subjects**

Subject code	Score	Level of self-confidence
RS	90	High
BC	75	Medium
NW	63	Low

After taking self-confidence data, students carry out a mathematical communication skills test consisting of 2 description questions with relation and function material. Selected subjects from class VIII A MTs Al-khairaat Tondo will then conduct an interview.

1. The subject of High Self-confidence (RS)

Written mathematical communication skills

From the problem "Suppose *f* is a function of the set A consisting of integers between 1 and 5 and the set B of integers between 3 and 7. If *f* function that expresses “two fare of” express *f* by : a.) Arrow chart; b.) Cartesian coordinates (graph)" are obtained in the following written test:

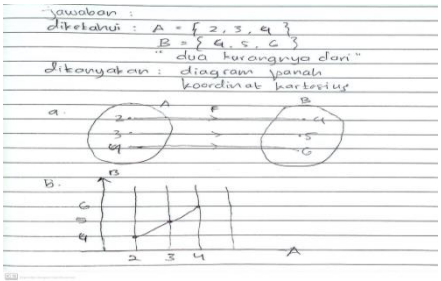

Figure 1 RS written test answer result number 1

Based on the results of the written test, mathematical communication skills on question number 1, the RS subject is able to write down the known and asked information contained in the problem and use correct mathematical symbols when solving relation and function problems. This is in line with the opinion of Rizqi et al. (2016) which states that if

students have high self-confidence then they are able to express mathematical ideas orally and in writing, coherent and clear, they are also able to describe in visual form completely, able to use mathematical terms, notations, and structures appropriately. Subject RS was also able to use mathematical representations by drawing arrow diagrams and cartesian coordinates. This is supported by research by Aini & Setianingsih (2022) which concluded that in the Drawing aspect, subjects who have high self-confidence are able to draw graphs correctly and completely on the answer sheet and are able to explain the steps of making graphs systematically.

From the problem "It is known that R is the set of natural numbers between 1 and 9 and S is the set of odd numbers between 1 and 9. The relation connecting the set R to S is "less than". Specify domain, codomain and range". The following written test is obtained:

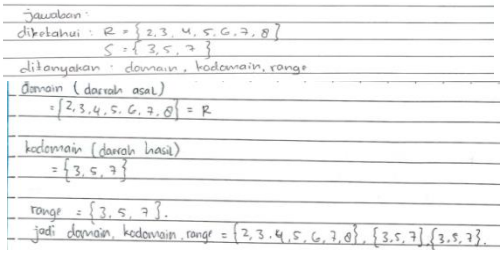

Figure 2 RS written test answer result number 2

Based on the results of the written test, mathematical communication skills on question number 2, the RS subject is able to write down the known and asked information contained in the problem and use the correct mathematical symbols when solving relation and function problems. This is in line with the opinion of Rizqi et al. (2016) which states that if students have high self-confidence then they are able to express mathematical ideas orally and in writing, coherent and clear, they are also able to describe in visual form completely, able to use mathematical terms, notations, and structures appropriately. Subject RS was also able to write the conclusion of the solution in accordance with the purpose of the problem. This is in line with the research of Asari et al. (2022) which states that subjects with high self-confidence can re-examine answers by writing conclusions well and correct answers. Students with a high level of self-confidence are able to fulfil all the ability indicators shown by being able to write and mention the information in the problem Safitri et al. (2022). From the results of the analysis of the mathematical communication ability test

on questions number 1 and 2, it can be concluded that the subject RS was able to fulfil all three indicators of mathematical communication ability. Oral mathematical communication skills. From the results of the analysis of the mathematical communication ability test on questions number 1 and 2, it can be concluded that the RS subject is able to meet all three indicators o of mathematical communication ability.

Oral mathematical communication skills.

Based on the results of interviews on questions number 1 and 2, the RS subjects were able to explain the information known and asked contained in the questions, able to explain mathematical symbols correctly, able to explain the existing images, able to explain the conclusions of the answers correctly. From the results of the interview analysis of oral mathematical communication skills, it can be concluded that RS subjects are able to meet the three indicators of mathematical communication skills properly and correctly. This is in line with the research of Safitri et al., (2022) which provides results for students with a high level of *self-confidence* to be able to meet all indicators of ability shown by being able to write and mention information on questions.

2. The subject of Medium self-confidence (SM)

Written mathematical communication skills

From the problem "Suppose *f* is a function of the set A consisting of integers between 1 and 5 and the set B of integers between 3 and 7. If f is a function that expresses "two fare of" Express *f* by: a.) Arrow chart; b.) Cartesian coordinates (graph)" are obtained in the following written test:

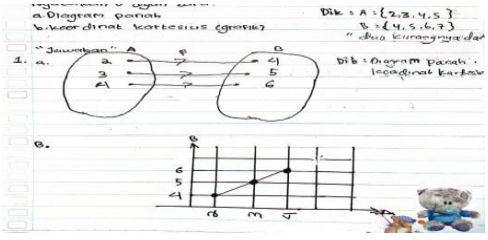

Figure 3 SM written test answer result number 1

Based on the results of the written test of mathematical communication skills on question number 1, the subject SM is able to write down the information known and asked contained in the problem and use correct mathematical symbols when solving relation and

function problems. This is in line with the research of Rizqi et al. (2016) which concluded that the mathematical communication skills of students who have moderate self-confidence are categorised as high. Subject SM was also able to use mathematical representations, namely by drawing arrow diagrams and cartesian coordinates. This is supported by Aini & Setianingsih (2022) which concluded that in the Drawing aspect, moderate self-confidence subjects were able to draw graphs correctly, although they were still less precise.

From the problem "It is known that R is the set of natural numbers between 1 and 9 and S is the set of odd numbers between 1 and 9. The relation connecting the set R to S is "less than". Specify domain, codomain and range". The following written test is obtained:

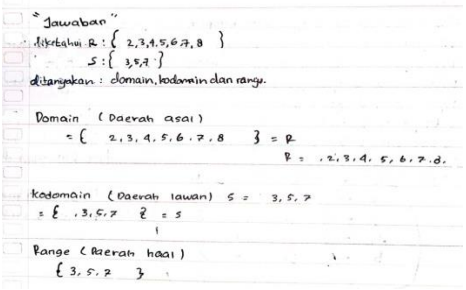

Figure 4 SM written test answer result number 2

Based on the results of the written test of mathematical communication skills on question number 2, SM subjects are able to write down the information known and asked contained in the problem and use correct mathematical symbols when solving relation and function problems. This is in line with the research of Rizqi et al. (2016) which concluded that the mathematical communication skills of students who have moderate self-confidence are categorised as high. However, SM has not been able to write the conclusion of the solution in accordance with the purpose of the problem.

From the results of the analysis of the mathematical communication ability test on questions number 1 and 2, it can be concluded that SM subjects are able to meet two indicators of mathematical communication ability.

Oral mathematical communication skills

Based on the results of interviews on questions number 1 and 2, SM subjects were able to explain the information known and asked contained in the questions, able to explain mathematical symbols correctly, able to explain existing images, but not able to explain the

conclusion of the answers. From the results of the interview analysis of oral mathematical communication skills, it can be concluded that SM subjects are able to meet two indicators of mathematical communication skills properly and correctly. This is in line with the research of Aini & Setianingsih, (2022) which provides results that students with moderate self-confidence have moderate mathematical communication skills, students with moderate self-confidence are still lacking in the aspect of Mathematical Expression, namely communicating mathematical ideas into mathematical notation.

3. The subject of Low self-confidence (NW)

Written mathematical communication skills

From the problem "Suppose *f* is a function of the set A consisting of integers between 1 and 5 and the set B of integers between 3 and 7. If f is a function that expresses "two fare of" Express *f* by: a.) Arrow chart; b.) Cartesian coordinates (graph)" are obtained in the following written test:

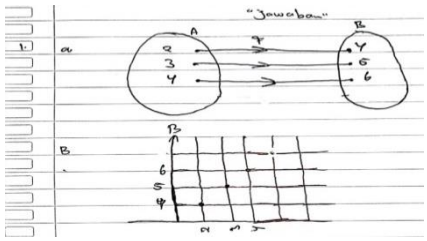

Figure 5 NW written test answer result number 1

Based on the results of the written test of mathematical communication skills on question number 1 subject NW has not been able to write down the information known and asked contained in the problem, NW is able to use mathematical representation, namely by drawing arrow diagrams and cartesian coordinates. This is in line with the research of Murtafiah et al. (2021) which states that low self-confidence subjects are less able to fulfil indicators of written and oral mathematical communication skills at the stage of implementing the plan and re-examining the solution. This is supported by the statement that communication skills are a prerequisite in solving mathematical problems, if students cannot communicate and interpret mathematical concepts and problems, then they cannot solve problems properly Alhaddad et al. (2015).

From the problem "It is known that R is the set of natural numbers between 1 and 9 and S is the set of odd numbers between 1 and 9. The relation connecting the set R to S is "less than". Specify domain, codomain and range". The following written test is obtained:

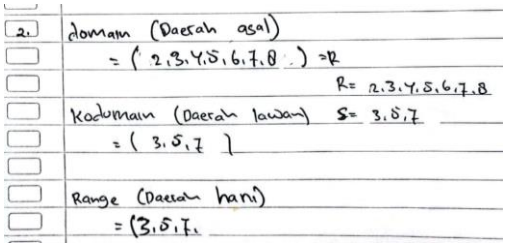

Figure 6 NW written test answer result number 2

Based on the results of the written test of mathematical communication skills on question number 2, the NW subject has not been able to write down the information known and asked contained in the problem, has not been able to use mathematical symbols correctly, has not been able to write conclusions from the results of the solution in accordance with the purpose of the problem.

From the results of the analysis of the mathematical communication ability test on questions number 1 and 2, it can be concluded that the NW subject is able to meet one indicator of mathematical communication ability.

Oral mathematical communication skills

Based on the results of interviews on questions number 1 and 2, NW subjects were able to explain the information contained in the questions, able to explain the existing pictures, but were not able to explain the conclusions of the answers. From the results of the interview analysis of oral mathematical communication skills, it can be concluded that NW subjects are able to meet one indicator of mathematical communication skills properly and correctly. This is in line with the research of Muniroh et al., (2018) which states that the lower the *self-confidence* of students, the lower their mathematical communication skills.

CONCLUSION

Based on the results of research and discussions that have been carried out, the following conclusions are obtained: (a). The subject of high *self-confidence* can demonstrate the use of mathematical language well, namely by writing mathematical symbols in writing mathematical problem solving and when writing down known information. High self-

confidence subjects can also write mathematical representations in the form of images used in solving mathematical problems and high *self-confidence* subjects can write conclusions correctly. (b). The subject of *moderate self-confidence* can demonstrate the use of mathematical language well, namely by writing mathematical symbols in writing down mathematical problem solving and when writing down known information. *Self-confidence* subjects can also write a form of mathematical representation in the form of images used in solving mathematical problems. However, the subject of *moderate self-confidence* has not been able to write conclusions correctly. This shows that the subject of *self-confidence* is having quite good mathematical communication skills. (c). The subject of low *self-confidence* has not been able to demonstrate the use of mathematical language well, namely by writing mathematical symbols in writing down mathematical problem solving and when writing down known information. Subjects of *low self-confidence* can write a form of mathematical representation in the form of images used in solving mathematical problems. The subject of low *self-confidence* has not been able to write down conclusions correctly. This shows that low *self-confidence* subjects have poor mathematical communication skills

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