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ANALYSIS OF MATHEMATICAL COMMUNICATION SKILLS IN SOLVING MODELING PROBLEMS WITH MARITIME CONTEXT IN ALGEBRA MATERIAL

Devika Adilakirani[1], Puji Astuti[2], Febrian[3]
[1,2,3] Maritime Raja Ali Haji University, Tanjungpinang, Kepulauan Riau
adilakirani2302@gmail.com[1]

Abstrak

Penelitian ini didorong pentingnya kemampuan komunikasi matematika dalam meningkatkan pemahaman matematika siswa. Tujuan penelitian ini adalah untuk mendeskripsikan keterampilan komunikasi matematis siswa pada materi aljabar ketika menyelesaikan tugas pemodelan dalam konteks kelautan. Metodologi penelitian yang digunakan dalam penelitian ini adalah penelitian deskriptif kualitatif. Penelitian dilakukan di SMP Negeri 2 Bintan pada Juni 2024. Subjek penelitian adalah mahasiswa VIII C. Teknik pengumpulan data adalah instrumen pengujian dan pedoman wawancara. Teknik analisis data adalah reduksi data, penyajian data, dan penarikan kesimpulan. Hasil penelitian menunjukkan bahwa terdapat 4 siswa kategori tinggi dengan persentase 19%, 12 siswa kategori menengah dengan persentase 57%, dan 5 siswa kategori rendah dengan persentase 24%. Peneliti merekomendasikan bahwa keterampilan komunikasi matematis siswa dapat ditingkatkan dengan mempraktikkan pemecahan masalah matematika yang terkait dengan komunikasi matematika.
Kata Kunci: komunikasi matematika, masalah pemodelan, konteks maritim, aljabar

Abstract

This research was motivated the importance of mathematical communication skills in improving students' mathematical understanding. The aim of this study is to describe students' mathematical communication skills on algebraic material when solving modeling tasks in the marine context. The research methodology used in this research is descriptive qualitative research. The research was conducted at SMP Negeri 2 Bintan in June 2024. The research subjects were VIII C students. Data collection techniques were test instruments and interview guidelines. Data analysis techniques are data reduction, data presentation, and inference. The result show that there were 4 students in the high category with a percentage of 19%, 12 students in the medium category with a percentage of 57%, and 5 students in the low category with a percentage of 24%. The researcher suggest that students' mathematical communication skills can be further improved by practicing mathematical problem-solving related to mathematical communication.
Keywords*: mathematical communication, modeling problems, maritime context, algebra*

INTRODUCTION

Law Number 20 of 2003 explains that education is a conscious and planned effort in realizing an active learning atmosphere so that it can develop the potential of students so that they have strength in terms of religion, personality, intelligence, morals and skills in society, nation and state. In other words, education is a process for acquiring and developing knowledge, skills, attitudes and also student experiences, where these aspects obtained will develop in students to be applied and become guidelines for living life in building (Dianti et al., 2021).

Mathematics is a crucial subject in all educational pathways, including formal, which helps develop students' rational thinking and innovative abilities. Good communication skills are needed to encourage innovation in various aspects of student life, with algebra material being fundamental for every student to master (Hafidhoh & Marlina, 2021).

Algebra is a branch of mathematics that uses symbols to represent numbers and

transform problems such as fractions and measures into simpler forms (Sugiarto, 2017). Algebra not only addresses abstract problems but also everyday situations, using symbols and mathematical tools to analyze problems (Aurelyasari & Nur, 2023).

The independent curriculum emphasizes the importance of mathematical communication skills in improving students' understanding of mathematics. Current mathematics learning needs to develop students' mathematical communication skills, which is important in achieving the goals of mathematics education and the curriculum (Saryantono & Nurdiana, 2022). Mathematical communication plays a key role in mathematics learning as an effective language to measure students' understanding by using mathematical symbols and applications to everyday life (Yulyantika et al., 2019).

Based on the TIMSS report in 2015, Indonesia ranked 44th out of 49 countries with an average score of 397, indicating the low mathematical communication skills of Indonesian students (Hadi & Novaliyosi, 2019). The TIMSS evaluation emphasizes students' ability to connect reality situations with mathematical concepts appropriately, and the results show that mathematical communication skills are low. From the daily assessment results, 78% of students in class VIIIA and VIIIB had scores below the average, indicating a problem in written mathematical communication skills. Researchers used this data to identify initial issues and conduct further analysis on algebraic material with a maritime context.

Mathematical communication skills of VIII grade students of SMP Negeri 2 Bintan are considered low based on research observations during the Introduction to the School Environment activity and when researchers gave mathematical problems on algebraic material. Students have difficulty conveying mathematical ideas in writing and expressing mathematical symbols from statements. Student learning outcomes also show low performance, reinforcing this conclusion.

Mathematics teachers observe that students have difficulty solving problems that require deeper logic and expressing ideas in writing. This problem shows that most students face difficulties in understanding problems that require mathematical communication. Researchers need to further analyze the location of this problem by giving problems that are formulated in mathematical models in by the rules of mathematical formulation (Kusniati, 2018).

Mathematical Modeling is a technique for representing complex systems in mathematical models. It involves the formulation of a system of equations to describe complex problems. This approach allows students to transform real-life problems into mathematical forms, identify problems, associate mathematical concepts, and develop mathematical models for appropriate solutions.

Mathematical modeling is a stage in mathematical problem solving that transforms everyday life problems into a mathematical format (Indrawati et al., 2019). According to Laia & Harefa (2021), mathematical problem-solving ability has a positive and significant relationship with students' mathematical communication skills, because mathematical communication helps in developing mathematical models to solve problems in science and everyday life.

Mathematical modeling problems use a story context that requires students to translate the problem into a mathematical format. This research develops maritime resources such as ponds and marine biota into algebraic problems, which are relevant for students in the Riau Islands due to its geographical condition, the majority of which is water (Sari et al., 2021). Maritime, which is related to the sea and maritime activities, including human, environmental, and marine biota aspects Akhirman (2017), is a familiar context and can be applied in mathematics learning to enrich students' learning experience.

The problem formulation in this study is how students' mathematical communication skills in solving modeling problems with the maritime context in algebra material. The purpose of this study is to describe students' mathematical communication skills in solving modeling problems with a maritime context in algebraic material.

METHOD

The research methodology used in this research is descriptive qualitative research as described by Sugiyono (2021). In this research, the type of research descriptive research is used to get a real picture of a phenomenon without treatment of students' mathematical communication skills. students. Before the test, the researcher will explain to the students related to the the research process so that students can prepare themselves well physically and mentally. physically and mentally. In addition, researchers conducted direct interviews with the subject under study to strengthen the data that has been obtained.The research was conducted at SMP Negeri 2 Bintan in June 2024. The subjects of this research were students of class VIII C SMP Negeri 2 Bintan. To obtain research data, two data collection techniques were used, namely test instruments and interview guidelines. Data analysis techniques used in this research are data reduction which will focus on student answers which refers to the mathematical communication skills of class VIII students, starting with conducting a mathematical communication skills test. begins by conducting a mathematical communication ability test. Then, the test results will be checked according to the answer key. Then, assess students' mathematical communication skills based on communication indicators by looking at the results of student work. Selection of research subjects to be interviewed based on the scores obtained by the students after the doing the examination. In this study, dividing students' communication ability into 3 categories, namely high mathematical communication ability, moderate mathematical communication ability, and high mathematical communication ability. high, medium mathematical communication ability, and low mathematical communication ability. Data presentation in the form of compiling data in the form of descriptive research results that mathematical communication skills in answering modeling questions, and conclusion drawing. The data validity test in this study is construct validity which is validity based on expert research. Furthermore, the credibility test of this research uses triangulation techniques.

RESEARCH RESULTS AND DISCUSSION

The test was given by researchers during one meeting, namely on June 20, 2024, with 60 minutes. Researchers gave a test of 4 questions. After the test was conducted, the researcher corrected the answers of each student based on the scoring guidelines for mathematical communication skills to describe the written mathematical communication skills of each student. The classification of students' mathematical communication skills based on the test results is listed in Table 1 below.

Table 1. Number of students in each category of written mathematical communication ability

Category	Number of Students	Percentage
High	4	19%
Medium	12	57%
Low	5	24%
Total	21	100%

It can be seen that student written mathematical communication skills are dominant in the medium category. It can be interpreted that most students do not fulfill the indicators of mathematical communication ability in solving test questions. Meanwhile, the number of students in each categori of mathematic comunication ability indicators can be seen in the following diagram.

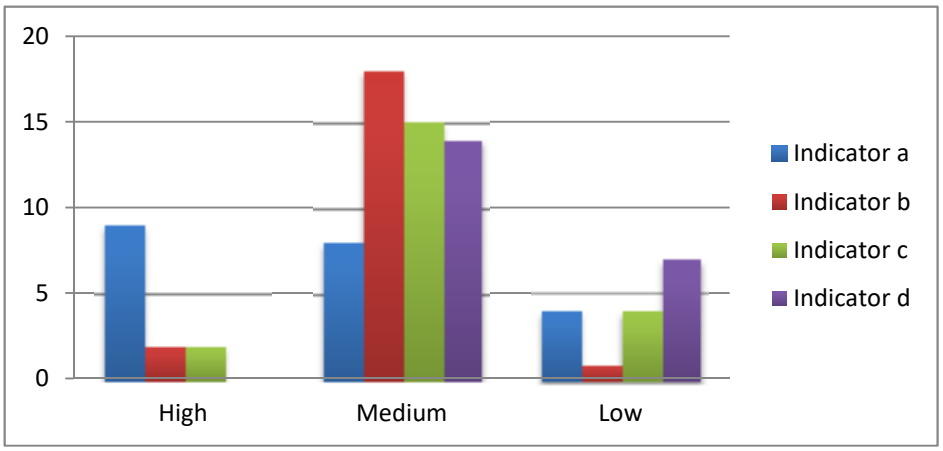

Figure 1. Diagram of student in each category of mathematical communication ability indicators

From Figure 1 above, it can be seen that the highest number of students in each indicator of mathematical communication ability is in the medium category. As for indicator a, namely the ability of students to understand and find mathematical ideas in finding problem solutions and solving strategies, 9 students are in the high category, 8 students are in the medium category and 4 students are in the low category. In indicator b, namely the ability of students to use mathematical terms, notations, and structures to present mathematical ideas in mathematical language or symbols, 2 students high category, 18 students medium category, and 1 students low category. In indicator c, namely the ability of students to express mathematical concept by stating everyday events in mathematical language or symbols, there are 2 students in the high category, 18 students in the medium category, and 1 student in the low category. In indicator d, namely the ability to communicate the conclusions of answers to everyday problems according to the results of the question, there are 0 students in the high category, 14 students in the medium category, and 7 students in the low category.

Besides being seen from the diagram based on the results of the test analysis, the interview also produced the same thing where students in the high category were able to describe mathematical ideas, convert everyday language into notation, and mathematical symbols, explain mathematical concepts everyday language into mathematical notation and symbols, explain the mathematical concepts used to solve the problem, and are able to describe mathematical ideas math concepts used to solve problems in the problem, and are able to communicate the conclusions that students make communicate the conclusions that students make in accordance with the problems that have been answered that has been answered. while the results of interviews with students with moderate categories cannot convey what is known in writing that means, students do not fulfill the first indicator of the first mathematical communication ability indicator, namely the ability of students to understand and find mathematical ideas in finding solutions to problems and strategies for solving them.

The results of interviews with students in the low category students did not understand the the meaning of the question. However, students can explain the first indicator which is that students can find mathematical ideas in the problem. So that it can be concluded that students are categorized as low in mathematical communication ability because they are not able to fulfill several indicators of mathematical communication ability.

The following is an explanation of the written mathematical communication skills of students in class VIII SMP Negeri 2 Bintan.

Students' ability to understand and find mathematical ideas in finding solutions to problems and their completion strategies.

Students in the high category were able to make known and questionable information in the problem by using mathematical ideas well. Students in the medium category did not write the known and questioned information completely, precisely, and arranged in some numbers. Meanwhile, students in the low categori were unable to write the known and questionable information in the problem.

Students' ability to use mathematical terms, notations, and structures to present mathematical ideas in mathematical language or symbols.

Students in the high category were able to convert everyday sentences into mathematical language by using mathematical notation and structure very well. Students in the medium category tend to be able to present mathematical ideas in mathematical language using mathematical notation and symbols. While students in the low category tend to be able to present mathematical ideas in mathematical language using mathematical notation and symbols.

Students' ability to express mathematical concepts by expressing everyday events in mathematical language or symbols.

Students in the high category can express mathematical concepts to solve problems in problems very well. Students in the medium category are less able to express mathematical concepts. Students in the low category tend to be unable to make mathematical concepts.

Ability to communicate the conclusion of the answer to everyday problems according to the results of the question.

Students in the high categori can make conclusions after getting the results of solving problems in the problem very well. Students in the medium category tend to be able to communicate the conclusion of the answer to the problem that has been solved. While students in the low category were not able to communicate the conclusion of the answer to the problem that had been solved.

CONCLUSIONS

Base on the result of the research analysis of students mathematical comunication skills in solving modeling problems with a maritime context in class VIII SMP, three groups of written mathematical communication skills category were obtained, namely high, medium, and low. Of the 21 students, 19% of students with high written mathematical communication skills, 57% of students with medium written mathematical communication skills, and 24% of students with low written mathematical comunication skills.

Student with high written mathematical communication abiliti can fulfill all indicators of mathematic communication ability, namely the ability to understand and find ideas, the ability to use mathematical terms, the ability to express mathematical concepts, and the ability to communicate conclusions. Student with moderate written mathematical communication ability tend not to fulfill one of the indicators of written mathematical communication ability or the solutions provided by students are less precise. Students with low written mathematical communication skill cannot fulfill several indicators of mathematical communication skills such as the ability to understand and find ideas, the ability to express mathematical concepts, and the ability to communicate conclusions.

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