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Research Article

Mathematical Communication Skills of Junior High School Students in Solving Straight Line Equation Problems Based on Learning Interest

Willy Abdul Ghany*, Endang Cahya M, and Dadang Juandi

Mathematics Education Department, Universitas Pendidikan Indonesia

ORCID
Willy Abdul Ghany: https://orcid.org/0009-0000-6403-8276
Endang Cahya M: https://orcid.org/0009-0009-8495-7873
Dadang Juandi: https://orcid.org/0000-0001-6997-1399

Abstract.
One of the skills that students should possess to compete in the 21st century is communication skills, including mathematical communication skills. In short, mathematical communication skill is an ability of students to convey their mathematical ideas. However, the facts show that the mathematical communication skills of junior high school students are still relatively low. This problem is closely related to learning interests. This study aims to analyze and describe the mathematical communication skills of junior high school students in solving straight-line equation problems based on learning interest. This study used a qualitative research method with a case study design. The research subjects were 33 grade VIII students from one of the junior high schools in Bandung, West Java, Indonesia. Data were collected using triangulation techniques from data on mathematical communication skills tests about straight line equations, learning interest questionnaires, and interviews. The research findings revealed that students with good and very good learning interests, mostly at level 3 mathematical communication skills (in general they can communicate ideas effectively but there are some small errors), students in the good enough learning interest category are at level 2 mathematical communication skills (can communicate some ideas with slightly ambiguous explanations), and students in poor learning interest are at level 3 mathematical communication skills (in general they can communicate ideas effectively but there are some minor errors).

Keywords: mathematical communication,students, straight line equations, learning interest

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1. INTRODUCTION

Mathematical communication skills in short is one of student ability to convey their mathematical ideas. Mathematical communication skills can be interpreted as the ability to share ideas and explain understanding in learning mathematics [1]. Students who have good mathematical communication skills tend to be able to easily express their

mathematical ideas/thoughts to be understood by friends, teachers and others. In mathematical communication, ideas that come from the problem-solving process become objects of discussion, refinement, reflection, and change [2]. Mathematical communication ability is one of the important skills that must be owned by students. The importance of mathematical communication skills is included in one of the competencies that must be developed [2]. Some previous researchers agreed that one of the most important and essential parts of mathematics education is communication [3–6]. Communication skills are one of the important skills of the 21st century and play an important role in learning. Communication is a very basic thing in social interaction, in building and maintaining all relationships [7].

Mathematical communication skills are not a special concern if the students are able to fulfill the existing indicators. However, if the indicators of students' mathematical communication skills have not been fully fulfilled, then there is an indication that there is a problem with students' mathematical communication skills. Several studies state that the mathematical communication skills of Indonesian students still need special attention and still need to be developed [6, 8, 9]. The facts show that mathematical communication skills of junior high school students are still relatively low [9–11]. Not only that, several regions in Indonesia also found that students' mathematical communication skills still need improvement [12–14]. This evidence attracts me that students' mathematical communication skills need to be investigated more deeply.

The problem of students' mathematical communication skills certainly cannot be separated from their learning interest. In simple terms, learning interest is defined as the desire to acquire knowledge. Learning interest is a sense of liking and interest in learning activities, without coercion [15]. If students have a good interest in learning mathematics, it is likely that they also have good mathematical communication skills. This is in line with Silvia's opinion that students with high learning interest and motivation generally get good academic grades, have organized study habits, high learning motivation and have a good understanding of learning. Previous research shows that junior high school students' interest in learning mathematics is in the low category [16, 17]. Therefore, low students' learning interest can potentially lead to a weak understanding of students towards mathematics.

Students' mathematical communication skills can also be sharpened through practice questions or problems related to algebra [18]. One of them is a straight line equation. Straight line equation material is one of the materials that can give students the opportunity to think, communicate, and discuss their mathematical ideas. Previous results of the study showed that students' understanding of language, mathematical concepts and

procedural concepts was still found that needed to be trained in working on questions about straight-line equations [19]. Based on that explanation, it deserves further attention and study on students' mathematical communication skills in straight-line equations. Therefore, the writer is interested in analyzing students' communication skills in solving straight line equations based on students' learning interest.

2. RESEARCH METHOD

This study used qualitative methods. In this study, we conducted a mathematical communication skill test and a learning interest questionnaire. This research aims to analyze and describe the mathematical communication skills of junior high school students in solving straight line equations based on learning interest. This research used a case study design. The case studies in this research are descriptive. Choosing descriptive case studies was to describe students' mathematical communication skills in depth based on the data obtained in the field. The choice of this design was because it is in line with the purpose of this study which is to identify, analyze, and classify the mathematical communication skills of junior high school students in solving straight line equations in depth based on their learning interest.

In this study, we focused on classifying the level of mathematical communication skills through a given mathematical communication ability test and classifying the categories of learning interest through a questionnaire. Thus, it is hoped that we can describe the level of mathematical communication skills based on in-depth learning interest. There were 33 grade VIII students (boys and girls) of average age of 14 years old from one of the Junior High Schools in Bandung, Indonesia, participating in this study. Qualitative research instruments used in this study include 1) Test students' mathematical communication skills on straight line equations. The indicator of mathematical communication ability used refers to the indicator of mathematical communication ability based on the National Council of Teacher Mathematics (NCTM) and is adjusted to the material of straight-line equations. 2) Learning interest questionnaire, aims to categorize students based on interest in learning into 5 categories [20]. 3) Interview guidelines, to obtain more detailed information and clarification regarding the results of students' mathematical communication skills based on students' perspectives. The qualitative data analysis techniques used based on Miles and Huberman explained the activities in analyzing qualitative data, namely data reduction, data display, and drawing conclusions [21].

The students' mathematical communication level in solving straight line equations was adopted based on the criteria proposed by Ansari with the details presented in Table 1 [22].

Table 1: Students' mathematical communication skill levels.

Levels	Description of Student Answers
Level 4	Provide complete and clear answers, unambiguous descriptions or explanations; able to enter a complete and precise graph; communicate effectively to readers or audiences; provide strong and logically acceptable supporting reasons; able to provide examples and counterexamples.
Level 3	Provide an almost complete answer with a reasonable description or explanation; able to enter almost complete and precise graphics; generally able to communicate effectively to the reader or audience; provide supporting reasons that are logically acceptable but there are some minor errors.
Level 2	Shows significant progress, but slightly ambiguous description or explanation; answers or communications are difficult to interpret or somewhat vague; reasons are incomplete or based on a logically unacceptable basis.
Level 1	Have not been able to give a complete answer but there are some elements that are correct; include a graph that is less relevant to the problem; a description or explanation shows an inaccurate flow.
Level 0	Ineffective communication: able to make graphs but does not describe the problem situation; words don't represent the problem.

3. RESULTS AND DISCUSSION

This research was carried out in VIII grade at one of junior high schools in Bandung, Indonesia, on first semester of the 2021/2022 Academic Year. The selection of the class was based on the students' mathematical ability which was quite homogeneous, and the achievement of the material lesson was on target. In this study, first, we took data on students' mathematical communication skills through a mathematical communication ability test which was intended to classify students based on the level of mathematical communication skills level 4, 3, 2, 1 or 0. Mathematical communication skills test is conducted online for 60 minutes. The test contains 5 questions about straight line equations. The test results show that students have varying levels of communication skills. Table 2 shows the results of students' mathematical communication ability levels.

Table 2 shows the test results of students' mathematical communication skills obtained in this study. There are 3 students (9.1%) mathematical communication ability level 1 students. In addition, there are 10 students at level 2 mathematical communication skills (30.3%). Furthermore, the dominance of mathematical communication skills is at level 3, which is 15 students (45.45%) and there are 5 students (15.15%) who are included

Table 2: The results of student mathematical communication skill level.

Mathematical Communication Skill Levels	The Number of Students (%)
Level 0	0 (0)
Level 1	3 (9.1)
Level 2	10 (30.3)
Level 3	15 (45.45)
Level 4	5 (15.15)
Total	**33 (100)**

in the level 4 category of mathematical communication skills. Meanwhile, there are no students at the lowest level of mathematical communication skills level 0.

Second, we also took data on a learning interest questionnaire which was intended to group students according to their learning interests in 5 categories [20], which are very good, good, good enough, not good, or not very good. This questionnaire consists of 23 positive and negative statements, using 4 answers, namely strongly agree, agree, disagree, and strongly disagree. Indicators of interest in learning that are focused on are feelings of pleasure, attention, interest, and student engagement. This learning interest questionnaire was given to 33 class VIII students online via Google form. The results of the student learning interest categories are presented in Table 3.

Table 3: Learning interest questionnaire results data.

Learning Interest Criteria	Number of Students (%)
Very good	8 (24.2)
Good	23 (69.7)
Good enough	1 (3.05)
Not good	1 (3.05)
Not very good	0
Total	**33 (100)**

Based on the results found in this study, Table 3 shows that students with very good interest in learning are 8 students (24.2%). Meanwhile, it was found that the majority of students in this study had a good interest in learning as many as 23 students (69.7%). Furthermore, there is a student with a good enough interest in learning or as much as 3.05% and there is a student with a not good learning interest or as much as 3.05%.

The results of the categorization are then taken by representatives in each category for interviews. Selected 3 students with a very good interest in learning, 4 students with a good learning interest and each 1 student in the category of good enough and not good learning interest. Because there were no students in the category of not very

good learning interest in this study, the researchers did not take data as representatives of the interview.

Table 4: Mathematical communication skills and student interests.

Respondent	Mathematical Communication Skills	Learning Interest
S1	2	Very good
S2	3	Good
S3	3	Good
S4	3	Good
S5	3	Good
S6	3	Very good
S7	1	Good
S8	3	Very good
S9	1	Good
S10	4	Good
S11	2	Good
S12	2	Good
S13	3	Good
S14	3	Not good
S15	1	Good
S16	3	Good
S17	4	Very good
S18	3	Good
S19	2	Good
S20	2	Good
S21	2	Very good
S22	2	Good enough
S23	3	Very good
S24	3	Good
S25	4	Good
S26	2	Good
S27	4	Very good
S28	2	Good
S29	4	Good
S30	3	Very good
S31	2	Good
S32	3	Good
S33	3	Good
OVERALL AVERAGE	**2.67**	**33 Students**

Based on Table 4, it shows that students have different and varied learning interests and get the results of mathematical communication skills that are also varied. There are

8 students with very good learning interest, 23 students with good learning interest, 1 student with good enough learning interest, and 1 student with not good learning interest. These results indicate that in this study the level of mathematical communication ability that most students had was mathematical communication ability level 3. The level of mathematical communication ability that students had at least was mathematical communication ability level 1. In this study, there were no students with mathematical communication skills level 0. The results also show that in this study, the most dominant students had good learning interest, while the least students had good enough and not good learning interest. There were no students who had a not very good learning interest.

Based on these data, mathematical communication skills in solving straight-line equations problems based on students' learning interests were found that students who had very good and good learning interests were dominant at level 3 mathematical communication skills. Meanwhile, students with good enough learning interest is at level 2 mathematical communication skills and student with not good learning interest is at level 3 mathematical communication skills.

From the various findings and discussions that have been described, we conclude that interest will greatly influence learning, especially learning mathematics. Learning interest affects the fulfillment of certain needs (for example high grades), so the stronger the desire for these needs, the greater the learning interest. However, students with very good interest in learning do not guarantee have good mathematical communication skills. Likewise, on the other hand, students with not good learning interest are very possible that their mathematical communication skills are not far from students with very good learning interest. Based on the findings of previous studies, it shows that the effect of interest in learning on mathematical communication skills has a positive effect of 30.5%. While the remaining 69.5% is influenced by other than students' learning interest [23].

We found several factors related to the causes of students with very good learning interest but obtaining relatively low communication skills, as follows:

1. The errors are caused by the lack of accuracy of students when working on questions. In line with Ningrum's opinion that the mistakes that are often made by students are not being thorough in applying the concepts used and the lack of students' ability to understand the questions, especially the form of word problem [24].

2. The difficulty of students in understanding the questions and what is known in the questions. In line with the research of Saidah and Mardiani that found some difficulties that arise when students work on mathematical communication problems based on the analysis of student difficulties, namely difficulties in understanding or interpreting mathematical ideas, difficulties in making conclusions, difficulties in performing calculations, and difficulties in stringing words to explain a statement [9].
3. Students' mistakes in generalizations can make it difficult for students to understand mathematical concepts well. In line with Venners opinion which states that the use of inappropriate generalizations effects student errors in understanding mathematical concepts [25].

4. CONCLUSION

Based on the findings and discussion, we conclude that, mathematical communication skills in solving straight line equations based on students' learning interests found that students in good and very good learning interest, mostly at level 3 mathematical communication skills (in general they can communicate ideas effectively but there are some small errors), students in good enough learning interest category are at level 2 mathematical communication skills (can communicate some ideas with slightly ambiguous explanations), and students in poor learning interest are at level 3 mathematical communication skills (in general they can communicate ideas effectively but there are some minor errors).

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