Mathematical communication ability students based on learning motivation in the COVID-19 pandemic

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Abstract. The research aims to describe Tenth-grade students' mathematics communication competence of vocational high school of Bina Teknologi, in Purwokerto Indonesia. The research used a qualitative method with Miles and Huberman model consisting of data reduction, data display, and taking a conclusion. The research subjects were Tenth-grade of Network and Computer Engineering class students obtained through purposive sampling. The students were grouped into three categories based on their learning motivation, namely students with high learning motivation, students with medium learning motivation, and students with low learning motivation. Two respondents, from each category, were chosen to be interviewed. The methods of data collection were questionnaires, tests, interviews, and documentation. The used validation test was technique triangulation. The research result shows that Subjects with high learning motivation were able to use language and mathematical symbols in daily events, were able to interpret mathematical ideas based on the graphs presented, were able to provide easy-to-understand arguments, and were able to draw graphs based on mathematical situations or problems. Subjects with learning motivation are able to use language and mathematical symbols in everyday events, are able to provide easy-to-understand arguments, and are able to draw graphs based on situations or math problems. Subjects with low learning motivation are able to use language and mathematical symbols in everyday events and are able to provide easy-to-understand arguments.

1. Introduction
Communication is one of the most important parts of learning mathematics. According to [1] mathematical communication reflects understanding and is part of mathematical power. Students who are studying mathematics as if they are in dialogue and writing about what they are doing. They participate in solving, looking for mathematical ideas, or having dialogues and listening to other students, in sharing ideas, strategies and solutions, while Ahmad [2] has the opinion that mathematical communication is the movement of messages whose contents are in the form of a formula, a concept or a way of solving problems. mathematics through speech or writing. The communication process can help in constructing a meaning, patenting ideas and being able to clarify an idea. According to Kaur and Toh [3] communication can refer to the ability to use mathematical language to express mathematical ideas and arguments that are precise, concise and logical. Convey mathematical conditions through speech or in writing; writing, listening and dialogue about mathematics; presenting an event in everyday life using symbols or mathematical language.

Improving the quality of mathematics learning, especially on intensity and quality in learning, will build and develop students' basic mathematical abilities. According Nesuin N. et, all [4] that the learning process must provide many benefits for students so that they can develop their full potential.
Hendriana, Rohaeti, and Sumarmo [5] stated that mathematical communication is one of the hard skills that students must possess because it is an essential mathematical ability that is essential and needs to be possessed by junior high school students. Mathematical communication is the basis for solving problems, so students are able to explore, investigate and formulate into mathematical models [5]. This will build a mathematical mindset so as to be able to express ideas correctly, and convey them into the language of mathematics. Indications that cause it are students have difficulty answering questions in the form of verbal, students are not able to express mathematical ideas in writing, difficult to understand the problem and form into mathematical models [6], [7], [8], [9][6-9]. This is the reason for improving students' mathematical communication skills. In order to achieve the maximum mathematical communication skills of students, it must be in line with the soft skills of students.

Mathematical communication is one of the skills required for students. The skills enable students to understand mathematics through the process of thinking, discussing and decision-making [10]. The skills can also guide students to demonstrate mathematical ideas in various ways [11]. Therefore, mathematical communication skills should be a major concern in mathematics learning to foster students’ skills of thinking and conveying ideas. Mathematical communication skills include the ability to present mathematical ideas verbally, in writing, pictures, graphics and other visual forms [12]. Both verbal and written mathematical communication can strengthen students’ understanding of mathematics [13]. The mathematical communication process may also provide students with opportunities to share ideas [14]. Therefore, mathematical communication must be well integrated into the classroom and students should be guided to express and write ideas, questions, and solutions. Based on some definitions of mathematical communication mentioned before, it can be argued that mathematical communication is the ability to demonstrate mathematical ideas and symbols both verbally and in writing, pictures, or diagrams.

Mathematical communication concerns with the ability to express and justify ideas as well as pose and explain questions. Students’ ability to think and convey ideas is strongly influenced by how their brains work as students have different levels of intelligence. Therefore, to optimally stimulate the brain during the learning, a teacher must establish a fun learning environment and challenge students’ thinking skills to increase students’ engagement leading to more meaningful learning. Mathematical ideas can be visualized using learning media, one of which is technology [15]. The 2013 curriculum also stipulates that teachers should integrate Information and Computer Technology (ICT) in the classroom. The use of ICT in mathematics learning can trigger ideas to foster students’ thinking skills [16]. A learning integrating ICT will motivate students to communicate so that teachers do not dominate the learning. Students’ mathematical communication skills are lacking, far from expected. Students do not have enough opportunities to express their opinions; consequently, students’ skills cannot be easily observed leading to students easily quit [17]. Also, high school mathematics teachers tend to insufficiently utilize ICT in the mathematics learning process [18]. Thus, students have difficulties in developing their communication skills resulting in a lack of students’ mathematical communication.

2. Method
The research used a qualitative method with Miles and Huberman model consisting of data reduction, data display, and taking a conclusion. The students were grouped into three categories based on their learning motivation, namely students with high learning motivation, students with medium learning motivation, and students with low learning motivation. Two respondents, from each category, were chosen to be interviewed. The methods of data collection were questionnaires, tests, interviews, and documentation. The used validation test was technique triangulation. The research result shows that Subjects with high learning motivation were able to use language and mathematical symbols in daily events, were able to interpret mathematical ideas based on the graphs presented, were able to provide easy-to-understand arguments, and were able to draw graphs based on mathematical situations or problems. Subjects with learning motivation are able to use language and mathematical symbols in everyday events and are able to provide easy-to-understand arguments, and are able to draw graphs based on situations or math problems. Subjects with low learning motivation are able to use language and mathematical symbols in everyday events and are able to provide easy-to-understand arguments.
The research subjects were Tenth-grade students of Network and Computer Engineering class obtained through purposive sampling. This research conducted by giving motivation learning questionnaires and a mathematical communication ability test. This was carried out due to the COVID-19 pandemic condition which required students to stay at home. Teaching and learning activities in schools face to face are considered to be vulnerable to transmission by students, teachers, and parents. Sampling was done by purposive sampling where a researcher in determining the sample is based on certain considerations. In this study, purposive sampling technique was used with the aim of taking 2 students who have high learning motivation, 2 students who have moderate learning motivation and 2 students who have low learning motivation to describe their mathematical communication skills.

3. Result and Discussions
This research consisted of questionnaires, tests and interviews. There are 20 students who are the research subjects. Retrieval of student learning motivation data using a learning motivation questionnaire distributed on June 16, 2020 which was attended by 20 people from that class. On June 18, 2020, researchers took data on mathematical communication skills using questions about the mathematical communication ability test to students. After conducting the test, researchers conducted interviews with research respondents. Interview activities were carried out on June 20, 2020 using Zoom application. Before assigning the six respondents to be interviewed, the researcher confirmed to the mathematics subject teacher whether the six students in learning were in accordance with the statements in the learning motivation questionnaire used by the researcher. Quantitative data from the results of the student's motivation learning (SDL) score obtained from 20 students. To determine the high, medium, and low motivation learning groups, the researcher used the calculation of the mean and standard deviation.

| Table 1. Categories of SDL |
|----------------------------|
| Categories of SDL | Criteria                      |
| High             | SDL Score > 85               |
| Medium           | 67 ≤ SDL Score ≤ 85         |
| Low              | SDL Score < 67               |

From table 1, it can be seen clearly that the total score of the questionnaire results average of 76 and a standard deviation of 9. The minimum score obtained is 62 and the maximum score is 90.

Based on the results of research regarding the mathematical communication skills of students of the SMK Bina Teknologi Purwokerto class in terms of learning motivation, it can be concluded that for the mathematical communication skills of the subjects of the group learning motivation is high. Subjects with the category of having high learning motivation in solving the test questions on their communication skills tried their best to solve the test questions well. Based on the answers given by 2 subjects who are included in the high learning motivation category, the subject is able to use language and mathematical symbols in everyday events, the subject is able to interpret mathematical ideas based on the graphs presented, the subject is able to give arguments that are easy to understand, and the subject is able to draw graphs based on mathematical situations or problems. Thus it can be concluded that subjects with high learning motivation categories have mastered the four indicators in mathematical communication skills in this study, namely Using language and mathematical symbols in everyday events, interpreting mathematical ideas based on the graphs presented, Giving arguments that are easy to understand, Drawing graphs based on mathematical situations or problems.

Mathematical communication skills of the subject of the moderate learning motivation group. Subjects with the category of having moderate learning motivation in solving test questions of their communication skills try their best to solve the test questions well even though not all of the answers given are correct. Based on the answers given by 2 subjects who are included in the medium learning motivation category, the subject is able to use language and mathematical symbols in everyday events, the subject is able to give arguments that are easy to understand, and the subject is able to draw graphics based on situations or math problem. Thus it can be concluded that the subject with the medium learning
motivation category has mastered three indicators of mathematical communication skills in this study, namely using language and mathematical symbols in everyday events, giving arguments that are easy to understand, drawing graphics based on mathematical situations or problems.

Mathematical communication skills of the subject group learning motivation is low. Students with the category of having low learning motivation in solving test questions of their mathematical communication skills find it difficult to solve the questions. Based on questions number 1 to number 4, the subjects seemed to lack understanding of the information on the questions. So that at the completion of the subject with the category of having low learning motivation to finish carelessly and many errors in the calculation. Based on the answers given by 2 subjects who are included in the low learning motivation category, the subject is able to use language and mathematical symbols in everyday events, the subject is able to give arguments that are easy to understand. Thus it can be concluded that the indicators in mathematical communication skills in subjects with the category of having low learning motivation in this study are indicators of using language and mathematical symbols in everyday events, giving arguments that are easy to understand.

4. Conclusion
The research result shows that subjects with high learning motivation were able to use language and mathematical symbols in daily events, were able to interpret mathematical ideas based on the graphs presented, were able to provide easy-to-understand arguments and were able to draw graphs based on mathematical situations or problems. Subjects with learning motivation are able to use language and mathematical symbols in everyday events, are able to provide easy-to-understand arguments and are able to draw graphs based on situations or math problems. Subjects with low learning motivation are able to use language and mathematical symbols in everyday events and are able to provide easy-to-understand arguments.

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