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Analysis of Mathematical Communication Ability based on Students' Self -Esteem in CORE Learning with Positive Feedback.

Meli Andriyani ✉, **Kartono Kartono, Walid Walid**

Universitas Negeri Semarang, Indonesia

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Abstract

This study aims to describe mathematical communication skills based on students' self-esteem in the CORE learning model with positive feedback. The research was conducted in class VIII of the Indonesian Institute of Middle School in Semarang with the selection of research subjects based on the results of the questionnaire scores so that high, medium, and low self-esteem groups were obtained. Determination of research subjects using a purposive sampling technique that selects two students in each group. Data analysis of mathematical communication abilities based on student self-esteem in CORE learning with positive feedback using triangulation from questionnaires and written test results with interviews. The results of the study show that CORE learning with positive feedback can improve mathematical communication skills. Mathematical communication skills with high self-esteem fulfill four indicators fulfilled on one subject, and other subjects fulfill three indicators. Students in the moderate self-esteem category can fulfill three indicators on one subject and two indicators on another issue. Students in the low self-esteem category achieve two indicators on one subject and one indicator is performed on another issue. So, the higher the level of self-esteem, the higher the students' mathematical communication skills.

✉Correspondence:
Jl. Kelud Timur II No.15, Gajah Mungkur, Kota Semarang.Indonesia
E-mail: meli.andriyani@students.unnes.ac.id

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INTRODUCTION

Mathematics as a language is of course very much needed to be communicated both orally and in writing so that the information conveyed can be known and understood by others. As stated by cockroft (Choridah, 2013), '*we believe that all these percepcions of the usefulness of mathematics arise from the fact that mathematics provides a means of communication which is powerful, concise, and unambiguous*.' this statement shows the need for students to learn mathematics because mathematics is a powerful, thorough, and not confusing communication tool.

Mathematical communication ability is an essential mathematical basic ability and needs to be possessed by high school students (sm). Mathematical communication is an important part of mathematics that must be owned by students. According to NCTM (in purba *et al.*, 2018) *states that mathematical communication is a way of sharing ideas and clarifying understanding. Through communication, ideas become objects of reflection, refinement, discussion, and amendment*.

This is to Vygotsky's theory where learning that is carried out with group discussions can build the ability of students to communicate and express ideas or ideas with friends or teachers so that they can build their knowledge through interaction in group learning.

Success in mathematical communication skills is influenced by many factors. One of them is a person's self-esteem. Self-esteem is a very important concern because according to Young & Hoffmann (2004), self-esteem is related to some life factors, one of which is student success in class. Lawrence (2014) added that students with high self-esteem tend to be confident in the social situations they face and are confident in handling assignments given by the teacher. In addition, students with high self-esteem will maintain their natural curiosity in learning and have enthusiasm and enthusiasm when facing new challenges.

According to Wijayanti, et al. (2018), learning activities in the classroom must be designed to develop students' abilities to solve problems in mathematics. One learning model that provides opportunities for students to connect concepts in mathematics is Connecting, Organizing, Reflecting, and Extending (CORE).

Therefore, the Connecting-Organizing-Reflecting-Extending (CORE) learning model was chosen (Fadhilah Al Humaira, Suherman, Jazwinarti. (2014). According to Jacob (Wijayanti, 2012, p. 15) CORE is a learning model that is based on constructivism. In other words, the CORE learning model is a learning model that can be used to make students active in building their knowledge.

The use of feedback is learning that invites students to receive input, so that they can criticize their own opinions, and correct misunderstandings, without hurting their self-esteem. Another thing that is no less important, namely the motivation of the teacher, which makes students feel competent; students are challenged to step forward a little from their current level of development. This is to the opinion of Anatole France (in Belle et al., 2010); that nine-tenths of education is encouragement. Feedback is information given to students about their ability to move toward achieving teaching goals in the form of scores on exam results, comments on assignments, and answers to questions (Slameto in Anggraini, 2015; Cole and Chan in Febriyanti, 2013).

This study aims to describe mathematical communication skills based on students' self-esteem in the CORE learning model with positive feedback.

METHOD

Make sure that work can be repeated according to the details provided. It contains technical information of the study presented clearly. Therefore, readers can conduct research based on the techniques presented. Materials and equipment specifications are necessary. Approaches or procedures of study together with data analysis methods must be presented.

The research subjects were class VIII E students who were able to take part in CORE learning with positive feedback on the Pythagorean theorem at SMP Institut Indonesia Semarang for the 2021/2022 academic year. The selection of research subjects was based on the score of the questionnaire results to obtain high, medium, and low self-esteem categories of students. By using a purposive sampling technique, 2 subjects were determined for each group as the focus of the research.

The data in this study were collected directly by the researchers so the main research instruments

were the researchers themselves who were assisted by auxiliary instruments in the form of questionnaires, tests, and interview guides. The data collection technique in this study was a test technique used to obtain data on students' mathematical communication abilities and non-test techniques to obtain data credibility.

Data analysis was carried out from the pre-field stage to the analysis stage while in the field. Prior analysis in the field was carried out by validating research tools and instruments. Analysis while in the field is the process of analyzing data on mathematical communication abilities in CORE learning with positive feedback based on students' self-esteem categories using triangulation techniques from questionnaires, and written test results with interviews. Data analysis is done by reducing data, presenting data, and verifying and drawing conclusions. Data validity uses 4 stages, namely trust, transferability, dependability, and certainty.

RESULTS AND DISCUSSIONS

When CORE learning is carried out students are accustomed to communicating their mathematical ideas to solve mathematical problems.

Table 1. Individual Completeness Test.

n	$\overline{X}$	s	t_{count}	t_{table}
31	82.3	8.41	8.131	1.70

The table above shows that the results of mathematical communication skills with a total of 31 students obtained a class average of 82.3 with a standard deviation of s = 8.41 and obtained a count = 8.131. Determine the critical value t_table=t_(n-1,α) where α=0.05 chance 0.95 and dk = 31 – 1 = 30 obtained t_table=t_(31-1.0.05)=1.7. This shows that t_count≥t_table is 8.131 > 1.70. So, the average student's mathematical communication ability is more than 70.

Table 2. Classical Completeness Test

n	X	π_0	z_{count}	z_{table}
31	29	0.75	2.379	1.645

Based on the above it shows that out of 31 students, there are 29 students have exceeded the KKM score of 70. z_count = 2.379. Determination of the critical value z_table=z_(0.5-α), where α at a significance level of 5% is obtained z_table=1.645. This shows that z_count> z_table, namely 2.379 > 1.645. Based on the description, it can be concluded that students in CORE learning with positive feedback exceeded classical completion by 75%.

CORE learning with positive feedback triggers interpersonal dialogue or communication and pays attention to social feelings in the learning process. This is to Vygotsky's theory where students form knowledge because of their thoughts and activities through language.

The conclusion is supported by research by Utami (2015) showing that CORE learning is effective with more than 75% positive responses. These results are in line with Prasetia (2020) which shows that there is a significant increase in improving student learning outcomes and giving a positive response to the CORE learning model. Positive feedback is used in the CORE model starting from the organizing stage to the extending stage. The description questions are given in the form of identical questions done together with the group. Feedback can be seen during core activities, question, and answer, for example, the teacher asks questions.

The Connection stage according to Lestari & Yudhanegara (2017), and Humaira in Konita, et. al. (2017) provides space for students to associate old knowledge with new knowledge and associate knowledge with real life. Connecting refers to old and new information between math topics and concepts, connections between other disciplines, and with students' everyday lives. At the connecting stage, new information received by students is linked to what was previously known. So that the teacher's feedback will look meaningful for students to answer incorrectly so that it can be corrected immediately. The teacher gives positive feedback in the form of motivation. Positive sentences can increase the spirit of these students. This is because feedback in learning must be specific or praised while providing Kulhavy correction (in Lestariningsih, 2014).

The use of positive feedback is used as reinforcement so that learning becomes directed according to the learning objectives. Feedback is an important part of effective learning (Osuala, et al., 2018). The main focus of this positive feedback is to assist students individually/in groups when experiencing difficulties in understanding the

problems given to help improve student learning outcomes. In line with Ion, et al. (2019).

The test uses a paired sample t-test intending to compare student self-esteem before and after CORE learning with positive feedback.

Table 3. Self-Esteem Analysis Test Results

Class	n	$\overline{X}$	t_{count}	t_{table}
Postest	31	80,3	3.113	1.701
Pretest	31	74.7		

Based on Table 3. shows in the posttest class that out of 31 students have an average of 80.3 and pretest as many as 31 students have an average of 74.7. Acquired value t_count = 3.113. Determination of the critical value t_table=t_(30;0.05), where α a significance level of 5% is obtained t_table=1.701. This shows that t_count > t_table is 3.113 > 1.701 then Ho is rejected. Based on the conclusion that the average self-esteem of students after learning CORE with positive feedback is better than the average self-esteem of students before learning CORE with positive feedback.

Student self-esteem data was obtained from the results of the self-esteem questionnaire. Filling in the self-esteem questionnaire was carried out in class VIII E. The self-esteem questionnaire aims to group students based on self-esteem categories divided into high self-esteem, moderate self-esteem, and low self-esteem. Based on the results of the analysis of the self-esteem questionnaire, the student grouping data is obtained which is listed in Table 4.

Table 4. Student Grouping in terms of the Self-Esteem Category.

Self-esteem category	Number of Students	Percentage
High self-esteem	5	16%
Moderate self-esteem	20	65%
Low self-esteem	6	19%
Jumlah	31	100%

Based on the results of the scores obtained by students in filling out the self-esteem questionnaire, two students with high self-esteem were selected, namely E-007 (S-1) and E-001 (2), two students with moderate self-esteem, namely E-015 (S-3) and E-006 (S-4), two students with low self-esteem, namely E-019 (S-5) and E-018 (S-6).

Table 5. Mathematical Communication Skills based on students' self-esteem in CORE learning with positive feedback.

Indicator	Analysis Results	Soal 1	Soal 2	Soal 3	Soal 4	Soal 5
Ability to use terms, mathematical notation and structures to present ideas	Accuracy of use notation, vocabulary, sketches or pictures	E-015 E-006 E-019	E-007 E-001 E-015 E-006 E-019	E-007 E-001 E-015 E-006	E-007 E-015 E-006	E-007 E-001 E-015
Ability to visualize mathematical ideas		E-007 E-001 E-006 E-019 E-018	E-007	E-007 E-001 E-015 E-006 E-019 E-018	E-007 E-001	E-007 E-001
Ability to understand and interpret mathematical ideas in writing	Writing suitability completion step with problems	E-007 E-001 E-015 E-006 E-018	E-007 E-001 E-015 E-006 E-019 E-018	E-007 E-001 E-015 E-006 E-019 E-018	E-007 E-001 E-015 E-006 E-019	E-007 E-001
The ability to express mathematical ideas through writing	Writing representation problem in a sentence or mathematical	E-007 E-001 E-015	E-007 E-001 E-015	E-007 E-001 E-015	E-001 E-019	E-007 E-001 E-019

	notation	E-006 E-019 E-018	E-006 E-019 E-018	E-006 E-019 E-018		

In question number 1, there was only 1 research subject who was able to respond to the problem correctly and coherently, while other research subjects still experienced errors in responding to the problem appropriately because the research subject was not careful in doing so and forgot to include it in the calculation process, unable to understand the information on questions.

In question number 2, there was only 1 research subject who was able to respond to the problem appropriately. In general, the research subjects still did not understand how to visually illustrate mathematical ideas correctly related to everyday life, were not careful when using data, did not have the skills to read the information on questions, and did not have understanding.

In question number 3, 4 research subjects were able to respond to the problem appropriately, while other research subjects still had difficulty responding appropriately. This is because the research subjects do not have the skills to use information in writing mathematical ideas in a structured manner.

In question number 4, none of the research subjects succeeded in responding to the problem appropriately. Each subject still makes mistakes in responding appropriately. This is because the research subjects do not understand writing mathematical ideas visually, have not been able to read the information in the problem correctly, and are not able to associate the information in the problem with a set of concepts.

In question number 5, 2 research subjects responded correctly. In general, this happened because the research subjects still had difficulty reading the information on the problem, did not have numerical manipulation skills, did not understand each procedure performed, did not have simplification arithmetic operations skills, did not have the skills to link information in the problem with a set of knowledge they had to compile problem-solving plan, unable to distinguish information from problems in the problem.

The results of the research information that students with high self-esteem can draw into mathematical models perfectly. This is the opinion of Nurma (Merlin, et al, 2015), students who can write and explain mathematical statements in the form of correct mathematical symbols means that students can present mathematical statements orally and in writing. Students with high self-esteem can illustrate ideas in the form of pictures and use concepts and formulas appropriately. On problems with students with high self-esteem, they can complete the description questions completely. The following is Figure 1. The results of the work of the high group students.

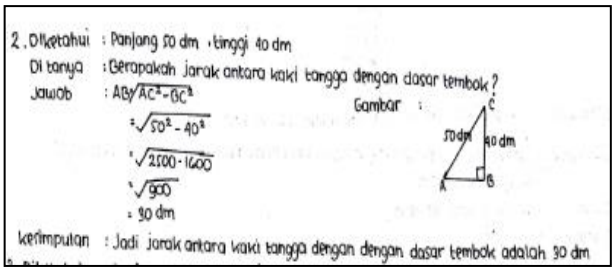

Figure 1. S-1 Subject Working on Question Number 2

This information is supported by the results of interviews with high self-esteem subjects who can provide reasons with appropriate conclusions from each problem in each indicator of mathematical communication ability. This result is in line with Adiputra (2015) which shows that self-esteem influences learning achievement. Students who have high self-esteem will generate self-confidence, self-confidence, a sense of usefulness, and always think positively about everything. In line with Yuniarti (2018) the higher the self-esteem, the higher the students' mathematical communication abilities. This means that students with high self-esteem do not experience difficulties and can solve all problems according to indicators of mathematical communication ability.

Self-esteem student research is having no difficulty in expressing mathematical modeling on 3 indicators. However, students' self-esteem is not maximal in solving problems on questions. The achievement level of students in most of the problems can be considered middle to the upper level (Ayan & Bostan, 2018).

Moderate self-esteem students need to be given the motivation to be more confident in their ability to express their mathematical ideas. The motivation is

in the form of positive support from the teacher to students for the assignments received. By raising students' awareness of the importance of working hard as a form of high enough motivation. Completion of tasks properly and with the capabilities possessed is a form of self-esteem. Students will study hard because of their self-esteem (Oktiani, 2017). Based on this explanation, motivating students to be more confident in their abilities, especially in the form of mathematical communication, will maximize their ability to solve a problem.

Students with low self-esteem show poor mathematical communication skills. The results of the study obtained information on the problems that stated pictures into the mathematical mode, low self-esteem students were able to solve problems but were still incomplete. On indicators of the ability to visualize mathematical ideas, low self-esteem students still experience problems in drawing according to problems. On indicators of ability to use terms, mathematical notations, and their structures to present ideas, low self-esteem students still lack what is known and asked and can use mathematical terms and notation correctly in both subjects. The following Figure 2 results of the work of students in the low group.

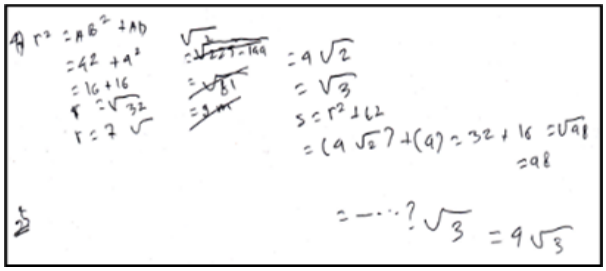

Figure 2. S-5 Subject Working on Problem Number 4.

This information is supported by Alfian, et al (2019) who stated that low self-esteem has not been able to fully express all indicators. Nur (2018) suggests that self-esteem has become an important concern due to some factors related to life and one of them is the success of students at school. Based on the indicators of mathematical communication ability, low self-esteem students can complete two indicators of mathematical communication ability, while other indicators mean that the answers of low self-esteem students are incomplete and maximal.

The level of self-esteem in students affects students' confidence in finding a solution to a problem that involves mathematical communication skills. So that low self-esteem students need more attention from the teacher. More guidance can be in the form of exercises or assignments in solving problems so that students will get used to solving a problem. When someone routinely works hard affects self-esteem. Tasks and exercises to solve problems in groups can be done during CORE learning with positive feedback, with heterogeneous groups of students with high abilities can help students with low abilities in solving a problem. Students who have high initial abilities greatly influence the experience in solving mathematical problems so that they can convey mathematical ideas or ideas to friends in groups (Mirna, 2018) and in these activities the right state of mind is needed so that they can be maximally productive in creative endeavors (Mann, et.al, 2016).

CONCLUSION

CORE learning with positive feedback can improve mathematical communication skills. Mathematical communication skills with high self-esteem fulfill 4 indicators fulfilled on one subject and other subjects fulfill 3 indicators. Students in the moderate self-esteem category can fulfill 3 indicators on one subject and 2 indicators on another subject. Students in the low self-esteem category achieve 2 indicators on one subject and 1 indicator is achieved on another subject. So, the higher the level of self-esteem the higher the students' mathematical communication skills.

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