

# Communication Skill of Junior High School Students in Mathematics Learning based on Double Loop Learning

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**Abstract:-** The communication skill of Indonesian student is still very low compared to other countries. This problem happens because the teacher still dominates in the learning process. The purpose of this research is to develop The Lesson Learned Plan of mathematics that integrates the communication skill. This research uses research and development approach. The subjects consist of mathematics teachers, principals and students of 65 Junior High Schools in Sukoharjo, Central Java. Exploration and analysis of research data needs use questionnaires, interview, and documentation. Data collection methods are enriched using Focus Group Discussions (FGD). The results showed the development of Lesson Learned Plans that integrates the communication skill is conducted by 1) including the communication skill that will be developed according to Basic Competence (BC), 2) developing indicator to reach BC, 3) formulating the learning objectives, 4) developing the relevant lesson, 5) developing a learning activity that will be conducted, 6) developing scoring tools to measure the quality of communication skill. In addition, it also conducts literacy planning in the learning process. Teachers and students desperately need mathematics learning based on double loop learning to guide students to improve their communication skill.

**Keywords:-** Communication Skill, Double Loop Learning, Lesson Learned Plan, Mathematics Learning

## I. INTRODUCTION

Many problems caused by communication in mathematics education. Amina & Marianib (2017) stated that the learning mathematics more passive than active learning (traditional learning), causing the structure of knowledge was not developed. This problem happens because: (1) a lack of understanding of the problem; (2) lack of knowledge of the strategy; and (3) the inability to translate problems into mathematical model.

Communication is very important in learning process. Because the existence of good communication will facilitate the learning process (Nartani, Hidayat, & Sumiyati, 2015). Communication can also affect the social education skills of students. Therefore the lack of ability to communicate a person will affect one's education. Lack of communication ability also still occur in Indonesia, one of them happened in education field that is at school. It can be seen from the research (Sumirat, 2014) at SMP Negeri 1 Metro in 2012/2013 which states the low students in learning

communication and mathematical disposition of students. It can be seen from the activity of students who do not care about how to explain the answers by using the correct language, pouring ideas or the subject of his thoughts into the picture, being a good listener in the discussion as well as embarrassed students ask if there is any difficulty. Consequently, passive students are more dominant than active students.

Education standards and education personnel are one of eight existing standards, in this case including improving the quality of teachers. Progress of education in Indonesia is largely determined by the success of the teacher's lessons school, because learning is the core of the educational process in a educational institutions. Achieving the quality of learning is teachers' responsibility, for example through the creation of meaningful learning experiences for students and facilities that students get to achieve maximum learning outcomes. The outcome of learning includes knowledge, skills and attitudes that are adequate stable to compete and independently. The teacher must be able to understand what the student needs in learning so that teachers know the shortcomings and weaknesses of students in the process learning. Therefore, the success of the learning not only of how much students achieve a certain competence, but also how much the teachers were able to improve the ability of students to learn (Sumirat, 2014).

The 2013 curriculum is designed to direct students to understand their potential, interests, and talents for career development both in higher education and in community careers. Students are required to be active in the learning process and have character qualities correspond to 21<sup>st</sup>-century skills(Sutama, 2017). Students are subjects who have ability to actively seek, process, construct, and apply knowledge in daily life. In order to deeply understand and apply knowledge, students need to be encouraged to work to solve problems, find everything for themselves, and strive to realize their ideas(Sutama & Narimo, 2012).The competence of 21st-century skills are a) critical thinking and problem-solving skill, b) communication skill, c) creativity and innovation skill, and d) collaboration skill (Sutama, 2017).

Communication is a process of transferring information, ideas, emotions from one entity to another entity or group to another group using signs, words, pictures, videos, graphics, and numbers(Warner & Kaur, 2017). The weakness of students in mathematical communication skills has been caused by many students who are directed to answer the questions in accordance with

the examples given by the teacher which are more concerned with the "correct" answers than how students can think logically about mathematics and how students can communicate ideas or his ideas orally or in writing, even how students can learn to take responsibility for their ideas.

Communication is an important part of mathematics learning, for students engaging in mathematical communication with both teachers and with their friends, both orally and in writing, both during and outside of the classroom, will be very useful for improving their mathematical understanding and result of learning mathematics of student. Furthermore, (Hirsch et al., 1989) defines the ability of communication in mathematics include: 1) The ability to express mathematical ideas through oral, written, and able to demonstrate it, and visually depicting; 2) The ability to understand, interpret, and evaluate mathematical ideas through oral, written or other visual forms; 3) Ability to use terms, mathematical notations, and structures to present ideas, describe relationships, and situational strategies.

Mathematics communication has an important role in learning because through mathematics communication, students can organize and consolidate their mathematical thinking. As expressed by a number of experts who have defined the notions, principles, and standards of mathematical communication. National Council of Teachers of Mathematics suggests that curriculum, mathematics as communication standard for 5th-8th grade students can: (1) model situations either orally, literally, images, graphics, and algebraic strategies; (2) reflect and clarify their own thoughts about mathematical ideas and the relationship; (3) develop an understanding with mathematical ideas into rules and definitions; (4) use the ability to read, hear to interpret and evaluate mathematical ideas; (5) discuss mathematical ideas, make conjectures and convince arguments; (6) appreciate the value, mathematical notation, and his role in developing mathematical ideas.

Lesson Learned Plans (RPP) was prepared and used by the mathematics teacher has not explicitly integrated the

communication skill students. The presentation of several RPP components arranged by mathematics teachers at the school where the study is also still varied. Some teachers write down Core Competencies, Basic Competencies (KD), and Indicators in narrative but there are also teachers who write them in table form. There are two versions of writing, 1) Core Competence (KI), Basic Competence (KD), and Indicator sequence down separately and 2) KI, KD, and Indicator sequence down but Indicator follow each KD. Likewise the selection and determination of objectives and learning materials are also very diverse.

To reach the character qualities correspond to communication skill, the alternative solution is innovation development based on double loop learning. This learning development innovation is in accordance with the principles of curriculum 2013. In PERMENDIKBUD Number 22 of 2016 on Standard Process of Primary and Secondary Education (Kemendikbud, 2017) mentioned that one of the important learning principles in the curriculum of 2013 is students find out not be told. In find out, students should get good quality services and opportunity to express themselves freely, dynamically, and fun.

Double loop learning is a learning method which was introduced by Chris Argyris and Donald Schon (Cartwright, 2002). The focus is on students to think more deeply about their own beliefs. Double loop learning has a destructive aspect that always questions about current norms, values, and assumptions. In Table I, unlike single loop learning, double loop learning always questioning the goal and have variation technique to treat the problem. Therefore the same problem may have different treatment.

Double loop learning measures the learning result of the efficiency, effectiveness, and the robustness perspective. Efficiency can be measured by comparison between input and output refer to Minimaks (Minimum input, maximum output). Effectiveness is a learning achievement to obtain the goal. Robustness of learning is a function of the nature and quality of the relationship between students and teachers, namely dynamic relationships and adaptability.

Single Loop Learning	Double Loop Learning
Decision-making based on repeated treatment at the same problem	Decision-making based on the problem. The same problem may have different treatment
No variation technique to treat the problem	Variation technique to treat the problem
Without ever investigate the goal	Investigate the goal

Table 1:- Comparison of Single Loop Learning and Double Loop Learning

According to (Cartwright, 2002) double loop learning is a transformation from a highly held perspective in work and action habits, through communication, dialogue involving many interactions between students. The purpose of double loop learning to 1) Creating harmony of working relationships between teachers and learners; 2) Creating the ability to solve math learning problems more openly; 3) Creating openness in communicating; and 4) Creating morale of learners and self-control.

The above description of the problem showed the need to look for solutions in the learning activities that can make students active, improve the ability of communication. In this paper, we proposed mathematics learning based on double loop learning to improve communication skill of junior high school students. Learning objectives of this research is proposed to arrange a model of mathematics learning management of Junior High School based on double-loop learning that effectively improve communication skill.

## II. METHOD

This research is a development research using mathematics learning which is aimed to develop The Lesson Learned Plans (RPP) that integrates the communication skill students' character. The research design is qualitative evaluative research. Qualitative research design is a research method used to examine the condition of natural objects, which researchers are key instruments, data analysis is inductive and the results emphasize the concept (Sutama & Narimo, 2012). The subjects consist of mathematics teachers, principal and students of 65 Junior High Schools in Sukoharjo, Central Java.

Exploration and analysis of research data needs are taken using questionnaire method, observation, interview, and documentation (Denzin & Lincoln, 1994). Data collection methods in development are enriched using focus group discussions (FGD).

Data analysis techniques in this study, using qualitative analysis of flow model. The process of analyzing this data, data collection, data reduction, data presentation, and cyclical evaluation / conclusions, through the validity of triangulation data sources and methods.

## III. RESULT AND DISCUSSION

From the questionnaire, observation, and interview given to teachers and students, it is revealed the obstacles faced by teachers and students in the learning process. After that, teachers and students provide suggestions for improvement of further learning. Teachers and students were also asked about the implementation of learning using students' worksheet.

Learning process is conducted by mathematics teacher consist of three steps, as follows; introduction activities, core activities, and closing activities in the classroom. All activities in the learning process are still dominated by the teacher.

Introduction consist of three steps, as follows; conditioning learning, apperception and motivation, and delivering competencies and lesson learned plan (RPP) (Amina & Marianib, 2017). Conditioning learning is activities to prepare the means of learning. Some example of the conditioning of students i.e. greeting teacher, setting learning environment, praying, checking the attendance of students, splitting the students into small group, arranging seating students. It is all controlled by teacher.

Apperception and motivation contained the mental preparation activities of students. Therefore students have high motivation to be ready to receive lessons. Teachers link current learning materials with previous student experiences, ask challenging questions and inform the benefits of learning materials. It is all done by teacher but only verbally.

Delivering competencies and lesson plans is activities to measure the students' prior or prerequisite knowledge activities. Beginning with identifying the prerequisite/previous knowledge followed by checking (monitoring) and assessment (evaluating) the ability of students. Teachers give some short question to help students remember the prerequisite knowledge or previous topic. It is all done by teachers but only verbally and not in specific.

Core activities is a core activity in learning process to give a new topic based on the goal of learning set. In core activities, scientific approach is applied by observing, questioning, experimenting, associating, communicating, and evaluating. However, it still has not appeared instead strategy steps has appeared. The tendency of the math teacher explicitly performs the learning strategy steps, for example the Discovery Learning (DL) strategy with the learning stage 1) Stimulation; 2) Problem statement (identification problem); 3) Data collection (data collection); 4) Data processing (data processing); 5) Verification (verification); and 6) Generalization (draw conclusions). Likewise, the integration of 21st-century skills in core learning activities has not been seen yet.

Observing is associated with the activity of the five senses to observe meaningful learning. Learning objects should challenge students to ask questions and stimulate their curiosity. Students are given the opportunity to observe through their senses, such as observing animated images, touching model artifacts, observing buy and sell transactions in school canteen, and many more. If the observed object or phenomenon is difficult to reach, it can be used as an artificial model, can be represented in the form of video-audio recording, animated images, or globe.

Questioning is a person's verbal skill need to be well developed. Usually a good answer because it is stimulated by a good question. Therefore, courage and the ability to ask are important to develop. Each question will encourage the emergence of responses in verbal responses, either by teachers or students creatively. In addition to arousing curiosity, the questioning serves to train students to argue according to their capacity, to learn, to accept dissent, to stimulate learners to re-think, and at the same time learn how to politely ask questions or respond to questions well.

Experimenting is a set of actions, performed to check or blame the hypothesis or to recognize the causal relationship. For the example, students are requested to measure length each side of square which is built from carton or something else. By doing such experiments, in addition to the students feel happy, they can learn while experiencing. Of course, every trial needs to be prepared before the lesson takes place and well formulated in the Lesson Plans (RPP) document.

Associating is the ability to combine ideas and associate various events which then include them into memory fragments. Students are trained to connect between objects with other objects, so the relationship between several variables become clear, either inductive or

deductive. For example, cause-effect induction such as "trying hard, praying, and not despairing, are the factors driving the success of person's life."

Communicating can be defined show the working result to public verbally or non-verbally, or in other form. Therefore it got wider response. In a class, students present their working result to other students in front of the classroom.

Evaluating an assessment of the activity of thinking and understanding related to knowledge / new topic. Students are encouraged to do three activities: (1) present the results of activities and explain the entire problem-solving activities; (2) taking into account input from other groups or teachers, as well as analyze the strength or weakness of the arguments that have built; and (3) revising through cooperative and collaborative activities if found weaknesses in the argument.

Some examples learning process encourages students to do observing, questioning, experimenting, associating, communicating and evaluating. The first example, a mathematics teacher gives one assignment to students. Teacher splits the students into small group. The problem: Ani has a saving box. One day, Ani opens a saving box 10 cm x 10 cm x 10 cm. She opens the box using cutter by slicing the box according to three base and upper ribs and one straight rib. Then she writes the slices on all sides in Figure 1:

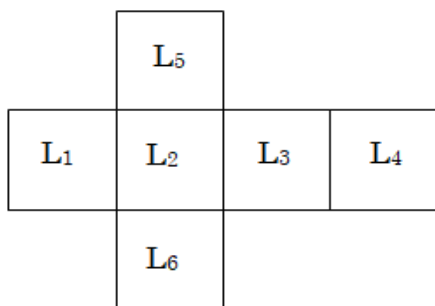


Fig 1:- Cube nets

After that, she writes with markers L1, L2, L3, L4, L5, L6 on each square. The assignment: Do what Ani do! What is the name of the square that has been made by Ani? What is the area of all square? Explain your answer in front of the classroom. The second example, Bu Yuli is a cake maker, she gets cake orders as much as 80 boxes. Usually, Bu Yuli bought the cake box but this time, Bu Yuli wanted to make it herself so the cost not too much. The box you want to make is measuring 25 cm x 20 cm x 15 cm or measuring 20 cm x 20 cm x 20 cm. Yuli's mother starts counting which box of sizes to use if she wants to make a box of the same material but at less cost, what size box does Bu Yuli choose? "From your observation, Which box will be chosen by Bu Yuli? Discuss your answer and explain in front of the classroom.

Closing activities has a main purpose to close all of the learning activities. Some example of the closing activities teacher ask to students about working on other tasks to create a concrete and contextual learning product, encourage students to implement the knowledge further, give additional knowledge to students, give an appreciation to students, provide feedback about the recent learning. In closing activities, students were expected to gain better understanding more about new topic. In closing activities, the students were given the assignment to find out initial exploration on the next topic to be studied. With the provision of structured tasks, students were expected to have the initial knowledge for the next topic. Therefore the following learning activities could be run well and involved the interaction of students better.

Teachers still dominate to determine of the course of the learning process as well as the only source lesson for students (Jazuli, La Ode, Anggo, Rahim, & Sahidin, 2017). Moreover, there are still passive students who just sit and keep silent in receiving lessons delivered by the teacher and there are students who do not involve themselves physically and mentally in the learning process in the classroom. So far, teacher only have been able to implement Lower Order Thinking Skills (LOTS) learning and have not moved to Higher Order Thinking Skills (HOTS) yet. Currently in most cases, in schools, it is still stuck at the LOTS level of skill building which is sadly not where our children need to be.

HOTS as a way of thinking at a higher level than memorizing, or retelling something that other people tell. According to (Krathwohl et al., 2002) the level of thinking ability starts from (1) remembering; (2) understand; (3) apply; (4) analyze; (5) evaluate to (6) create. The levels of thinking ability (1), (2), and (3) are categorized as LOTS. While the level of thinking ability (4), (5), and (6) categorized as HOTS.

HOTS inside cognitive domain (based on Bloom's Taxonomy) (Krathwohl et al., 2002) includes analysis, evaluation, and creation. Therefore students are not just consider a formula, then understand it and apply the formula in a problem. But students are able to analyze (solve the problem becomes some parts, then determine which parts related to each other), evaluate (rate that includes checking and criticizing), and creation (make something new of which already available). Examples of observational materials HOTS: The first example; One day, Anita and Beni were shopping in the same stationery. They have same money, which is Rp. 30.000,00 and intend to spend the money. Anita bought 10 pencils and 2 books. Beni bought 5 pencils and 4 books. How much is the price 1 pencil and 1 book? The second example: "Fina and Rina shop the same shirts and dress in the same store. They have the same money, which is Rp 500.000,00 and intend to spend it. Fina spends her money on a shirt and two dress, while Rina spends her money on three shirts and a dress. a) Without knowing the price of a shirt or dress, can you determine which items are more expensive? Explain your opinion. b) What is the price of a shirt? Explain your

opinion. c) What is the price of a pair of dress? Explain what you think."

Developing a Competency Achievement Indicator (IPK) in order to achieve KD and develop the character of communication skills, is done through operational verbs from easy to difficult. Example of IPK in Mathematics class SMP class VIII developed in communication, that is 3.5.3 Completed system of linear equations of two variables connected with contextual problem. 4.5.1 Creating a mathematical model of contextual problems relates to a two-variable linear equation system.

Developing learning materials relevant to KD characteristics and indicators, including factual, conceptual, procedural, and metacognitive materials. The materials are sorted and selected to integrates the development of communication skill that have been formulated according to KD demands. Examples of developed learning materials, Linear Equations Two Variables: The concept of a two-variable linear equation system, Solution of two-linear equations, Two-variable model and system of linear equations.

In the learning activities of all mathematics teachers where the research tends to be no striking variation, the domination of teacher is still very dominant. Its shows that in preparing the lesson plan, teachers have not observed the principle of active participation of students to encourage the spirit of learning, motivation, interest, creativity, initiative, inspiration, innovation and independence. The habit of writing "Teachers" too much in RPP needs to be transformed into learners' learning activities. Learning experience is a place for learners to develop creativity and in turn able to create.

Learning objectives should contain Audience, Behavior, Condition, and Degree (ABCD). In this research we take the following example: Through a scientific approach using the mind mapping method students can 1) interpret the system of linear equations of two variables connected with the contextual problem correctly, and 2) solve the contextual problem relating to the system of linear equations of two variables, curiosity, never give up, and cooperate with each other. Examples of the formulation of learning objectives that contain ABCD: C: Given the problem of two variable linear equations A: Student B: can determine the variable values of linear equations of two variables in daily life D: within one minute.

In the learning process, teachers have not use the model of learning or teaching methods that vary in teaching mathematics. To improve communication skills, authors formulate some point that can be developed in the learning process. Some of the communication skills that can be developed in mathematics learning based on double loop learning include: a) Understanding, managing, and creating effective communication in various forms and content non-verbal or verbal, written, and multimedia (ICT Literacy); b) Using the ability to articulate ideas, both at the time of discussion inside and outside the classroom, or in writing;

c) Use spoken language that conforms to the content and context of the conversation with the person to whom the person is speaking or who is invited to communicate; d) In addition, in non-verbally communication is also required attitude to be able to listen, and respect the opinions of others; e) Uses logical thinking, structured in accordance with applicable rules; and f) In the 21st century communication is not limited to only one language, but multi-language possibilities. The results reveal that communication skills can also be expressed by looking at the reflection and ideas of students written through writing, because by writing students actively build relationships between what they have learned with questions or questions.

In addition development related to the content of RPP, literacy activity in learning is very urgent to be implemented. Literacy activities are conducted through text / non-text discourse strategies, i.e 1) Activities before reading consist of: a) making predictions and b) identifying the purpose of reading. Literacy before reading is done in the preliminary activities in the learning process. 2) Activities when reading consist of: a) identifying relevant information, b) visualizing (if text is not visual form), c) making information, and d) making connections. Activities when reading is done on the core activities in the learning process. 3) After reading activities consist of; a) make a summary, b) evaluate the text, and c) inform, revise, or reject the prediction. After reading activities can be done on the core activities and closing in the learning process.

#### IV. CLOSING

Developing Indicators of Competence Achievement (IPK) in order to reach KD and to develop a communication skill character, is done through operational verbs from easy to difficult. Learning will perform competency measurement in LOTS sequence to HOTS.

Formulate learning objectives to be clear in demonstrating the communication skill that students should have conducted with the orientation that the learning objective is a good idea to load ABCD. The purpose of learning is used as a reference in the selection of materials, strategies, methods, and learning media that will be used in the learning process.

The development of Lesson Plans (RPP) that integrates the communication skill is conducted by 1) including the communication skill that will be developed according to Basic Competence (KD), 2) developing indicator to reach KD, 3) formulating the learning objectives to be clear in showing the skill students must have, 4) developing the relevant lesson, 5) developing a learning activity that will be conducted, 6) developing scoring tools to measure the quality of 21st century skill. In addition, it also conducts literacy planning in the learning activities.

Developing learning materials relevant to KD characteristics and indicators, including factual, conceptual, procedural, and metacognitive materials. Learning materials are sorted and selected to meet the development of 21st century skills that have been formulated according to KD demands.

Assessment of learning outcomes in the communication skill, should be able to measure the mastery of learners on the quality of character, competence, and literacy, and can develop high-level thinking process. The assessment instrument is completed with a grid and assessment rubric.

Literacy activity is done through text / non text strategy in three activities. 1) Activities before reading, conducted on preliminary activities. 2) Activities when reading, performed on the core activities. 3) Activities after reading, can be done on the core activities and cover in the learning process.

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