

## IMPROVING STUDENTS' ACTIVITY IN MATHEMATICS COMMUNICATION TROUGH METACOGNITIVE LEARNING APPROACH BASED ON LESSON STUDY

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### ABSTRACT

This research aims to improve the activity of students' mathematical communication, both oral and written through metacognitive learning approach based Lesson Study in class VII D of SMP Negeri 2 Sukoharjo school year 2013/2014.

The research was conducted in SMP Negeri 2 Sukoharjo even semester of academic year 2013/2014 with the number of students as many as 32 students. The collection of data obtained from the technical tests and observation. After the data analysis results that have been achieved by students through test and observation.

The conclusions are that: (1) students' oral communication activity with metacognitive learning approach based Lesson Study has increased, the average students' activity only 23.75%, the first cycle of 31.6%, to 51.6% in the second cycle; (2) The average score of the end of the written communication test students at the end of each cycle has increased, the average score is 67.6, the average score of the first cycle was 77.3 (good), in the second cycle increased to 82, 4 (very good); and (3) the number of students passed the material (score > 75) has increased, the number of students passed the material only around 50% or some 16 students, in the first cycle of 62.5% or some 20 students and the second cycle of 87.5% or some 28 students.

**Keyword:** *activity, mathematical communication. metacognitive learning, Lesson Study*

### 1. PREFACE

The activity of communicate in mathematics is the activity that can include and contain of various opportunities to communicate orally and in writing. Oral mathematics communication in the form of: 1) the activity of the student to ask the questions, 2) the activity of the student to answer the questions, 3) the activity of the student to express the ideas, 4) the activity of the student to present the answers. While the written mathematics communication in the form of: 1) reflect the real objects, pictures, or ideas of mathematics, 2) create a model of the situation or problem using the written method, concrete, graphs, and algebraic, 3) using the skills of reading, writing, and

analyze to interpret and evaluate ideas, symbols, terms, and mathematical information, 4) responds the statement or statements to the convincing argument (Sudrajat, 2001:18).

Based on the experience of teachers to teach mathematics class VIII odd semester academic year 2013/2014, the activity of students' oral communication is quite low, about 20% and the average score of assignments is low, about 62.5. During the learning, the majority of students have difficulty, which is have difficulties mathematical reasoning and communication, which are: 1) lack of courage of students in asking questions, indicated by at least the student who asked the teacher to explain the material, 2) lack of courage of students in an opinion or idea, seen from the statement of some students who are still hesitant in answering the teacher's questions, 3) low ability students in making a resume or conclusions on the material being studied, 4) students do not dare to show their work, as indicated by at least the students who are willing to present the results of their work in front of the class. Based on discussions with peers, it can be expected the root of the problem is the low activity of students' mathematical communication both oral and written, so it needs to be improved.

By the problems above, it is necessary action to overcome the problems that occur in learning quickly and accurately. Each teacher surely expect the students can master the material that is taught in accordance with the competencies that have been determined, therefore, to overcome the problems of the students needed an approach to learning that is relevant.

Many learning approaches, allowing teachers to choose one of these approaches to solve existing problems, one of which is to apply the learning approach with metacognitive learning approach. In its application, metacognitive learning approach is a learning approach that is based on the theory of cognition and social metacognition, so in learning be required to interaction with friends to solve a math problem, there are three components are interdependent, that is metacognitive activities, interaction with peers, and systematic activities from feedback-enrichment-improvement. In this approach the teacher delivers a new concept with a number of questions metacognitive, thus helping students to construct or build their own knowledge. (Kramarski and Mevarech in Rohaeteti, 2003:14). In this metacognitive learning approach, there are three interdependent components, namely metacognitive activities, interaction with peers, and systematic activities of feedback-enrichment-repair, which is done in small groups.

On the other hand, an increase in the quality of education in junior high school continue to be pursued by the government. One alternative to improve the quality of learning is to implement Lesson Study (Depdiknas, 2009). One of the problems or recent educational topics of interest to be

discussed, which emerged as one of the alternatives to overcome the problem of learning practices that have been seen as less effective. As we know, learning paradigm in class today has shifted orientation. Originally, learning orientation was nothing more than the delivery of information to students. But now, preferred learning to explore the potential of students, so that unearthed knowledge (cognitive), attitudes (affective) and skills (psychomotor). The paradigm shift makes the changing role of the teacher in the classroom, on the role that only conveys information (transformer) to the role of intermediaries (facilitators and mediators). In other words, a shift from the "teacher centered" to "student centered". That requires teachers to further improve their competence, both as a professional and as a craftman (professionals and skilled).

Lesson Study is a model of professional development of educators through collaborative learning assessment and sustainable, based on the principles of collegiality that are helpful in learning to build a learning community. In Lesson Study educators working in small teams to plan, teach, observe, analyze, and enhance learning in the classroom, which is known as the study of learning (Cerbin, W and Kopp, 2006). According to Lewis (2002), the idea contained in the Lesson Study is actually short and simple, that is, if an educator wants to improve learning, one of the most obvious way is to collaborate with other peer educators to design, observe and reflect on their learning done.

Through Lesson Study, the learning carefully designed not only by an educator but together the team. Educators work closely to learning can take place effectively. Similarly, when the implementation of learning, educators (teachers / teacher models) do not alone, the students observed whether students can learn or not. The results are discussed further observation after completion of learning. This activity is known as Plan-Do-See. According to Lewis (2002), Lesson Study provides a continuous method for improving the quality of learning that is based on careful observation to the work of learners. Educators working together through the Plan-Do-See done carefully.

Implementation of lesson study on an ongoing basis will help accelerate the improvement of teacher professionalism. Indicators are improving the professionalism of teachers through the implementation of lesson study is the development of lesson plan or RPP which always demanded learning and assessment innovation, cycle plan-do-see that enables teachers to be able to develop critical and creative thinking about teaching and learning, the process of sharing observation based learning experiences provide opportunities for teachers to develop openness and increased social

competence, and processes of reflection on an ongoing basis is an event for teachers to raise awareness of their limitations.

Application of metacognitive approach based Lesson study is a collaborative in learning. Researchers can maintain and improve self-motivation to always participate in reviewing and developing mathematical learning theory related to the way of thinking or learning styles of students. Learning instructional materials through the application of metacognitive approach based Lesson study, can be an alternative in choosing teaching materials.

Based on the above, the researcher as teacher collaborate with lectures in the mathematics program of Teacher Training and Education Faculty University of Veterans Build archipelago Sukoharjo and other maths teachers in SMP Negeri 2 Sukoharjo, deems it necessary to conduct action research in an effort to enhance the activity of students' mathematical communication with approach metacognitive learning based lesson Study. To avoid reaching, then the implementation of learning with metacognitive learning approach based Lesson limited and focused on the subjects of mathematics with circle material in class VIII D SMP Negeri 2 Sukoharjo even semester of academic year 2013/2014.

The purpose of this study is to improve the activity of students' mathematical communication, both oral and written with metacognitive learning approach based Lesson Study.

## **2. METHOD**

The research was conducted in SMP Negeri 2 Sukoharjo. This type of research is a classroom action research that consists of several cycles and in each cycle consisting of two meetings to provide action-based learning approach metacognitive Lesson Study in each learning. Classroom action research or PTK is a systematic research process and planned through learning corrective action by the teacher in the class itself. PTK aims to improve the performance of teachers so that the quality of learning becomes more increased (Supardi, 2004: 16).

The subjects were students VIII D even semester of academic year 2013/2014 with the number of students as many as 32 people. The reason for choosing this class is because the communication of mathematics students in the learning process in the classroom is still low and it has never been held prior research.

This classroom action research in each cycle consisting of planning, action, observation, evaluation, and reflection. Each cycle consisted one teaching sessions, each meeting time allocation is 2 x 40 minutes. Actions taken always collaborate with Lesson Study team consisting of

researchers (Utami Murwaningsih, S.Pd.M.Pd.) as a model teacher, maths teacher SMP Negeri 2 other (Sri Hutomo, S.Pd.M.Pd. and Dwi Agus Sri Kuncoro, S.Pd.), and lecturer of Univet Bantara Sukoharjo (Dr. Herry Agus Susanto) in implementing the Plan, Do, and See. The steps of the activities contained in the following table:

Table 1. Step Action

Teacher Activity	Student Activity
<p><b>Begining activity :</b></p> <ol style="list-style-type: none"> <li>1. Teachers convey learning aim.</li> <li>2. Teachers organize students into small groups consisting of 3-4 people.</li> <li>3. Teachers convey apperception</li> </ol>	<ol style="list-style-type: none"> <li>1. Students listen and pay attention to the teacher's explanation.</li> <li>2. Students form groups in accordance with the directives set by the teacher.</li> <li>3. Students listen and answer questions.</li> </ol>
<p><b>Main activity:</b></p> <ol style="list-style-type: none"> <li>1. Teacher explains new concepts with various types of questions.</li> <li>2. The teacher gives the booklet to be resolved by discussion.</li> <li>3. The teacher and students discuss the answer work sheet.</li> </ol>	<ol style="list-style-type: none"> <li>1. Students answer and ask questions with enthusiasm.</li> <li>2. Students working on the work sheet while you discuss with the group.</li> <li>3. The students presented the results of discussions and improve response.</li> </ol>

Data collected by the method of testing and observation. This test is used to measure students' mathematical communication skills written. Measurement of learning outcomes using the final test conducted at the end of each cycle, the description about the shape of the test form.

The test instruments is matters description consist of 4 items, the score of each item is 25, and maximum score is 100. The criteria of the result each matter indicator:

- 0 < score < 5 : not good
- 5 < score < 10 : poorly
- 10 < score < 15 : pretty good
- 15 < score < 20 : good
- 20 < score < 25 : very good

While the formula used to determine the students' final score is:

$$\text{Final score} = \frac{\text{result}}{\text{maximum score}} \times 100$$

Criteria average score of students:

0 < average final score < 20	: not good
20 < average final score < 40	: poorly
40 < average final score < 60	: pretty good
60 < average final score < 80	: good
80 < average final score < 100	: very good

Observations made by using observation sheet teachers and students. Observation of students performed to measure oral communication, while the observed activity is activity of students in asking questions, answering questions, expressing an opinion or disclaimer, and student activity in presenting the results of the discussion.

Analyzes technique were performed on the results achieved by students through tests and observation. The results of the first cycle used for the next cycle. The data analyzed were the findings on observations of students during the learning takes place.

In this student activity observation sheet, consists of four indicators, namely ask questions, answer questions, express opinions or objections, and presented the results of the discussion or reply. And to analyze this data using classical response percentages in each cycle.

$$\text{percentage (\%)} = \frac{\text{frequency}}{N} \times 100$$

Specification:

N: number of respondents overall (students).

The criteria are as follows:

0 % - 20%	: not good
20 % - 40%	: poorly
40 % - 60%	: pretty good
60 % - 80%	: good
80 % - 100%	: very good

Classroom action research is successful if there is an increase in the activity of student communication both oral and written. Student's oral communication activity is successful if the student's response  $\geq 45\%$ . As for the student's written communication is successful when the

average score for each indicator and the average score of the final test cycle entry in both criteria and the number of students who pass the study of  $\geq 75\%$ .

### 3. DISCUSSION

Observations on the implementation of the research of the first cycle to the second cycle showed the following results:

#### 3.1 The students' activity of mathematical communication

##### 3.1.1 Students' activity of oral mathematics communication

Table 2. Students' activity of oral mathematics communication score

No	Students' Activity	Begining	cycle I	cycle II
1.	Asking questions	20 %	31,25 %	50 %
2.	Answering queations	31,25%	37,5 %	62,5 %
3.	Give the ideas / disclaimer	12,5%	20%	31,25 %
4.	Present the result	31,25%	37,5%	62,5 %
	average	23,75%	31,6%	51,6%

The results in the table above shows that students' activity of oral mathematics communication in learning mathematics by using metacognitive learning approach based Lesson Study in circle material in problem solving has increased. It shows that the use of metacognitive learning approach based Lesson Study in learning mathematics can improve the students' activity of oral communication.

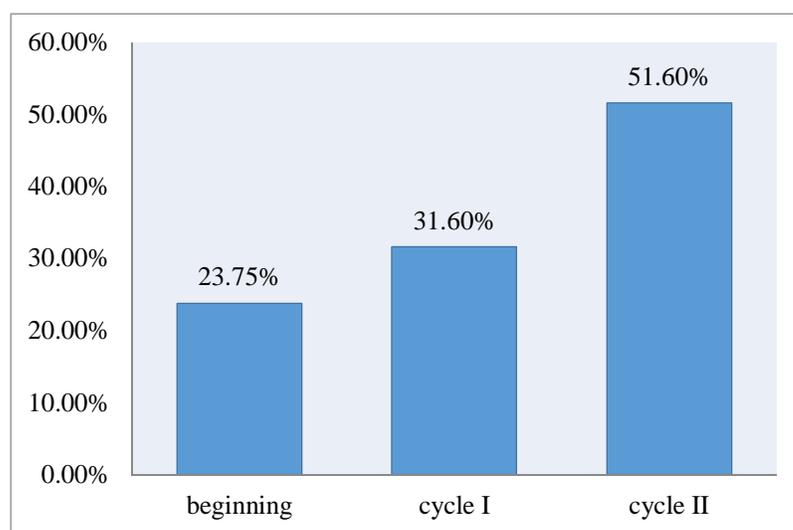


Figure 1. Histogram of students' activity of oral mathematics communication.

Based on the histogram above can be seen that the activity of the oral communication is only about 23.75%, in the first cycle gained an average of 31.6% of students' activity and increase in cycle II reached 51.6%. From the average percentage of students oral communication during maths learning using metacognitive learning approach based Lesson Study, overall from the first cycle to the second cycle has increased significantly. This is consistent with the statement of Rohaeteti (2003: 16) that metacognitive approach, participation, interest, curiosity and students' active learning can be improved.

### 3.1.2 Student' written mathematics communication

Written communication maths test scores of students is obtained through description tests that conducted on each end of the cycle. Recapitulation score of students' written mathematics communication class VII D of SMP Negeri 2 Sukoharjo are as follows:

**Table 3.** The score of students' written mathematics communication

Cycle	score		
	lowest	Higest	Average
I	40	95	77,3
II	70	100	82,4

Based on the table above, it can be seen that the score of students' written mathematics communication has increased, in the first cycle score of students' written mathematics communication entering in both criteria 77.3 (good) and the second cycle increased to 82.4 (very good). Thus students' written mathematics communication has increased during the learning of metacognitive learning approach based Lesson Study. The average score of students' written mathematics communication can be seen through the histogram graph below.

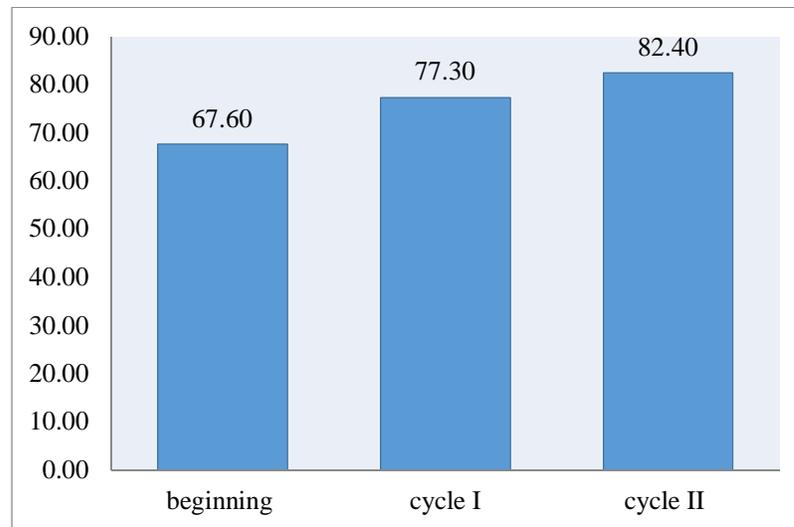


Figure 3. Histogram of students' written mathematics communication of class VII D

Based on the histogram above can be seen in the first cycle obtained an average score of 77.3 (good) and the second cycle of the average scores obtained 82.4 (very good). Thus the students' written mathematics communication has increased during the learning of metacognitive learning approach based Lesson Study.

### 3.1.3 Students Passed The Material (score > 75)

The students' written communication mathematics score obtained through description test conducted at each end of the cycle. Recapitulation mastery learning students are as follows:

Table 4. Students Passed The Material

cycle	Percentage (%)	explanation
I	62,5	INCREASED
II	87,5	

Based on the table above, it can be seen that the number of students who passed the material (score > 75) can be increased, the number of students who passed the material increased, in the cycle I students who passed the material 20 students or 62.5% then in the cycle II students who passed the material is 28 students or 87.5%. Thus the number of students who passed the material increased during learning using metacognitive learning approach based Lesson Study.

An increasing number of students who passed the material in mathematics, particularly in problem solving circle material through metacognitive learning approach based Lesson Study can be seen through the histogram graph below:

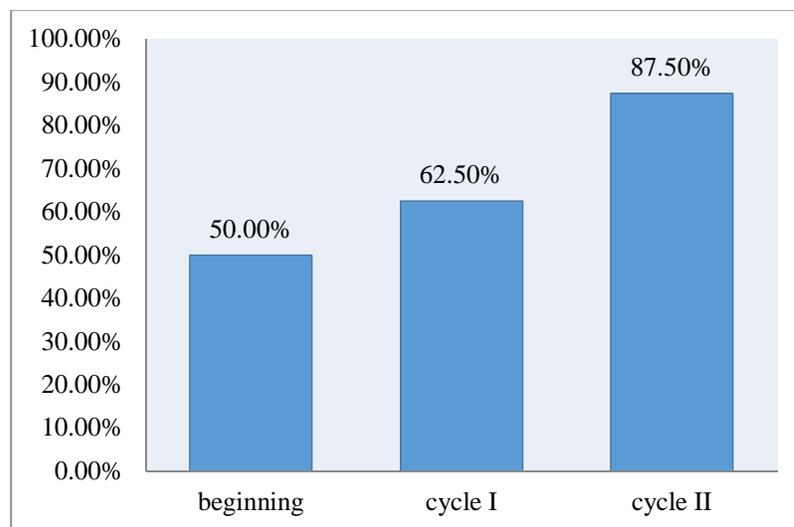


Figure 4. Histogram level of mastery learning students.

Based on the histogram above can be seen in the cycle I obtained by students who obtained a score  $> 75$  amount of 62.5% (20 of 32 students) and the cycle II a number of 87.5% (28 of 32 students). Thus the students' written communication has increased during the learning of metacognitive learning approach based Lesson Study. Increasing the number of students who passed the material (score  $> 75$ ) through learning with metacognitive approach is based Lesson Study in accordance with the opinion Rohaeteti (2003: 16) that the metacognitive learning approach to learning will improve the students' understanding of the material, awareness of the tasks assigned teachers and regularity himself in applying the strategy and connecting prior knowledge with new learning.

### 3.2. Activity or teacher performance

In addition to the positive impact for students by increasing the activity of mathematical communication orally or in writing, metacognitive learning based approach based Lesson Study in circle material in problem solving can also increase the activity or the performance of teachers. Based on the observation of teacher performance as described above showed that the activity of teachers in the use of learning based Lesson Study metacognitive approach also increases or better. This suggests that during the study, teachers collaborate with team Lesson Study always correcting weaknesses or deficiencies that occur in each cycle, and the next cycle

of teachers trying to fix its shortcomings. In addition, teachers' understanding of metacognitive learning approach based Lesson Study is also increasing.

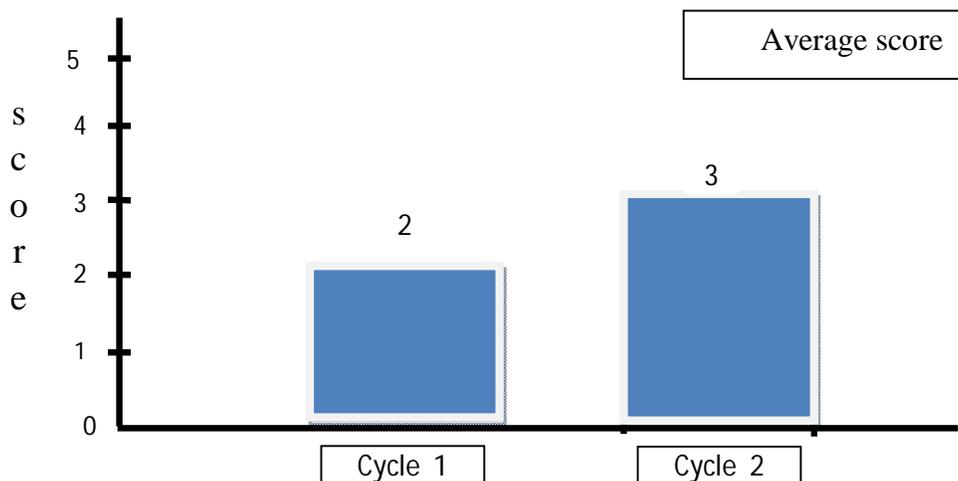


Figure 5. Histograms of teachers in learning activities using metacognitive approach based Lesson Study

#### 4. CONCLUSION

Based on the overall results of the research conducted during the following conclusions:

1. Students' oral communication activity with metacognitive learning approach based Lesson Study has increased, the average students' activity only 23.75%, the cycle I 31.6%, to 51.6% in the cycle II.
2. The average score of the end of the students' written communication test at the end of each cycle has increased, the average i score is 67.6, the average score of the cycle I was 77.3 (good), in the cycle II increased to 82.4 (very good).
3. The number of students who passed the material (score > 75) has increased, the number of students who passed the material only around 50% or some 16 students, in the cycle I of 62.5% or some 20 students and the cycle II of 87.5% or a number 28 students.

## 5. REFERENCES

- Arends, Richard, I. (1997). *Classroom Instruction and Management*. Mc Graw-Hill: New York USA.
- Arikunto, Suharsimi. (2002). *Dasar-Dasar Evaluasi Pendidikan*. Jakarta : Bumi Aksara
- Budiharjo. (2006). *Landasan Matematika*. Jakarta : Bumi Aksara.
- Catherine Lewis (2004) *Does Lesson Study Have a Future in the United States?*. Online: [http://www.sowi-online.de/journal/2004-1/lesson\\_lewis.htm](http://www.sowi-online.de/journal/2004-1/lesson_lewis.htm) Lesson Study Research Group online: <http://www.tc.edu/lessonstudy/whatislessonstudy.html>. Diakses pada 1 Januari 2012.
- Rohaeteti. (2003). *Pembelajaran Dengan Menggunakan Pendekatan Pembelajaran Metakognitif berbasis Lesson Study Untuk Meningkatkan Pemahaman Dan Komunikasi Siswa SMA Baik lisan maupun tertulis*. Tesis: tidak diterbitkan.
- Sudrajat. (2001). *Komunikasi Matematika Edisi Revisi*. Jakarta : Grafindo Persada.
- Supardi dkk. 2004. *PTK ( Penelitian Tindakan Kelas )*. Jakarta : Bumi Aksara.