

THE EFFORTS TO INCREASE THE INTELLECTUAL ABILITY AND COMMUNICATION IN LEARNING OF MATHEMATICS USING THINKING ALOUD PAIR PROBLEM SOLVING (TAPPS) METHOD OF VII GRADE STUDENTS OF SMP NEGERI 2 BINANGUN CILACAP

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ABSTRACT

This research is implementable because of the low intellectual ability and communication of the students in learning mathematics. The objective of this research is to try to increase the intellectual ability and communication of VII grade students in semester II of SMP Negeri 2 Binangun Cilacap in the academic year 2015/2016 using Thinking Aloud Pair Problem Solving (TAPPS) method. This research is a Classroom Action Research which consists of two-cycle, where each cycle consists of two meetings. The subject of this research is the students of VII B in the second semester of SMP Negeri 2 Binangun Cilacap in the academic year 2015/2016 which consists, 32 students, there are 16 male students and 16 female students. The object of this research is the intellectual ability and communication using the Thinking Aloud Pair Problem Solving (TAPPS) learning process. The data accumulation technic used observation, interview, test, triangulation, documentation, and field notes. The data analysis used descriptive qualitative analysis. The result of the research showed that the mathematics learning using Thinking Aloud Pair Problem Solving (TAPPS) method was able to increase the intellectual ability and communication of VII grade students in semester II of SMP Negeri 2 Binangun Cilacap. The result of the observation assessment sheet in cycle I the percentage of intellectual ability belonged to the good category (67,88%) and the percentage of communication ability belonged to the fair category (58,59%). In cycle II, the percentage of the intellectual ability belonged to a very good category (87,97%) and the percentage of the communication ability was belonged good category (75,78%).

Keywords: Thinking Aloud Pair Problem Solving, Intellectual Ability, Communication, Mathematics

INTRODUCTION

Education is very important for the survival of the nation's life because education according to the most important aspects to help humans develop themselves so that they become qualified and potential human beings. In the Law (UU) of the Republic of Indonesia Number 20 of 2003 concerning the National Education System it is said that: Education is a conscious and planned effort to create an atmosphere of learning and learning process so that students actively develop their potential to have religious-spiritual strength, self-control, personality, intelligence, noble character, and the skills needed by himself, society, nation, and state. Education that takes place in Indonesia includes several levels, namely, consisting of formal education, non-formal education, and informal education. The level of formal education consists of basic education, secondary education, and higher education. The implementation of formal education carried out through learning, one of which is mathematics learning.

One of the goals of mathematics is about mathematical reasoning. Reasoning is a very important basic competency that students must learn in class. In mathematics, the application of reasoning is often found even though it is not formally referred to as reasoning learning. The reasoning ability is basically needed in solving problems both mathematical problems or not and to inform the solution so that it can be understood by others requires communication skills. Communication skills and reasoning abilities are skills that need to be developed by the community today because reasoning is the basis of verbal and nonverbal communication. Therefore communication is needed in real-life experienced by students.

Based on the average data of the mathematics scores of the Middle Semester (UTS) 1 academic year 2015/2016 obtained the following results:

Table 1. Average UTS Mathematics Score

Kelas VII	A	B	C	D	E	F	G
Rata-rata Nilai	56	58	62	59	58	58	58

Based on the results of observations made at SMP Negeri 2 Binangun, Cilacap Regency, they still use conventional methods in the learning process, especially mathematics learning. The teacher still dominates the class so students are less active and creative. This information was obtained from a brief observation interview with Mr. Sudaryo, S.Pd as a grade VII mathematics teacher on August 25, 2015. He even said that the reasoning and communication skills of SMP Negeri 2 Binangun students were still low. Many students have not been able to draw their own conclusions, but need to be guided by the teacher. And communication between students and educators and communication between other students is still lacking. Students rarely ask the teacher, or to friends when they don't understand the given subject. When given a group assignment students also rarely ask friends in a group and students also rarely ask or answer the teacher's questions when the teacher gives questions. This can also be seen in the results of observations carried out on Tuesday, September 1, 2015, in class VII B, that the ability of reasoning and communication of students of SMP Negeri 2 Binangun Cilacap Regency in tables 2 and 3.

Table 2. Table Reasoning Ability Students

No	Indicator	The number of students	Percentage
1	Doing mathematical manipulation	11	34,37%
2	Filing a hunch	10	31,25%
3	Provide reasons / evidence for the correctness of the solution	8	25,00%
4	Draw a conclusion	6	18,75 %
Average			27,34%

Table 3. Table Student Communication Ability

No	Indicator	The number of students	Percentage
1	Being able to ask	7	21,87%
2	Able to answer	4	12,50%
3	Being able to express opinions	6	18,75%
4	Able to raise hands	8	25,00%
Average			19,53%

Based on the table above it can be concluded that the average student reasoning ability is 27.34% with low criteria. For an average student communication skills is 19.53% with low criteria.

Therefore, efforts should be made so that the reasoning and communication skills of SMP Negeri 2 Binangun students increase. To improve reasoning and communication skills, one of them is by choosing the Thinking Aloud Pair Problem Solving (TAPPS) learning method. TAPPS learning method is a problem-solving learning method that involves students working together in pairs to solve problems. Students act as problem-solving who then solve all the ideas and thoughts during the problem-solving process to their partners. His partner as a listener who follows corrects, and guides the problem solver to solve the problem by listening to the whole process carried out by the problem solver and provides guiding questions to help solve the problem. This method is shown to assist students in thinking of solving a problem, then expressing all their ideas and thoughts in making solutions, using this TAPPS method it is expected that the reasoning and communication skills of SMP Negeri 2 Binangun students can be improved.

The limitation of this research problem is the effort to improve the ability of reasoning and communication in learning mathematics using the TAPPS method in class VII B students of SMP Negeri 2 Binangun Cilacap Regency in the academic year of 2015/2016 on the quadrilateral building material.

The formulation of the problem in this study are:

1. Can the TAPPS method improve students' reasoning ability in learning mathematics in class VII B students of SMP Negeri 2 Binangun Cilacap in the 2015/2016 school year?
2. Can the TAPPS method improve students' communication skills in learning mathematics in grade VII B students of SMP Negeri 2 Binangun Cilacap in the 2015/2016 school year?

The hypotheses in this study are:

1. The TAPPS method can improve students' reasoning abilities in learning mathematics.
2. The TAPPS method can improve students' communication skills in learning mathematics.

TAPPS is a problem-solving learning method that involves students working together in pairs to solve problems. The existence of TAPPS is expected to help students who experience difficulties in reasoning and communication skills in learning mathematics.

During the implementation of learning, students are given the opportunity to think critically and actively, able to analyze problems, conclude what they have learned before. Students can train themselves to be able to think, reason and communicate problems in implementing learning. By working on it, students form groups in pairs, one of the students acts as a problem solving who solves the problem then conveys all his ideas and thoughts during the problem-solving process to his partner. His partner as a listener who follows corrects, and guides the problem solver to solve the problem by listening to the whole process carried out by the problem solver and provides guiding questions to help solve the problem. Learning with the TAPPS method is expected to improve students' reasoning and communication skills.

METHODS

This type of research is a type of classroom action research (CAR). This research was conducted at SMP Negeri 2 Binangun Cilacap Regency 2015/2016 Academic Year.

The research setting used in this study was SMP Negeri 2 Binangun, Cilacap Regency. The time used in this study is the even semester of the academic year 2015/2016, by adjusting the class time in class VII B.

The subjects in this study were students of class VII B of SMP Negeri 2 Binangun in the even semester of the 2015/2016 school year, totaling 32 students consisting of 16 male students and 16 female students. The object of this research is the whole process of applying the TAPPS learning method.

Research procedure

1. Planning
In this stage, explaining what, why, when, where, by whom, and how the action was carried out. In the planning stage, the researcher determines the point or focus of the event that needs special attention to be observed, then makes an observation instrument to help the researcher record the facts that occur during the action.
2. Implement
Implementation is the implementation or application of the design contents. Implementation seeks to comply with what has been formulated in the design and remains valid. The study was conducted by researchers who acted as teachers.
3. Observations
Observation is an observation activity carried out by an observer. This action serves to document the things that occur during the action and the effect of the related action. In this stage the teacher observes the actions being carried out. Both take place at the same time.
4. Reflection
Reflection is an activity to restate what has been done. This activity is very appropriate when the implementing teacher has finished taking action, then confronts the researcher to discuss the implementation of the action plan.

Data collection techniques in this study is to use the method of observation, interview methods, test methods, triangulation, documentation, and field notes. Data collection instruments in this study were using observation sheets, interview guidelines, test questions, triangulation, and field notes.

Data analysis conducted in this study was to examine all the data available from various sources, namely the observation sheet of the implementation of learning, interviews, tests, field notes and documentation. The analysis techniques included data reduction, data presentation, and conclusion drawing. The percentage increase in students' reasoning abilities can be calculated with the following formula:

$$P_r = \frac{nm_r}{N_r} \times 100\%$$

P_r = Percentage of student reasoning

nm_r = Number of reasoning items checked

N_r = Sum of all reasoning items

The data from observations of student communication are also analyzed using the percentage formula, namely:

$$P_k = \frac{nm_k}{N_k} \times 100\%$$

P_k = Percentage of student communication

nm_k = The number of communication items that are checked

N_k = The sum of all communication items. The sum of all communication items.

(Slameto, 1988:115).

The criteria for P_r and P_k values can be seen in Tables 4 and 5

Table 4. Criteria Value P_r

Percentage	Qualification
$81\% \leq P_r \leq 100\%$	Very well
$61\% \leq P_r < 81\%$	Well
$41\% \leq P_r < 61\%$	Enough
$21\% \leq P_r < 41\%$	Less
$< 21\%$	Very lacking

Table 5. P_k Value Criteria

Percentage	Qualification
$81\% \leq P_k \leq 100\%$	Very well
$61\% \leq P_k < 81\%$	Well
$41\% \leq P_k < 61\%$	Enough
$21\% \leq P_k < 41\%$	Less
$< 21\%$	Very lacking

(Arikunto, Suharsimi, 2009:35)

It is expected that its success will be achieved, namely improving the quality of mathematics learning, among others, marked by an increase in the percentage of students' reasoning and communication in learning mathematics in accordance with the indicators specified in the observation sheet and a minimum of 61% or achieving good criteria (B).

RESULTS AND DISCUSSION

The study was conducted in 2 cycles. Cycle I was held in two meetings, with details of one learning meeting, and once for the first cycle test. Cycle II was carried out in two meetings, with one learning meeting and one time for the second cycle test. The data collection process in this study was carried out by observing learning using the TAPPS learning method.

The results of classroom action research consisting of cycle I and cycle II regarding mathematics learning using the TAPPS learning method show an increase in students' reasoning and communication skills. This is evident from the results of the assessment on the observation sheet and the results of the cycle tests on each cycle showed an increase in students' reasoning and communication skills.

In the cycle, the mathematics learning process was carried out using the TAPPS learning method. The reasoning of students in learning mathematics is included in both categories. This can be seen from the average percentage of student reasoning of 67.88% with good criteria. The details of the presentation are doing mathematical manipulation of 75.00% with good criteria; submit allegations of 75.69% with good criteria; provide reasons or evidence of the truth of the solution of 70.83 with good criteria, and draw conclusions of 50.00% with sufficient criteria.

Whereas students' communication in learning mathematics is still insufficient criteria. This can be seen from the average percentage of students' communication observation results of 59.59% with sufficient criteria. The details of the presentation are able to ask by 56.25% with sufficient criteria; able to answer questions by 50.00% with sufficient criteria; able to express an opinion of 53.12% with sufficient criteria, and dare to raise their hand at 75.00% with good criteria.

In cycle II after correcting the deficiencies contained in cycle I, the mathematics learning process was carried out using the TAPPS learning method. The reasoning and communication of students in learning mathematics is increasing.

The results of the assessment of students' reasoning abilities in the second cycle, the average percentage was 87.97% with very good criteria. While the results of observations of student communication in the second cycle, the average percentage of 75.78% with good criteria. This means that this research has met the indicators of success so that this study is sufficiently stopped in the second cycle. From the description above it can be seen that an increase in the average percentage of research results per cycle.

From the percentage of students' reasoning ability in each cycle for each indicator has increased that is doing mathematical manipulation in the first cycle the percentage reached 67.88% with good criteria, in the second cycle, the percentage increased to 87.97% with very good criteria.

In the second indicator regarding presenting allegations in the first cycle, the percentage reached 75.69% with good criteria, in the second cycle, the percentage increased to 89.93% with very good criteria.

In the third indicator about giving reasons or evidence of the truth of the solution, it can be seen that in the first cycle the percentage reached 70.83% with good criteria, in the second cycle the percentage increased to 87.85% with very good criteria.

In the fourth indicator regarding drawing conclusions, it can be seen that in the first cycle the percentage only reached 50.00% with enough category, in the second cycle the percentage increased to 75.69% with good criteria.

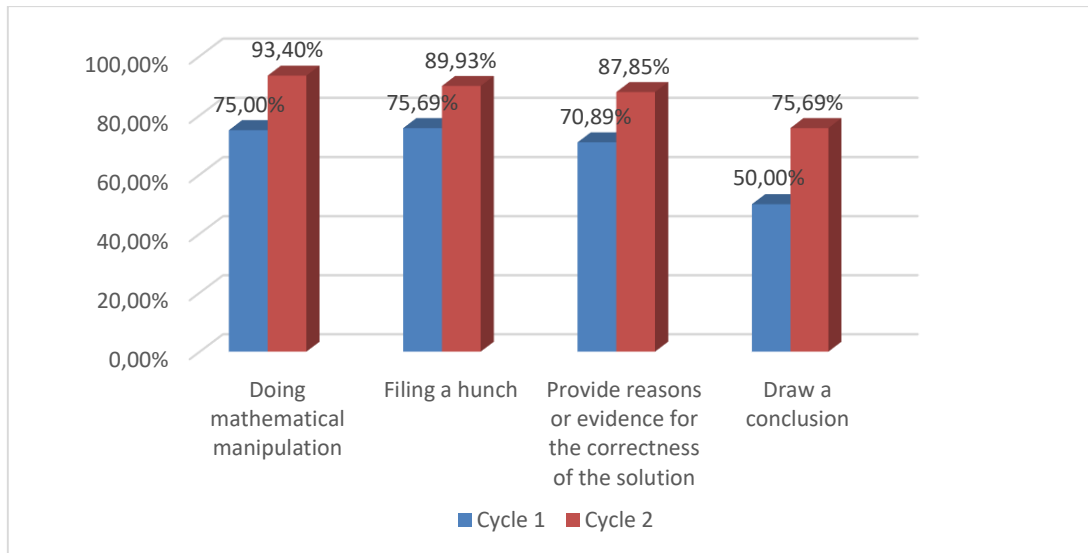
In the percentage of student communication in each cycle for each indicator has increased, which is able to ask questions in the first cycle the percentage only reached 56.25% with sufficient criteria, in the second cycle the percentage increased to 62.50% with good criteria.

In the second indicator which is able to answer the questions seen in the first cycle the percentage only reached 50.00% with sufficient criteria, in the second cycle the percentage increased to 62.50% with good criteria.

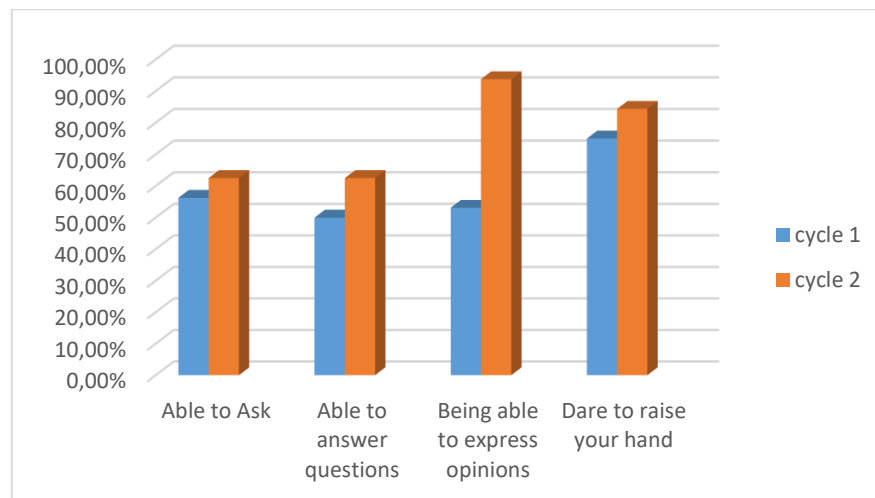
In the third indicator which is able to express an opinion, it can be seen that in the first cycle the percentage only reached 53.12% with sufficient criteria, in the second cycle the percentage increased to 93.75 with very good criteria.

In the fourth indicator, which is daring to raise hands, it can be seen that in the first cycle the percentage reached 75.00% with good criteria, in the second cycle the percentage increased to 84.38% with very good criteria.

For more details on improving students' reasoning and communication skills in cycle I and cycle II can be presented in Graph 1 and Graph 2 as follows:



Graph 1. Improving Students' Reasoning Capabilities



Graph 2. Improvement of Student Communication Capabilities

The response of students to learning mathematics using the TAPPS learning method is very good, this can be seen from the results of interviews with representatives of class VII B students of SMP Negeri 2 Binangun. Based on the results of the interview the following results are obtained:

1. Positive responses from students to mathematics learning using the TAPPS learning method, students feel happy and are not easily bored.
2. The TAPPS learning method can improve students' communication skills in the mathematics learning process, with the TAPPS method students are braver to ask questions, answer questions, express opinions, and raise their hands.
3. By using the TAPPS learning method students are more independent in solving problems, and can improve their ability to manipulate mathematics correctly.
4. The TAPPS method can train students to submit allegations, so students are more able to submit allegations correctly.
5. Students can give reasons precisely because of the habit of students in solving problems.
6. Students are easier to draw conclusions precisely.

Overall, it can be concluded that learning mathematics using the TAPPS learning method can be used as an effort to improve the reasoning and communication skills of students in class VII B, SMP Negeri 2 Binangun, Cilacap Regency, even semester 2015/2015 academic year. Thus the action hypothesis in this study was accepted.

CONCLUSION

Based on research that has been carried out on grade VII B students of SMP Negeri 2 Binangun, Cilacap Regency, the even semester of the academic year 2015/2016 on the subject of quadrilateral building using the Thinking Aloud Pair Problem Solving (TAPPS) learning method, the following conclusions can be drawn:

1. The percentage of reasoning ability assessment has increased in each indicator in each cycle, namely: the ability to do mathematical manipulation in the first cycle by 75.00% increased to 93.40% in the second cycle. The ability to submit an estimate of 75.69% in the first cycle, increased to 89.93% in the second cycle. The ability to provide a reason or proof of the truth of the solution 70.83% in the first cycle, increased to 87.85% in the second cycle. The ability to draw conclusions of 50.00% in the first cycle, increased to 75.69% in the second cycle.
2. The percentage of observations of student communication has increased in each indicator in each cycle, namely: the ability to ask 56.25% in the first cycle, increased to 62.50% in the second cycle. The ability to answer questions 50.00% in the first cycle, increased to 62.50% in the second cycle. The ability to express an opinion of 53.12% in the first cycle, increased to 93.75% in the second cycle. Dare to raise hand 75.00% in cycle I, increasing to 84.38% in cycle II.
3. An increase in the percentage of research success, namely:
 - a. The percentage increase in the assessment of reasoning ability is 67.88% in the first cycle, increasing to 87.97% in the second cycle.
 - b. The percentage increase in the observation score of students' communication skills was 58.59% in the first cycle, increasing to 75.78% in the second cycle.

Mathematics learning using the TAPPS learning method gets positive responses from students, which means students can receive well and are interested in participating in learning. This is evident from the results of interviews with students which shows that learning runs smoothly and there is a positive response from students.

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