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Active Learning Strategies in Improving Middle School Students' Mathematical Abilities

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ABSTRAK

Ability communication mathematics have role Which very important in learning mathematics. In mathematics ability Mathematical communication acts as a tool that students use in learning put forward idea Which they have For build knowledge the math. The low ability communication mathematical student influenced bymany factors both internal and external. One of the research focuses This looks at external factors namely the learning strategy factor. To improve students' mathematical communication skills, then from teachers need to apply appropriate learning strategies. One strategy that can give chance to student role active in communicating knowledge is an *Active Learning learning strategy* type tutors peer.This research aims to determine the increase in students' mathematical communication skills after implementing the peer tutoring *Active Learning strategy*.Approach Which done in study This use approach quantitative. Approach quantitative is an approach based on interpretation of data in the form of numbers. Design study Which will used in study This is study *quasi experimenter*. On study This, type design Which used researcher that is design *control group pretest-posttest design*. The data collection technique used in this research is a test. The instruments used in this research are learning tools and test sheets.Based on the results of the research carried out, the conclusion is that the mathematical communication skills of students who apply the *Active Learning learning strategy* with the peer tutor type improve compared to expository learning.

INTRODUCTION

The future of a country is largely determined by how that country is treat education. Education in Indonesia is always changing And repair in accordance with development era. Effort change And These improvements aim to bring the quality of Indonesian education to a better level. Education is one of the determining factors for the success of a developmentnation, especially in effort increase source Power man Which quality.

In implementation education, process learning is something activity Which very determine to success Study student. But in in fact, Still There is a number of Teacher Which looking that learning is the transformation of knowledge. The world of school education requires students to be able to master all the sciences taught by Teacher. In matter This, school as Wrong One institution education formal has a very important role in helping and guiding children to direction maturity And make it as member public Which useful. Besides That, Teacher Also as power education own not quite enough answer to his students so that in accordance with the intention of National Education.

As stated in in Constitution No. 20 year 2003 about System Education National Chapter II chapter 3 Which reads: National Education works develop ability And form character as well as civilization nation Which dignified in frame enlighten life nation aim For develop potency participant educate so that become humans who believe and are devoted to God Almighty, have morals noble, healthy, knowledgeable, capable, creative, independent and a good citizen democratic as well as responsible answer. For realize objective education national level, then in schools various learning is carried out field study, one among them is Mathematics

(Ministry of National Education, 2003)

Mathematics hold role important in life daily, So mathematics needs to be understood and mastered by all levels of society especially student in school. Mathematics is Wrong One knowledge Which helps in finding solutions to various problems in life. It cannot be denied that not a day goes by without it use of mathematical principles ranging from simple mathematics to mathematics level tall. Role mathematics in life daily very important because mastery of mathematics is very necessary for students as a provision in facing such developments in science fast.

In development, mathematics No regardless connection with development of science and technology (IPTEK). Mathematics as a tool in development technology And industry, his presence has capable push appearance science And technology. As something knowledge knowledge, mathematics aim practice man think logical, critical And responsible answer. (TEAM MKPBM , 2002) In science (physics, chemistry), mathematics used as language and tools, modern science relies almost entirely on mathematics. Industry and technology is advancing rapidly thanks to modern science. Almost every aspect of life now, either directly or indirectly using mathematics.Objective learning mathematics according to Curriculum 2013 that is (1) increase ability intellectual, specifically ability level tall students, (2) forming students' abilities in solving a problem systematically, (3) obtain high learning outcomes, (4) train students in communicate ideas, specifically in write work scientific, and (5) develop character student. For reach objective learning Mathematics, one of the abilities that students must have is ability communication metamatic (Ni Wayan Yulianti And Ma'rufi, 2009).

Communication mathematical is intermediary For put forward mathematical ideas or ideas in oral and written form. Ability communication mathematics is ability convey idea or idea mathematics, both orally and in writing as well as the ability to understand and accept other people's mathematical ideas or ideas carefully, analytically, critically, And evaluative Which sharpen understanding (Lestari, KE, and Yudhanegara, MR , 2015) . Can said that ability communication mathematics is ability put forward idea or idea mathematics through symbol, table, diagram, or model mathematics carefully and precisely. Mathematical communication skills too get attention special on education in Indonesia. Wrong One objective learning mathematics on curriculum 2013 is communicate idea, reasoning as well as capable compile proof mathematics with use complete sentences, symbols, tables, diagrams, or media other (Ministry of Education and Culture, 2013).

Ability communication mathematics have role Which very important in learning mathematics. In mathematics ability Mathematical communication acts as a tool that students use in learning put forward idea Which they have For build knowledge the math. Mathematical communication can also train thinking skills the mathematics And develop understanding they to mathematics.However in fact ability communication mathematics in Indonesia tend low and not up to expectations.

The low ability communication mathematical student influenced by many factors both internal and external. One of the research focuses This looks at external factors namely the learning strategy factor. During This There is trend in process learning Teacher Still use expository learning strategy. An expository learning strategy is strategy learning Which emphasize to process delivery material verbally from a teacher to his students with the intention that the students can understand the subject matter optimally. The learning process is still centralizedon teachers as transferers of information to students, this causes students become not enough active in process learning, Because learning This tend one way and student not many got feedback.(Vienna Sanjaya. 2009).

Strategy learning active different with method lecture as Which said Vienna Sanjaya, in strategy learning Expository can be used as a lecture method as well as question and answer and even discussion by utilizing available resources including using the media learning. This can enable mathematical communication skills students are not optimal, because students are less involved in learning. By Because That, Teacher need involve student in learning so that his

communication skills are optimal. Based on these problems, required strategy Which in accordance For change And make student more active during process learning taking place so that can increaseability students' mathematics (Dessy Triaana Relita, 20017).

To improve students' mathematical communication skills, then from teachers need to apply appropriate learning strategies. One strategy that can give chance to student role active in communicating knowledge is an *Active Learning learning strategy* type tutors peer. Strategy learning *Active Learning* is strategy learning which involves students more in accessing information and knowledge to be discussed and studied in the learning process in class, so that they gain various experiences that can improve understanding And competence. During process learning ongoing, student sued For role active in communicate problem- mathematics problems so that they can improve communication skills the mathematics well oral or written (Indriyani Dhian Rachmadhani and Andat, 2019).

In the learning process, the teacher only positions himself as facilitator namely regulating the circulation and course of learning with moreover first convey the goals and competencies to be achieved in the process learning the. Besides That, strategy learning learning *Active Learning* is also intended to keep students' attention focused process learning And For optimizing all potency Which owned student so that student can increase ability communication the mathematics.

According to Ma'mur in Indriyani, active learning is something a term that contains several learning models, which focus on responsibility responsible for the learning process to students. In the strategy learning process *Active* Learning : Students are required to be active in solving problems and apply what they are learning. In this research strategy learning *Active Learning* Which used is strategy learning *Active Learning* peer tutor type, this is a learning strategy from friends. Student in process learning will hear, submit question, And discuss material with person other. No only just do it, but Also share knowledge Which have been students got it from a friend his peers.

When the learning process takes place, so that all students are involved being active in the learning process, can be done in a way that students understand and actively try to explain to students who don't understand, so The student becomes understanding and active. Even for students who understand but not active, can also explain learning material to his friends who don't understand. This will motivate the student to be more active on in the classroom during the learning process (Ningrum Pusporini. A , 2019). Whereas according to Suharsimi Arikunto, a student will more easy accept information Which given by my deskmate or Friend Which other Because there is no feeling of reluctance or embarrassment to ask questions. In this case the teacher can ask assistance to students who have a deeper understanding of mathematics explain to student other (Suharsimi Arikunto , 2002).

RESEARCH METHODS

Approach Which done by study in study This use approach quantitative. Approach quantitative is an approach based on interpretation of data in the form of numbers number. Design study Which will used in study This is study *quasi experimenter*. (Nana Shaodih Sukmadinata, 2011). Study *quasi experimenter* is research that is basically the same as pure experimental research, only different in control variable. Design This No possible The researcher carried out full control over other influencing factors variable and experimental conditions (Suharsimi Arikunto, 2010).

On study This, type design Which used researcher that is design *control group pretest-posttest design. Pretest control group* research design-*The posttest design* uses two classes, namely the control class and the experimental class. Test beginning (*pre-test*) will given on class experiment For see students' basic abilities, after that as an experiment they will be given treatment by implementing *Active Learning learning strategies* such as peer tutoring process learning. After process learning finished, student will given final test (*post-test*) to see changes in mathematical communication skills students after implementing the strategy.

Likewise with the control class, before the material taught study Also will give test to student. After process his learning ongoing, student given test end For see development Which obtained. As for design his research is as following:

Table 1. *Controls groups, pre-test,* Treatment *post-test design*

Group	*Pre-Test*	Treatment	*Post-Test*
Experiment	O_1	X_1	O_2
Control	O_2	X_2	O_2

*Source: Design pre-test And post-test experiment (*Sugiyono , 2011)

Information:
O_1 = *Pre-test* experimental class and control
class O_2 = Po *st-test* class experiment And
class control
X_1 = Learning through tutor type *Active Learning learning strategies*peer
X_2 = Learning through strategy learning expository

RESULTS AND DISCUSSION

Results

Students' Mathematical Communication Ability by Applying *Active Learning Learning Strategies*

Based on hypothesis testing, it is obtained that $t_{h\ itung} = 15.92$ and $t_{tabel} = 1.71$. This result results in $t_{h\ itung} > t_{tabel}$, namely 15.92 > 1.71, thus rejecting H_0 and accepting H_1, it can be obtained that by implementing *Active Learning learning strategies* with the peer tutor type, students can improve their mathematical communication skills.

As for the description of students' mathematical communication skills, an increase in each indicator can also be seen, namely 1). Stating that elements that are known and asked about in the very good category have increased from the previous 40% to 96%. The *post-test* percentage results show that students are able to state the elements of the problem given; 2) Using appropriate mathematical language and symbols in the very good category has increased from the previous 82% to 88.5%. In the *post-test percentage* of the second indicator, it can be seen that almost all students are able to use mathematical language and symbols correctly for the problems that have been given; (3) Describing problem situations and stating solutions to problems using pictures, charts, tables and algebraically in the very good category has increased from the previous 54% to 82.5%. In the *post-test percentage* of the third indicator, it can be seen that almost all students are able to describe problem situations and state solutions to the problems given; 4) Drawing logical conclusions in written form in the very good category has increased from the previous 34% to 57%. In the *post-test percentage* of the fourth indicator, it can be seen that some students are able to draw logical conclusions from existing problems.

The third phase, organizing students into groups and selecting tutors, means the teacher groups students into heterogeneous groups and selects tutors for each group. Then each group will be given the task of studying one subtitle of the material. At this stage, students are expected to be able to work together with their group members in solving the problems in the material. The fourth phase is that the tutor guides the study group. In this phase the tutor will guide the discussion group to study the material that has been provided. Then the tutor and other students will play an active role in finding problems in the material, for example arranging the problem in the form of a mathematical model using appropriate mathematical language or symbols. In this case, train students in developing indicators using appropriate mathematical language or symbols. And if there are students in the group who don't understand, the tutor will explain again using their own language so that the students understand the material.

The fifth phase, evaluation, is that the teacher will ask students to present the results of their discussion. Students can present the problems in the material in the form of pictures, graphs, stories about the problems that are made into videos or even in the form of mathematical expressions that are made in such a way that other students are interested in learning them. Meanwhile, for solving problems, students will be given the freedom to present their problem solutions, so that students' mathematical communication skills, such as solving problems in the form of pictures, diagrams, charts, tables or algebraically, are channeled optimally. In this way, students' mathematical communication skills can develop. This phase trains students in developing indicators to describe problem situations and state solutions to problems using pictures, charts, tables and algebra.

The sixth phase is drawing conclusions. The teacher and other students will review whether the results of the group discussion are in accordance with the learning objectives and whether all the concepts of the material presented are correct, so that general conclusions can be drawn from the existing problems. In this phase, train students in making or drawing logical conclusions. Based on the learning phases described above, it appears that the peer tutoring *Active Learning strategy can be applied to students' mathematical communication skills.*

Mathematical Communication Skills applied by Expository learning strategies

However, in reality, this strategy lacks a reciprocal relationship between teachers and students, this is because the teacher explains more of the subject matter so that students have less opportunity to ask questions and express their opinions. Next, we will look at the differences in the mathematical communication abilities of students who apply the peer tutoring *Active Learning strategy* and students who apply the Opportunity learning strategy. We can see it in the following table:

Table 2. The Statistics Of Pre-Test and Post Test Result Type

Statistics	**Learning strategies *Active Learning* Peer Tutor type**	**Expository Learning Strategy**
	Pre-test Results	
1. Average	17.87	17.12
2. Standard deviation	1.89	1.86
	***Post-test* results**	
1. Average	26,28	23.74
2. Standard deviation	2.57	2.44

Source: Data processing results

From table 4.36 we can say that the *pre-test* and *post-test results* of students who applied the peer tutoring *Active Learning strategy were better than students who applied the expository* strategy. This means that the peer tutoring *Active Learning strategy is more effective in improving mathematical communication skills.* Next we will look at the differences between the two strategies in the learning process, this is shown in the following table:

Table 3. The Stages between Peer Tutor Type *Active Learning Learning Strategy and Expository Strategy*

Stages	**Peer Tutor type *Active* Learning Learning Strategy**	**Expository Learning Strategy**
1. Interaction	Collaborate	Individual.

Stages	Peer Tutor type *Active* Learning Strategy	Expository Learning Strategy
2. Teacher Activities	The teacher is only a facilitator, namely guiding and directing students.	Teachers are more active in explaining and delivering material.
3. Student Activities	Students are more active in finding and solving the problems given.	Students are more passive because they only hear and listen to the teacher's explanations and solve problems using standard procedures that have been explained.
4. Learning Process	Form heterogeneous groups.	Don't form groups.
5. Tutors	Each group has one tutor.	Don't have a tutor.
6. Evaluation	Present the results of group discussions.	Only collect the LKPD that has been given.

Based on table 4.37, it can be concluded that learning with the peer tutoring *Active Learning strategy* will make students more active in learning because the learning process tends to be collaborative so that students have the opportunity to develop all their abilities, including mathematical communication skills. When compared with expository learning strategies, learning activities tend to be more individualized so that students are less active in learning and there is no opportunity for students to become tutors. In the expository strategy, students tend to listen and write more, so they are less brave to ask questions and express their opinions. Therefore, it can be said that learning with expository strategies is less effective in improving students' mathematical communication skills.

Discussion

Students' Mathematical Communication Ability by Applying *Active Learning Learning Strategies*

This is in line with research conducted by Beny Yosefa and Wiwin Hesvi which stated that the improvement in mathematical communication skills of students who applied *Active Learning strategies* through *Group-to-Group techniques* was better than students who received conventional learning (Beny Yosefa and Wiwin Hesvi, 2014) Furthermore, research conducted by Sumardi and Adi Priyogo in 2010 concluded that there was an increase in student learning outcomes after implementing the *Active Learning learning strategy* with the peer tutor type (Sumardi and Adi Priyogo, 2011).

The advantages of the *Active Learning learning strategy* in the learning process are as follows (1) it can develop students' skills in solving problems that have been given by the teacher in the student's role as a tutor, (Siti Aisyah, 2019) (2) for tutors, this activity will strengthen understanding the concept being discussed, because it is as if they are re-explaining the concept they already understand to other students (3) the knowledge in the form of concepts obtained by students will be more long-lasting because they are directly involved in the learning process and they obtain it from their own friends with collaboration between group members and tutors, (Dessy Triaana Relita, et al , 2017) (4) learning processes that involve students in groups and presentations in front of the class teach students to be independent so that they can generate self-confidence and increase students' motivation to learn, (Ratri Candra Hastari , 2019) (5) can improve students' communication skills due to interaction between tutors and group members in solving problems that have been given, (6) for group members who do

not understand the concepts being studied can directly ask their group tutor without feeling of reluctance and embarrassment. Based on the phases and advantages of the peer tutoring *Active Learning* learning strategy described above, it appears that implementing the peer tutoring *Active Learning learning strategy* can improve students' mathematical communication skills as has been tested by researchers (Suharsimi Arikunto, 2002).

Mathematical Communication Skills applied by Expository learning strategies

Based on the results of *the pre-test* on students' mathematical communication skills, the average of students in the control class was 17.12 with a standard deviation of 1.86. Meanwhile, for the *post-test results* of mathematical communication skills after applying the expository strategy, the average score obtained by students was 23.74 with a standard deviation of 2.44. However, based on the results of hypothesis II testing, it shows that accept H_1 reject H_0, this means that the mathematical communication skills applied with the expository learning strategy are no better than the mathematical communication skills applied with the peer tutor type *Active Learning strategy* . This is in line with research conducted by Fitri Yunida which stated that the mathematical communication abilities of students taught using the expository method were no better than the mathematical communication abilities of students taught using the *Problem Based Learning model* (Fitri Yunida, 2016).

Theoretically, an expository learning strategy is a learning strategy that emphasizes the process of conveying material verbally from a teacher to students with the aim that students can understand the subject matter optimally. Teacher activities in this strategy are only carried out at certain times, namely at the beginning of lesson activities, explaining the material and providing example questions. Meanwhile, student activities in this strategy are listening, paying attention and taking notes. But not only that, students also solve math problems and work on practice questions contained in the LKPD that the teacher has given. In working on and completing LKPD students work individually or in collaboration with their classmates and if students experience difficulties or do not understand something, they can ask the teacher.

CONCLUSION

Based on the results of research carried out regarding mathematics learning by applying peer tutoring *Active Learning strategies* to the mathematical communication skills of students at SMKN 2 Tulungagung, the following conclusions were obtained:1)The mathematical communication skills of students who apply the *Active Learning learning strategy* with the peer tutor type increase, this is based on the results of the first hypothesis test which shows that H_0 is rejected so accept H_1. So it can be said that implementing *Active Learning learning strategies* with peer tutoring can improve students' mathematical communication skills. The description of the overall increase in mathematical communication skills in the experimental class has increased from the previous 52.5% to 81%. 2)Increasing the mathematical communication skills of vocational school students who apply the peer tutoring *Active Learning strategy* is better than increasing the mathematical communication skills of students who apply the expository learning strategy.

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