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The Influence of Active Knowledge Sharing Strategies and Initial Ability of Students' Mathematical Ability

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***Abstract*—In this study, researchers compare mathematical abilities between students who use Active Knowledge Sharing Strategies and students who are taught by using conventional approaches. The type of research used is Quasi Experiment. The population of this study was the fourth grade students of Group VIII Kec. Koto Tangah Padang City. Sampling technique used wasrandom sampling. Selected as the experimental class were the fourth grade students of SDN 50 Kampung Jambak and the control class was the fourth grade students of SDN 37 Sungai Bangek. The instrument used in this study was a test consisting of an initial ability test and a concept understanding test and mathematical communication skills. The data obtained were analyzed using t-test and two-way ANAVA. The results of the analysis show that: (1) Understanding the mathematical communication concepts and abilities of students with active knowledge sharing strategies is higher than students who learn with conventional learning. (2) Understanding the mathematical communication concepts and abilities of high and low initial ability students taught with active knowledge sharing strategies is higher than those taught with conventional learning. (3) There is no interaction between the learning model and the initial ability to influence the understanding of concepts and initial abilities in influencing the understanding of concepts and mathematical communication skills.**

Keywords—Active knowledge sharing, concept understanding and mathematical communication, initial

I. INTRODUCTION

The first mathematical ability possessed by students is the ability to understand concepts of studying mathematicsthat require comprehension against the concept symbol [1].This is reinforced by NCTM which contains five standard mathematical abilities that must be owned by students [2] . Students who have a good understanding of concepts will ease to solve mathematical problems in everyday life. Concept understanding includes facts, concepts, principles and skills or algorithms [3]. Revealed the importance of understanding concepts in students' learning using their knowledge of formulas and symbols [4]. With an understanding of the concept will be able to develop mathematical communication skills. Communicating mathematically *(mathematical communication)* can express opinions and ideas verbally, in writing, or in other forms and be able to understand the opinions and ideas of others [5] .

The TIMSS Study (*Trend in International Mathematics and Science Study*) shows that the position of Indonesian is in 38th out of 42 countries. This study explains that learning mathematics in Indonesia is more in mastering basic skills; there is very little emphasis on the application of mathematics in everyday contexts, communicating mathematically, and mathematically reasoning. The Mathematics Teachers Development Training Center Development Team's research also revealed that in several regions of Indonesia, most students have difficulty in solving problem and translating the questions of everyday life into mathematical models [6]. The results of this study shows that the ability of the students to understand concepts is still low so they are not able to communicate mathematically.

When giving new knowledge, teachers should pay attention to the students' background knowledge. Asserts thatit will easy for some one to learn something if learning is based on what the person already knows [7]. Therefore, to learn a new material, the past learning experience from someone will influence the learning process of the mathematical material.

According to the Ministry of National Education conventional learning has the following characteristics: learning does not pay attention to student experience, abstract and theoretical learning; assessment is only determined by tests not on the assessment of the learning process [8] . This learning places students as learning objects that act passively as information so that the results of students' mathematical abilities are low. Students' mathematical abilities are also influenced by the learning approach used by the teacher during learning.

The low mathematical ability of students is caused by various factors including students learning by listening and watching teachers in mathematics learning. Another cause according is that mathematics has no meaning if only memorizing, but more than that students can better understand the concept of a material [9]. The low student learning outcomes are also caused by the lack of precise learning approaches taken by the teacher, and also influenced by students' learning interest. That learning must be in demand, abilities that are expected to be achieved, and learning activities can be carried out by children [10]. Learning aims to understand the concepts being taught.

stated that understanding of concepts was the main goal of mathematics education [11]. These concepts will give birth to theorems or formulas. In order for the concepts and theorems to be applied to other situations, it is necessary to have the skills to use these concepts and theorems. Therefore mathematics learning revolves around concepts, theorems and skills.

One of the methods carried out by researchers is to use an approach to learning to improve students' understanding of skills and communication skills. The strategy used is the Active Learning type of active knowledge sharing type. "Learning active is useful to connect between what is experienced by students with the concepts that you want to convey[12]". Active learning is all forms of learning that enable students to actively participate in the learning process itself both in the form of interaction between students and students with the instructor in the learning process [13]. This strategy provides opportunities for students to find concepts in learning so as to make learning interactive. That students must be given the opportunity to rediscover mathematical concepts, so that teaching and learning becomes very interactive [14].

Active knowledge sharing strategies are designed to involve students directly into subjects to build their attention or interest, raise their curiosity, and stimulate thinking. This is consistent with whostated that this is a good way to attract students immediately to your subject matter [15]. You can use it to measure the level of knowledge of students while, at the same time, do some team building (*team building*). The strategy works with several lessons and with some subject matter ". Many teachers make teaching errors too early before students are invited to be mentally prepared. Using this strategy will correct the tendency.

II. METHOD

This research is a Quasi Experiment which aims to compare the influence of active knowledge sharing strategies with conventional approaches to students' mathematical abilities. The variables in this study consist of 3 variables, namely the independent variable, the dependent variable and the moderator variable. *First*, the independent variable is learning with an active knowledge sharing strategy. *Second*, the dependent variable is the understanding of students 'mathematical concepts and communication skills, and the moderator variable is the students' initial ability.

The population in this study were Grade IV elementary school students in cluster VIII in Koto Tangah District in the 2017/2018 school year who had the same curriculum, KKM, and accreditation. Of the 5 primary schools in cluster VIII randomly selected as the study sample and control class. 17 grade IV students of SDN 50 KampungJambak as the experimental class took part in learning using active knowledge sharing strategies and 22 grade IV students of SDN 37 Sungai Bangek as the control class will follow the learning using conventional approaches. The research design used to measure the effect of active knowledge sharing strategies and initial abilities on students' mathematical abilities was*Randomized Group Only Design*.

Data were collected by using tests. Tests are used to measure students' prior knowledge, and students' mathematical abilities. The testswere validated by experts, then tested for question validity, indicators of understanding mathematical concepts were (1) restating a concept, (2) Classifying objects according to certain properties (according to the concept), (3) applying concepts or algorithms solution to problem. While the indicators on communication skills were (1) Reflecting real objects, pictures and characters into mathematical ideas (2) Explaining ideas, situations, and mathematical relations in writing with real objects, images, and algebra (3) Stating daily events days in language or mathematical symbols. Data were analyzed by using t-test and two-way ANAVA after conducting a series of normality and homogeneity tests.

III. RESULTS AND DISCUSSION

Based on data analysis, students' understanding of concepts and mathematical communication skills were classified according to their prior abilities, as can be seen in Table I.

TABLE I. DATA OF MEASUREMENT RESULTS ON UNDERSTANDIN CONCEPTS OF CONCEPTS

Class	Initial Ability	N	Average
Experiment	High	6	10.17
	Low	11	8.36
	Total	17	8.82
Control	High	12	8.42
	Low	10	6.3
	Total	22	8.09

Table I shows that the average value of students who follow an active knowledge sharing learning strategy is higher than students who take learning using a conventional approach. Based on initial ability, the average value of the experimental class is higher than in the control class.

After conducting a series of normality and homogeneity tests, it was concluded that the t-test was used for six hypothesis testing and two-way ANAVA was used to examine the interaction between active knowledge sharing strategies and initial ability to influence students 'understanding of concepts and students' mathematical communication skills. A summary of hypothesis testing, with the help of SPSS software, is presented in table II below.

1. First

This hypothesis test is used to determine the understanding of students' mathematical concepts that are taught with an active knowledge sharing strategy in conventional experimental and learning classes in the control class. T test results are shown in Table 2.

TABLE II. CALCULATION RESULT CONCEPT TRAINING CLASS EXPERIMENT AND THOSE UNDER

Class	N	average	$T_{arithmetic}$	df	Sig
Experiment	17	8.82	2.236	37	0.015
Control	22	8:09			

Table 2 shows that the test results are different; understandings of mathematical concepts obtained value significant = 0.015 means that $H_{0\ is}$ rejected or understanding of the concept of students taught with instructional strategies to actively share knowledge higher than students' understanding of concepts taught by conventional teaching.

2. Second

This hypothesis test is used to determine the understanding of mathematical concepts of high initial ability students who are taught with active knowledge sharing learning strategies in the experimental class and conventional learning classes in the control class. The following is presented the results of the second hypothesis test using t test in table 3.

TABLE III. COMPUTATION CALCULATION RESULTS CONCEPT OF STUDENTS EARLY ABILITY HIGH CLASS EXPERIMENTS AND CONTROLS

Class	N	Average	t_{count}	df	Sig
Experiment	6	10.17	1.985	16	0.032
Control	12	8.42			

In Table 3 it looks that different understanding of mathematical concepts capable students high initial gained significant value = 0.032 means that $H_{0\ is}$ rejected or understanding concepts capable students high initial taught by learning to share knowledge actively higher than understanding the concept of capable students high initial taught by conventional teaching

3. Hypothesis The third

Hypothesis test is used to find out the understanding of mathematical concepts of students with low initial abilities who are taught with active knowledge sharing learning strategies in the experimental class and conventional learning in the control class.

TABLE IV. CALCULATION RESULTS CONCEPT TRAINING STUDENTS CAPABLE EARLY LOW CLASS EXPERIMENT AND CONTROL

Class	N	average	$T_{arithmetic}$	df	Sig
Experiment	11	8:36	2.265	19	0.017
Control	10	6.3			

Table 4 shows that the test results different understanding of mathematical concepts capable students lower initial values obtained significant = 0.017 means that $H_{0\ is}$ rejected or understanding of the concept of low-performing students are taught beginning with learning actively share knowledge higher than the understanding of the concept of early low-ability students taught by conventional teaching.

4. Fourth

This hypothesis test is used to determine the interaction between the learning model and the students 'initial ability to influence the understanding of students' mathematical concepts.

TABLE V. TEST RESULT ANAVA TWO WAY INTERACTION BETWEEN MODEL LEARNING AND CAPABILITY BEGINING OF THE CONCEPT TRAINING

Resources Diversity	Sum of Squares	df	Square Middle	F	Sig
ability Preliminary	5,8820.2 855	8		1,316	47,057
Learning Model	9,3060,1 48	2		2,082	18,612
K. Inital * Model	0,637 0,674	5	2,848		14,241

5. Hypothesis Fifth

This hypothesis test is used to determine students' mathematical communication skills taught by active knowledge sharing learning strategies in the experimental class and conventional learning in the control class.

TABLE VI. COMMUNICATION SKILLS MATHEMATICAL CALCULATION RESULTS CLASS EKSPERIMENT AND CONTROL

Class	N	average	$T_{arithmetic}$	df	Sig
Experiment	17	9:00	2,746	37	0.0045
Control	22	7:23			

In Table 6 shows that the test results obtained by mathematical communication ability differences significant value = 0.0045 means that $H_{0\ is}$ rejected or mathematical communication ability of students taught by learning strategies to actively share knowledge higher than mathematically communication skills of students taught by conventional teaching.

6. HypothesisSixth

This hypothesis test is used to determine the mathematical communication skills of high initial ability students who are taught with active knowledge sharing learning strategies in the experimental class and conventional learning in the control class.

TABLE VII. CALCULATION RESULTS OF MATHEMATICAL ABILITY OF ABILITY EARLY STUDENTS HIGH GRADE EXPERIMENTS AND CONTROL

Class	N	Average	T_{count}	df	Sig
Experiment	6	9.83	2,167	16	0.023
Control	12	7.83			

From table 7 it can be seen that the results of differences in mathematical communication skills obtained significant value = 0.023 means $H_{0\ is}$ rejected or mathematical communication skills early high ability students taught by learning strategies to actively share knowledge higher than mathematically communication skills of students taught by conventional teaching.

7. Hypothesis Seventh

This hypothesis test is used to determine the mathematical communication skills of low initial ability students who are taught with active knowledge sharing

learning strategies in the experimental class and conventional learning in the control class.

TABLE VIII. MATHEMATICAL COMMUNICATION ABILITY CALCULATION RESULTS OF EARLY LOW GRADE EXPERIMENTS AND CONTROL

Class	N-	Average-rata	T arithmetic	df	Sig
Experiment	11	8:55	2,322	19	0.0155
control	10	6:50			

In table 8 shows that the test results of mathematical communication ability differences lower initial ability students in experimental class and control class derived significant value = 0.0155 means that $H_{0\ is}$ rejected or mathematical communication skills of students low initial abilities taught by active knowledge sharing learning strategies are higher than the mathematical communication skills of students with low initial abilities taught by conventional learning.

8. Hypothesis Eighth

This hypothesis test is used to determine the interaction between the learning model and the students 'initial ability to influence students' mathematical communication skills. Testing this hypothesis using two-way ANOVA can be seen in Table 9.

TABLE IX. TEST RESULTS ANAVA TWO-WAY INTERACTION BETWEEN MODEL EARLY LEARNING AND ABILITY TO CONCEPT TRAINING

Diversity Source	Sum of Squares	df	Central Square	F	Sig
Initial Capabilities	2129	8	0266	0976	0501
Model learning	2.530	8	0.266	1.160	0.399
k.Awal * Model	1579	11	0316	0526	0849

Based on Two-Way Anova test calculations in table 9 the significance value was 0849. Because of the great significance was 0.05 then$_{H0\ was}$ accepted or there is no interaction between learning models and the prior ability on mathematical communication skills.

Active knowledge sharing strategies maske students more active in learning as "Every individual must be actively involved in the learning process and the teacher must get an assessment of the students so that there is individual accountability" [16]. Students must study mathematics with understanding, actively build new knowledge from prior experience and knowledge (NCTM).

Knowledge sharing strategies will make students actively build their knowledge. This is in line stating that when students find mathematical concepts for themselves and improve problem solving skills in small groups, they learn mathematics and independence[17]. Knowledge sharing strategies cansupport the understanding of independent learning from mathematical concepts and techniques [18]. This reinforces that by actively sharing knowledge strategies can improve understanding of mathematical concepts and communication. So, the researchers conclude that knowledge sharing learning will develop students' ability to understand concepts by sharing with a group of friends. The results of the second hypothesis testing show that in general the understanding of the concept of high initial ability students taught with active knowledge sharing learning strategies is higher than those of high initial ability students taught with conventional learning.

Students who have high prior ability can explain and repeat the concepts that are being learned while helping friends in the group. Students who have high initial ability can actively share knowledge with their group friends [19]. In order for active learning to be more effective, teachers should use the following: small group discussions and projects (research), class presentations and debating, experience training, field experiences, simulations, and case studies.

In the learning process there will be interaction between students; it will gain knowledge together "Interactions that arise during the learning process will lead to *positive interdependence* where the consolidation of knowledge learned can only be obtained together through active exploration in learning [20]. With this, students will be able to work together with students having high initial abilities. In learning concept understanding is very important in learning mathematics. Hi this was raised by Hiebert and Carpenter in Juan (1994) asserts that students are required to have mathematical understanding.

In learning mathematics,students must have mathematical communication skills. Emphasizes mathematics learning requires students to have mathematical communication skills to convey their knowledge [21] . Knowledge sharing strategies can encourage specifically designed communication and initiated questions both oral and verbal communication through discussion and sharing ideas between students and written assignments [22].

The importance of mathematical communication skills [23], namely the ability of mathematical communication is a person's ability to connect messages by reading, listening, asking, then communicating the location of the problem and presenting it in solving problems that occur in a classroom environment. Suggests communication skills are important when students have discussions because they will practice to explain, describe, listen, state, ask, and cooperate so that they can understand mathematical concepts by building their own knowledge with teacher guidance [24]. This proves that mathematics learning requires mathematical abilities, especially understanding of concepts and mathematical communication. Mathematical abilities and mathematical thinking are needed for students to achieve success in life, especially when working in real life.

IV. CONCLUSION

Based on the results of the study and discussion it can be concluded that the learning strategy by sharing knowledge actively gives a better influence than the conventional approach in improving students' ability to understand

concepts and mathematical communication. This conclusion also applies to students with high and low initial ability students. There is no interaction between the learning model and the initial ability to influence students' understanding of concepts and mathematical communication skills.

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