Comparing the Result of Mathematics Learning Between Reciprocal Teaching and Students' Facilitator and Explaining by Controlling Early Ability

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Abstract. This study aims to determine the mathematics learning outcomes using high and low reciprocal teaching-learning models, and student facilitator model, with high and low learning independence to explain students' initial abilities. The research made use of the experimental method. A two-way Anacova method was used to test for hypothesis. Hypothesis 1 indicates that H0 is rejected based on t-test statistics with a value of 4.90, which is greater than t table (0.01; 59) value of 2.39. Hypothesis 2 analysis shows that H0 is rejected based on t-test statistics, with a t count value of -1.83, which is greater than t table (0.05; 59) value of-1.67.

Keywords: Early Ability, Mathematics, Instructional Models

1 Introduction

The current rapid globalization era of the development of science, technology, and information has gradually led to a continuous competition among nations across the globe. In order to anticipate and win these competitions, we must prepare ourselves by growing and developing many competencies or skills. Based on the results of a preliminary study at the Margabaru Middle School, it was gathered that students' mathematical learning ability is very low. This is owing to the unvaried teaching model. Teachers are expected to be able to choose an academic teaching model according to the characteristics of students. The following problems often arise in the use of conventional teaching technique: 1) students are less active in expressing their opinions; 2) students are often not interested in learning mathematics; 3) their disinterested attitude towards solving current problems; 4) low independence rate. [1] To overcome these inconsistencies, research needs to be carried out on independence mathematical learning models

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by controlling students' abilities. [2] Learning is the process of communication between teachers and students to convey and achieve specified competencies. [3]

Ostovar-Namaghi dan Shahhosseini states the theoretical basis of reciprocal teaching, namely the zone of proximal development, teaching and proactive scaffolding, which is focused on constructing of meaningful interactive process between the teacher and students. [4] Menurut Freihat dan Al-Makhzoomi defined *Reciprocal Teaching* as a model used to guide students to interact with text in more sophisticated ways, resulting in an increase in the quality of summaries and significant questions. [5]According to Salehi and Vafakhah, reciprocal teaching is an instructional style that was originally developed for struggling readers. Furthermore, Aderonke and Akinsola, defined reciprocal teaching as a student-centered learning method in which students and teachers switch roles in a lesson. [6]

Student Facilitator and Explaining Learning Model is a cooperative learning activity. Gillies and Andrian explained the concept of cooperative learning as a process in which the teacher: (a) explains academic assignments to students; (b) explains the criteria for success; (c) dishes out positive interdependence and individual accountability structures; (e) explains behavior (i.e., social skills) and (f) emphasizes on how inter-group collaboration eliminates the possibility of competition among students and extends the interdependence of positive goals to class. [7] Effendi and Ikhsan (2007) argued that cooperative learning is based on the belief that learning is most effective when students are actively involved in sharing ideas and working in groups to complete academic tasks. [8] According to Muslim, learning Student Facilitator and Explaining is one type of cooperative academic technique that emphasizes special structures designed to influence patterns of student interaction and has the purpose of improving academic mastery. [9]

According to Nagpal, Priyamakhija, James, and Gyanprakash academic independence is a process, method, and educational philosophy where a student acquires knowledge on his own and develops the ability for critical investigation and evaluation. [10]Grover, Miller, and Porter stated that Individuals take the initiative, with or without the help of others, in diagnosing their educational needs, formulating goals, identifying academic human and material resources, selecting and implementing appropriate learning strategies, and evaluating the outcomes.[11] The teacher ensures that children are aware of their own needs and understand how to identify them. Fisher and Williams discusses ways to create an effective and conducive learning community; and shows that an independent learning environment must develop a climate in which society is important and respects groups giving rise to trust, support, and communication.[12] Harvey and

Louise argues that the first important step before self-learning skills can be developed for students is to understand the need to change "*Unless they see this need and the desire for change, students have no reason to change their approach or any motivation to overcome old habits."[13]* Johnson opined that independent learning technique, allows students to adopt their own styles, and progress at their own pace. It also enables them to explore personal interests, and develop their talents using numerous resources. [14]

The initial ability according to Mariotti is to refer to previous individual experiences and information that they are already familiar with. [15]According to Dick, Johnson, and Carey the initial ability is a set of skills students should have before they take on a new learning process. [16]

2 Methodology

The study was conducted with a quantitative approach by using a quasi-experimental research. This research method can truly test hypotheses concerning cause-and-effect relationships. It represents the most valid approach to the solution of educational problems, both practical and theoretical, and to the advancement of education as a science. Data was obtained from Junior High School students of Margabaru, Musirawas Regency, South of Sumatera, Indonesia. In collecting the data, the researcher made use of the test and questionnaire data capturing technique. The tests were given twice. Before the students were taught the reciprocal model was used and after teaching them, the questionnaire was used. The research data set can be accessed in https://osf.io/rxav5/?view_only=5680917649b0449fa5510a0884d30384 [17] analyzed through Analysis of Covariate (ANACOVA).

Variabel Perlakuan / Variabel Moderator	Model Pembelajaran *(A)*	
	Model Reciprocal Teaching (A_1)	Model *Student Facillitator and Explaining* (A_2)
Kemandirian Belajar Tinggi B_1	$A_1 B_1$ $[X, Y]_{11k}$ $K = 1,2, \ldots, n_{11}$	$A_2 B_1$ $[X, Y]_{21k}$ $K = 1,2, \ldots, n_{21}$
Kemandirian Belajar Rendah B_2	$A_1 B_2$ $[X, Y]_{12k}$ $K = 1,2, \ldots, n_{12}$	$A_2 B_2$ $[X, Y]_{12k}$ $K = 1,2, \ldots, n_{12}$

3 Result and Discution

Descriptive statistical analysis was carried out to describe students 'mathematics learning outcomes obtained from the treatment of educational teaching models, academic independence attributes and students' initial ability scores obtained from the results of questions. Table 1 below will present a summary of the value of the students' initial abilities and learning outcomes.

Table 1. Recapitulation of Initial Ability Scores and Student Mathematics Learning Outcomes in All Groups

A		A_1		A_2		Total	
B		X	Y	X	Y	X	Y
B_1	n	16	16	16	16	32	32
	Mean	68,06	74,31	49,63	55,25	58,84	64,78
	S	9,32	8,88	9,27	5,81	13,09	12,18
	Min	50	64	37	47	37	47
	Maks	83	98	70	66	83	98
B_2	N	16	16	16	16	32	32
	Mean	50,19	55,56	59,25	62,88	54,72	59,22
	S	8,41	6,20	12,19	10,29	11,28	9,15
	Min	37	47	37	40	37	40
	Maks	65	66	76	79	76	79
Total	n	32	32	32	32	64	64
	Mean	59,13	64,94	54,44	59,06	56,78	62,00
	S	12,60	12,14	11,72	9,09	12,30	11,05
	Min	37	47	37	40	37	40
	Maks	83	98	76	79	83	98

The hypothesis testing of this study was carried out using covariance analysis (ANACOVA), which aims to examine the effect of learning models and interaction on mathematics and independence teaching models after controlling students 'initial abilities. The ANACOVA results were then followed by a t-test to determine the differences in the average mathematics learning outcomes formed after controlling for students' initial abilities. Using the ANACOVA table, the analysis results below are obtained.

1. **Differences in mathematics academic outcomes between those who learned to use reciprocal teaching models and those who learn using the student facilitator model.**

The results of the analysis of testing hypothesis 1 indicate that H0 is rejected based on t-test statistics, with a tcount value of 4.90. This value is higher than t table (0.01; 59) at 2.39. Thus it can be concluded that for groups of students who have high learning independence, there are significant differences in mathematics academic outcomes between groups of students who study

with reciprocal teaching models and those who learn with student facilitation techniques after controlling their initial abilities. The group with the higher value can be seen from the average value corrected by the two groups. In the group of students with high educational independence, using alterative teaching techniques a corrected average of 73.18 can be seen. While in the group who study with student facilitation an average corrected value of 55.97 can be seen. The calculation results shows that for groups of students with high academic independence, teaching mathematics using the reciprocal teaching model are higher than those that use student facilitation models.

2. **Differences in mathematics learning outcomes between those who learn to use reciprocal teaching models with high learning independence and those who learn using the student facilitator model are explained after controlling students' initial abilities**

The results of the analysis of hypothesis 2 shows that H0 is rejected based on t-test statistics, with a t count value of -1.83. This value is smaller than t table (0.05; 59) value of -1.67. Thus it can be concluded that for groups of students who have low learning independence, there are very significant differences in mathematics learning. The group with the higher value can be seen from the average value corrected by the two groups. For those with low independence, the mathematics learning outcomes have a corrected average of 56.22. However, the group learning outcomes of students who were given student facilitation and explaining lessons had an average corrected value of 62.63.

5 Conclusion

Based on the data obtained from the research and discussion, conclusions are presented as follows:

1. The mathematics learning outcomes of students taught with alternative teaching models were higher than those taught using the student facilitator and explaining model.
2. The mathematics learning outcomes of students taught using reciprocal teaching learning models were lower than those taught using the student facilitator and explaining model, in students with low learning independence, after controlling their initial abilities.

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