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The Effect of Collaborative Problem Solving Learning Model on Mathematical Literacy Skill

S Morin[1*], S Prabawanto[1]

[1]Departemen Pendidikan Matematika, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229, Bandung 40154, Indonesia

[*]shellymorin96@upi.edu

Abstract. This research aims to investigate the difference in mathematical literacy skills between students who experienced collaborative problem solving learning and those experiencing expository learning. The research used quasi experimental method with Only Control Design post-test research design. Subject in this research was the entire eighth grade students of junior high school in Tangerang City. In this research, there were two groups, namely experimental group which consisted of 36 students and control group involving 36 students. Data collection techniques used in this research was purposive random sampling through the use of instrument on mathematical literacy skills test in the form of essay. Based on the research results, it was found that mathematical literacy skills of the students who received the learning experience of collaborative problem solving are better than the skills of students who experienced the expository learning.

1. Introduction

Education is an effort to develop human resources. Planned education is expected to create a learning process that makes students actively develop their potential. One of the government's efforts to improve the standard of education is by participating in the international scale test of the International Student Assessment Program (PISA) and the Trends in the International Mathematical and Science Study (TIMSS). The International Student Assessment Program (PISA) is developed as an attempt to see the extent of the success of Indonesia's education programs compared to other countries in the world [1]. Trends in the International Mathematics and Science Study (TIMSS) is an international study to evaluate existing education especially the learning outcomes of 14-year-old students at the junior high school level. The importance of literacy in context determined the quality of human resources for advancing the nation's capital, and the unavailability of literacy studies in the context of Indonesia demands the research on the literacy achievement of Indonesian students in secondary education.

The slogan from UNESCO namely "literacy for all" confirms that the right of every human being to be "literate" is considered as the capital to meet life [2]. Literacy makes individuals, families and communities empowered to improve their quality of life. Mathematical literacy makes individuals use mathematical knowledge and understanding abilities to be applied in daily life. According to the definition of UNESCO, literacy is the ability to identify, understand, interpret, create, communicate, and the numeracy through written material and its variants

One effort to improve mathematical literacy skills is by using learning methods. Using collaborative problem solving learning methods, students are encouraged to interact with each other in the learning process to improve the understanding of each student. By means of collaboration learning

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method, the teacher only acts as a facilitator in directing and controlling students when collaborating, so that the collaboration process can work accordingly. In the collaboration process students can find ideas to produce solutions to the problems given.

This research aims to investigate the difference in mathematical literacy skills between students who experienced collaborative problem solving learning and those experiencing expository learning.

2. Experimental Method

2.1Research Design

This research used the Quasi Experimental research method with the Only Design post-test research design [3]. In the experimental group, students were taught using Collaborative Problem Solving learning model and control group students were taught using expository learning model. The research design is as follows**.**

Table 1. Post-test research design

Group	Treatment	Post-test
Experiment	X	Y_E
Control	-	Y_K

Notes:
X: Treatment in the experimental group using collaborative problem solving learning
Y_E: Post-test data in the experimental group on mathematical literacy skills
Y_K: Post-test data in the control group on mathematical literacy skills

2.2 Population and Sample

Population in this study was the entire eighth grade students of a junior high school in Tangerang City. In this research, there were two groups, namely experimental group which consisted of 36 students and control group involving 36 students.

2.3 Research Procedure

This research began with determining the sample. After determining the sample, the experimental group received the treatment by having collaborative problem solving learning and the control group experienced expository learning. The two groups were provided with mathematics learning which utilized different methods. At the end of the learning, students were given several questions to investigate the differences in literacy skills between both groups.

2.4Data Analysis

This research was processed at the next stage by analyzing the data collected from the two groups. Quantitative data were measured using SPSS 20. The process of data analysis using the analysis prerequisite test involved the normality test to determine whether the population is normally distributed or not. Homogeneity test was conducted to determine whether the sample has a homogeneous variant and t-test was computed to determine the differences in mathematical literacy skills

3. Result and Discussion

3.1. Result

In order to analyze the differences in averages of mathematical literacy skills, prerequisite data analysis was performed by running the normality test and homogeneity test, then t-test was conducted to determine which is better between the experimental group and the control group.

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Table 1. Results of Post-test T-Test Calculation for Mathematical Literacy Skills

Group	Leven's Test For Equality Of Variances		t-test For Equality Of Means		
	F	Sig.	t	df	Sig. (2-tailed)
Experiment and Control (Equal Variances Assumed)	0.258	0.613	7.806	64	0.000

The results from table 1 above significantly show the effect of differences in mathematical literacy skills between the experimental group and the control group. The results of the research indicate that collaborative problem solving learning model can affect mathematical literacy skills. In this learning model students are encouraged to interact with each other so they can find ideas so as to produce solutions to the problems given.

3.2. Discussion

The fact that experimental group which received collaborative problem solving learning is better than the control group was proved by the results of calculations. Teaching and learning activities in the experimental class put more emphasis on cooperation between students to get the final solution to the problems given. Students were required to be more active in expressing opinions, collaborating in solving problems, and respecting each other's opinions in their groups and other groups. According to Takaria, the CPS model is effectively used in learning [4]. Collaboration can facilitate students in understanding the materials well, especially by how they are trained to construct ideas individually in understanding information and present information in the form of tables or graphs.

The control group experienced expository learning where teacher dominated the class interaction. Students just sat, worked, and paid attention to what the teacher said. Moreover, only a few of students would pose questions during the learning process. Therefore, students looked bored and eventually joked around with their friends in the class. Using expository learning, students generally spend more time to only receive the information than to seek individual solutions. According to Fathani, Mathematical Literacy is a person's ability to formulate, use and interpret mathematics in various contexts of everyday life problems efficiently [5]. The expository learning process of students is more of accepting, whereas according to Fathani aside from learning the calculation it is also important to balance the learning process by letting students communicate with others.

4. Conclusion

Based on the research results, it was concluded that there is a difference in mathematical literacy skills between students who experienced the learning process using collaborative problem solving model and students who experienced expository learning. This is seen from the average score of mathematical literacy skills at the end of the learning period. The average score of students who were taught with collaborative problem solving learning model is higher than students who experienced expository learning.

The results of this study are only based on the results that have been concluded. The implementation of learning with collaborative problem solving does not require costs in its implementation. Recommendations for collaborative problem solving learning can be an alternative to improve mathematical literacy skills in other subjects of mathematics learning.

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