The Effect of Cooperative Learning Model (CLM) on Teacher Student's Science Literacy Abilities

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Abstract: The purpose of this research was to determine the effect of cooperative learning model (CLM) implementation on the improvement of teacher students' scientific literacy abilities in the basic concepts of science course. The research method used is qualitative research that is carried out through action planning, carrying out actions, observations, and reflections that are carried out collaboratively and partially with the aim of improving learning activities using appropriate learning models. Data were collected through observation and essay tests for 34 elementary teacher students. The results showed that for all indicators of scientific literacy ability through the implementation of CLM there was an increase in the medium category, namely for indicators thinking and working scientifically increased by 19%, math and science abilities increased by 8%, the role of science increased by 28%, and science and society increased by 14%.

1 INTRODUCTION

The quality of Indonesian education, especially in the scientific literacy abilities of students in the international arena, is still very low, as evidenced by the results of the Program for International Student Assessment (PISA) which ranked 64th out of 65 countries (Shi, He, Wang, Fan, & Guo, 2016). According to Stacey (2011), the success of Japanese mathematical literacy in trends in the International Mathematics and Science Study (TIMSS), strongly emphasizes improving the quality of teacher competencies. The ability to master the material and elements of scientific literacy is essential for teaching students to be able to use appropriate methods in developing scientific literacy in the classroom (Udompong, Traiwichitkhun, & Wongwanich, 2014). Therefore, one of the efforts to overcome the deterioration of the quality of science education is by increasing the competence of science teachers and natural science teacher students, especially in scientific literacy abilities, because in time the science teacher students will teach science through scientific literacy aspects to students.

According to Yaduvanshi & Singh (2018), revealed the effect of the implementation of cooperative learning model (CLM) on improving students' scientific literacy abilities in the basic concepts of science course. Some of the advantages of CLM have been proven in helping the successful implementation of the learning process rather than problem-solving models and conventional (Johnson, 2013) (Hutauruk, 2016). Learners get more opportunities to speak, initiative, make choices and generally develop good habits (Duckworth, 2010) (Demitra & Sarjoko, 2018). Furthermore, Yi & LuXi (2012) said the advantages gained in this learning are as follows: 1) Positive interdependence; 2). There is recognition in responding to individual differences; 3) Students are involved in classroom planning and management; 4) Relaxing and pleasant class atmosphere; 5) The establishment of a warm and friendly relationship between students and teachers; 6) have many opportunities to express pleasant emotional experiences.

Science literacy can be interpreted as scientific knowledge and skills to be able to identify questions, acquire new knowledge, explain scientific phenomena, and draw conclusions based on facts, understand the characteristics of science, awareness

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of how science and technology shape the natural, intellectual and cultural environment, and the willingness to be involved and care about science-related issues (Organisation for Economic Co-operation and Development, 2016). According to Fives, Huebner, Birnbaum, & Nicolich (2014), aspects of scientific literacy consist of thinking and working scientifically, mathematics and science, the role of science, science, and society. Many efforts have been made by experts in improving scientific literacy abilities, including by developing assessments, revising the curriculum, and applying research-based instrumentation (Surpless, Bushey, & Halx, 2014).

The purpose of this research was to determine the effect of CLM's implementation on the improvement of teacher students' scientific literacy abilities in the basic concepts of science course.

2 METHODOLOGY

The research method used is a qualitative research method that is carried out through action planning, implementing actions, observations and reflections that are carried out collaboratively and partially with the aim of improving learning activities using appropriate learning models. The subjects of this study were 34 teacher students of elementary school education for the academic year 2017 in the basic concepts of science course.

In this study, the primary data collection was done with an essay-shaped test technique with a success limit of 75%, while the supporting data was obtained through observation (participant observation). The research instrument is based on scientific literacy indications from Surpless, Bushey, & Halx (2014), namely: thinking and working scientifically, mathematics and science, the role of science, science, and society. Study materials and tests about simple aircraft that contain scientific literacy indicators. Data collection steps are as follows: (1) retrieve data before cooperative learning is applied; (2) applying a cooperative learning model; (3) provide written tests; (4) conclude the findings of the observations; and (5) comparing the results of tests and observations with the results of initial tests and observations.

3 RESULT AND DISCUSSION

The results of pretest and posttest conducted on students can be compared as shown in Figure 1 below:

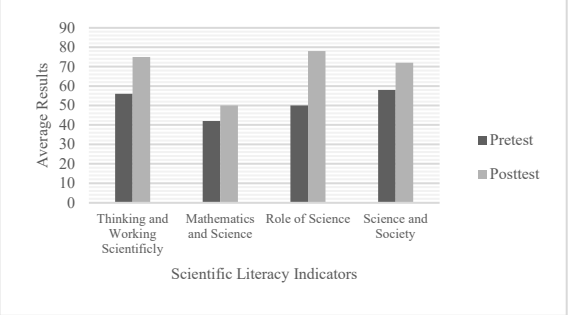

Figure 1. Comparison of pretest and posttest outcome based on scientific literacy indicators

Based on the results shown in Figure 1 that all scientific literacy indicators have increased after the CLM was applied in the basic concepts of science course.

The most significant increase was shown by the scientific role indicator of 28%. While mathematical and scientific indicators indicate the lowest increase with a percentage of 8%. Improved indicators of mathematics and science still occupy the lowest position; this is consistent with the research conducted by Diana (2016) which also obtained the lowest results on indicators of mathematics and science for the application of peer-assisted learning strategies to student scientific literacy in the course of plant morphology.

Before cooperative learning was applied, the average scientific literacy ability of students in the Basic Concepts of Science course was 51.5 with a maximum value of 100. These results were still relatively lacking (Rachmatullah, Diana, & Rustaman, 2016) because the success rate was still below 75%. The highest scientific literacy ability in the pretest is on indicators of science and society with a value of 58, this result is not much different from the average value of the indicator of thinking and working scientifically that is 56. While the lowest results are on indicators of mathematics and science, namely with 42. This is based on the results of interviews that students still find it challenging to translate sentences into counts. Meanwhile, increasing scientific literacy through the application of the cooperative learning model is displayed in Table 1 below:

Table 1. Improving Test Results for Each Scientific Literacy Indicators

No	Indicators	Average Pretest	Average Posttest	Improvement	Information
1	Thinking and working scientifically	56	75	19%	An improvement occurred
2	Mathematics and science	42	50	8%	An improvement occurred
3	The role of science	50	78	28%	An improvement occurred
4	Science and society	58	72	14%	An improvement occurred

Table 1 shows that the highest increase occurred in the role of science indicators that is equal to 28%, while the lowest increase occurred in science and community indicators that are equal to 14%.

Overall, the improvement of students' scientific literacy abilities through the application of cooperative learning models is in the "medium" category. Although the results of this study add to the list of ways to improve scientific literacy, this effort must continue to be developed. Many factors can inhibit the increase in scientific literacy for students, namely the existence of different learning demands from PISA demands. So, there are many recommended ways to improve science literacy such as Guided Discovery and Problem Based Learning (Ardianto & Rubini, 2016), Levels of Inquiry (Arief, 2015), Guided Inquiry (Putra, Widodo, & Jatmiko, 2016), Science, Technology, Engineering, and Mathematics (STEM) (Khaeroningtyas, Permanasari, & Hamidah, 2016), and Cooperative Learning (Hariadi, 2009).

4 CONCLUSION

The CLM that are applied to the basic concepts of science can improve teacher students scientific literacy abilities in the "medium" category. The indicators of scientific literacy used in this study include thinking and working scientifically, mathematics and science, the role of science, and science and society.

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