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The Effectiveness of Cooperative Model CIRC Type Assisted by Schoology on The Mathematical Literacy Ability of Junior High School Students

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Abstract

The purpose of this study was to determine the effectiveness of cooperative model CIRC type assisted by Schoology on the mathematical literacy ability. Schoology in this research is a free web-based education application which allows teachers to give lessons to students digitally. This study method applied in this research was a quantitative method of quasi-experimental with Nonequivalent Control Group Design model. The population of this study was the grade VII students of Public Junior High School 5 Kudus. Sampling was done by using simple random sampling. Data collection technique was used mathematical literacy ability tests, observation, and documentation, respectively. This study was analyzed using t-test. The results show that the mathematical literacy ability using the cooperative model CIRC type assisted by Schoology has reached 75% of classical completeness, the average mathematical literacy ability using the cooperative model CIRC type assisted by Schoology was better than the average mathematical literacy ability using the expository learning model, the proportion of students 'mathematical literacy ability using the cooperative learning model CIRC type assisted by Schoology was more than the proportion of students' mathematical literacy ability using the expository learning model. The average of total teaching skills and activities of students in mathematics learning was in very good criteria.

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INTRODUCTION

Mathematics is one of the disciplines taught at every level of education. Mathematics is often said to be the foundation for other subjects. The Indonesian government, through curriculum development, has also formulated the goals/ objectives of giving mathematics to all students ranging from elementary, junior high school, to high school. The government directs to equip students with the ability to think logically, analytically, systematically, critically, and creatively as well as the ability to obtain, analyze, conclude, and utilize information to survive in the conditions that are always changing, rapidly developing and competitive. The ability inferred is mathematical literacy ability.

According to Abidin, Mulyani, Yunansah, and Sari (2017) mathematical literacy is a person's ability to formulate, apply and interpret mathematics in a variety of contexts, including mathematical reasoning abilities and uses concepts, procedures, and facts to describe, explain, or predict phenomena or events.

According to Afriyanti, Mulyono, and Asih (2018) indicators of mathematical literacy ability are communication, mathematizing, representation, reasoning and argumentation, devising strategies for solving problems, using symbolic, formal and technical language operations, and using mathematics tools. The important role of mathematical literacy ability, according to Kusumah (2011) is to utilize previously acquired mathematical knowledge to be applied in solving problems in real contexts. However, the important role of students' current mathematical literacy ability has not been fully implemented.

According to the Program for International Student Assessment (PISA) which measures the ability of 15-year-olds in mathematical literacy shows that in 2015 the math score obtained was 403. The score is below the international average of 493. The proportion of Indonesian students in the program below level 2, which only reached 75.7% (Abidin, Mulyani, Yunansah, and Sari, 2017).

Considering the low literacy skills of Indonesian students in the survey, the Ministry of Education and Culture anticipated the situation by carrying out school literacy movements at all levels of education initiated by the Ministry of Education and Culture as stipulated in Permendikbud Number 23 of 2015. One of the activities carried out in the GLS (School Literacy Movement).

According to Winardi, and Wardono (2018) GLS is an overall effort to make schools as learning organizations whose citizens are literate throughout life through public involvement. According to Sutanto (2017) the implementation of GLS in the MA was carried out in three stages, they are: (1) the habituation stage by growing reading interest through a 15-minute reading activity, (2) the development stage by increasing literacy skills through activities responding to enrichment books, and (3) the learning phase with improve literacy skills in all subjects. However, this breakthrough has not been able to maximize Indonesian students to be more active in developing literacy skills, especially mathematics. According to Wardono, and Kurniasih (2015) that the ability of Indonesian students to solve questions that demand mathematical literacy ability is still very low.

The low mathematical literacy abilities of Indonesian students can be seen from the results of previous studies. Holis, Kadir, and Sahidin (2016) research results showed that the mathematical literacy ability of students of Public Junior High School Konawe with an average value of less than 60% for each level of PISA type literacy questions. Similar research was also conducted by Maulana, and Hasnawati (2016) which showed that the mathematical literacy ability of students of Public Junior High School Kendari only reached less than 60% for each level of mathematics literacy questions.

Based on the result of preliminary research, so can get a conclusion that Indonesian children's literacy is still far from expectation. The low mathematical literacy ability of students is caused by their inability to understand questions in the form of stories and construct them into mathematical models. Students often

work on practical questions rather than challenging questions.

The above results are in line with the results of the preliminary test conducted by the researcher on the literacy ability of Public Junior High School 5 Kudus which showed that the achievement was far from the expected score. Based on the preliminary data of mathematical literacy ability on the mathematizing aspects and the average representation of students is still far from expectations. Students were still having difficulty in solving problems.

According to Wardono (2018) one of the efforts that can be made by educators is to improve students' literacy ability in innovating mathematics learning. The learning model that is supposed to be used to improve the mathematical literacy ability is the CIRC type of cooperative learning model. Susilo, Zulaeha, and Subyantoro (2016) suggested a cooperative type CIRC model formulated reading (and listening) activities with writing activities (summarizing) in an activity involving students in active interactions. This learning model directs students to increase critical thinking power, creativity, and requires a high social sense. The Step of CIRC type cooperative learning models is described in Figure 1.

Based on Figure 1 showed that CIRC type cooperative learning models giving impact in improving the effectiveness of mathematical literacy skill. But, to optimize the cooperative model type CIRC, the researcher utilizes e-learning media. According to Dewi (2015) the use of the internet in mathematics learning has the potential to create a meaningful and enjoyable learning atmosphere. One of the e-learning media that support mathematics learning in Schoology.

According to Irawan, Sutadji, and Widiyanti (2017) Schoology is a free educational website that is applied by the teacher to be given to the students digitally. The role of media Schoology as a sum of students to be more active in asking questions and discussing outside the class hours. This media is a supplement in mathematics learning.

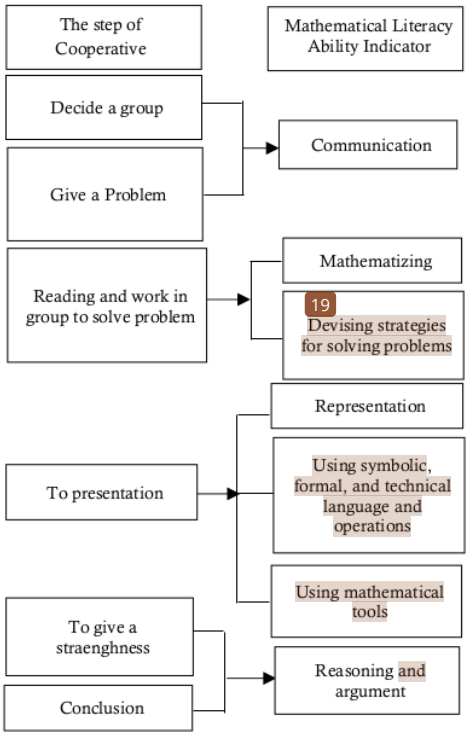

Figure 1. The Step of CIRC Type Cooperative Learning Models

Research related to this research were Wicaksana, Wardono, and Ridlo (2017) who stated the ability of students' mathematical literacy in project-based learning assisted by good quality Schoology. According to Nolapu, Wardono, and Supriyono (2018) showed (1) the results of the mathematics literacy test of students of Public Junior High School 2 Purwokerto with PBL learning the RME approach assisted by Schoology in quadrilateral material could achieve classical completeness, (2) Mathematical literacy ability of students of Public Junior High School 2 Purwokerto with PBL learning approach to RME assisted by Schoology is better than students' mathematical literacy ability with conventional learning.

Based on the above description, the objective to be achieved in this study is to determine the effectiveness of the cooperative learning model of CIRC type assisted by

Schoology on students' mathematical literacy ability.

METHODS

This research was a quasi-experimental quantitative model with a nonequivalent control group design to measure the effectiveness of the cooperative model CIRC type assisted by Schoology. The population used was the grade VII students of Public Junior High School 5 Kudus Academic Year of 2018/2019. The determination of the experimental class and the control class were performed using Simple Random Sampling, then obtained grade VII A and VII C as the samples in this study. The data collection technique was done by using tests, observations, and documentation. The data collection instrument used was an observation sheet of teacher teaching skills and student activities in learning using a CIRC type cooperative model. Student cognitive results were measured by using tests of mathematical literacy ability. Indicators of mathematical literacy ability in this study were (1) communication, (2) mathematizing, (3) representation, (4) reasoning and argument, (5) devising strategies for solving problems, (6) using symbolic, formal, and technical language and operations, and (7) using mathematical tools.

RESULTS AND DISCUSSION

Data were analyzed by using independent sample t-test with a prerequisite test of normality, homogeneity, and similarity average can be seen in Table 1.

Table 1. The Result of Prerequisites Test

Prerequisites test	Score	Sig.	Conclusion
Normality test	0.777	0.05	Normal distribution
Homogeneity test	0.391	0.05	Data homogeneous
Test similarity average	0.455	0.05	The population has the same capacity

The results of the effectiveness using cooperative model CIRC type assisted by Schoology on mathematical literacy ability is discussed further as follow. The analysis of individual completeness mathematical literacy ability test of students with cooperative model CIRC type assisted by Schoology using a one-way test with a significance level of 5%, obtained the value of $t_{value} = 8.539$ greater than $t_{table} = 2.039$ so that H_0 is accepted, therefore, it is concluded that the average mathematical literacy ability test of experimental class students reaches success indicator to 65. The results of the classical completeness analysis with success indicator 65 obtained 29 students completed at 90.62%. The test results of the proportion of one party with a significant level of 5% obtained value $Z_{value} = 2.04$, whereas, $Z_{table} = Z_{(0.5-0.05)} = Z_{(0.45)} = 1.64$, therefore, obtained $Z_{value} > Z_{table}$ so that H_0 is accepted. Based on these results, it can be concluded that the results of students' mathematical literacy abilities in the cooperative model of the CIRC type assisted by Schoology that reached 65 degrees have exceeded 75%. The achievement of classical completeness can be seen in the following Figure 2.

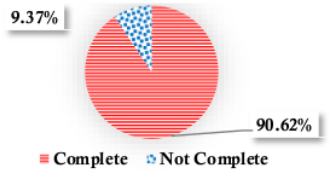

Figure 2. The Classical Completeness of The Mathematical Literacy Ability

The analysis of the results of mathematical literacy ability based on the indicators can be seen in the following Figure 3.

Based on Figure 3, it can be seen that the achievement of the indicators of students' mathematical literacy abilities has been completed. In indicators 2, 6, and 5, namely reasoning and argument, using symbolic, formal, and technical language and operations, and devising strategies for solving problems obtain

very good criteria. Students can provide logical reasons at the end of problem-solving. The use of mathematical terms like writing down units and calculating operations was considered appropriate. The strategy used in the settlement is appropriate, and the application of the concept of material is following the problem presented.

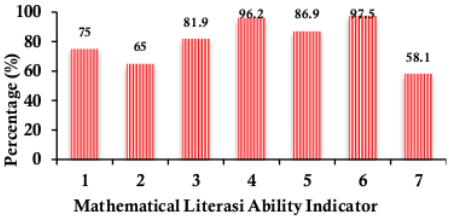

Figure 3. The Percentage of Mathematical Literacy Ability Indicator

In indicators 4, 5, and si, namely representation, communication, mathematizing obtain good criteria. Most of the students were able to represent the problem in the form of a graphic well — provided information on the graph following the instructions in the problem. The students' understanding of problems by changing real-world context problems into mathematical sentences is already good. The students' understanding of the question and to recognize the problem is good. However, the indicators even that is using mathematical tools, were in moderate criteria. On this indicator, students showed that they were not yet skilled in using mathematical tools such as a ruler. Students' drawings were not according to the specified size. There were still some students who did not use a ruler in solving math problems.

This is one of the resulting student mathematical literacy skill test, which shows that the cooperative type a circular model assisted by Schoology is effective in improving the achievement of indicators.

1. Communication

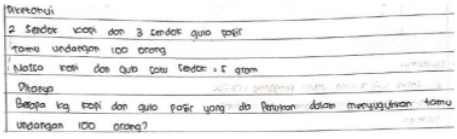

Figure 5. Communication Indicators

Based on Figure 5 showed that student could understand the question who is giving with writing information step which they get in the question

2. Mathematizing

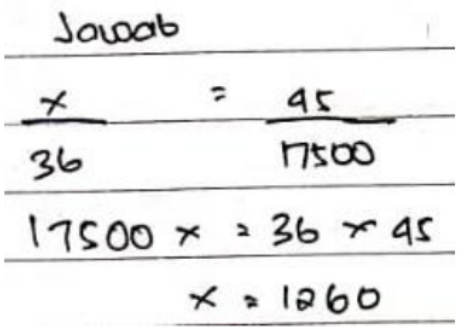

Figure 6. Mathematizing Indicators

Based on Figure 6 showed that student could change the real question context in the mathematical statement.

3. Representation

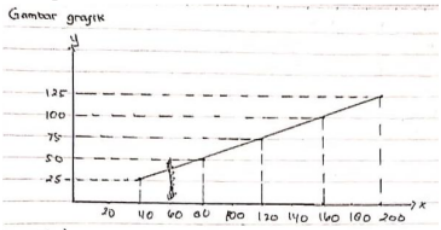

Figure 7. Representation Indicators

Based on Figure 7 showed that student could explain the question in the graphic with a good result.

4. Reasoning and argument

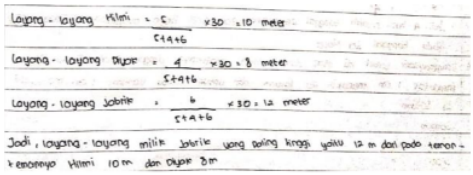

Figure 8. Reasoning and Argument Indicators

Based on Figure 8 showed that student could give the logic reason in the last finishing

process. The logic reason has support with the correct finishing process. The result of the answer can use to giving a reason, so that can make strongest reason which gives.

5. Devising strategies for solving problems

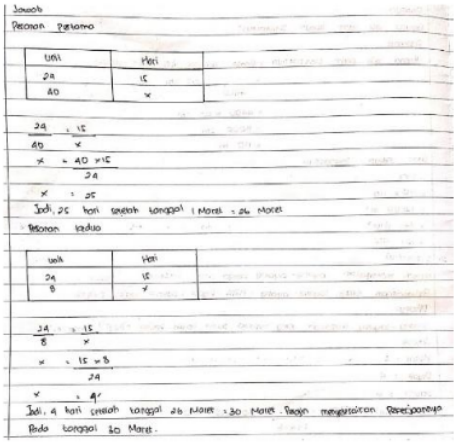

Figure 9. Devising Strategies for Solving Problems Indicators

Based on Figure 9 showed that student could use the correct strategies in finishing the problem of mathematical.

6. Using symbolic, formal and technical language and operations

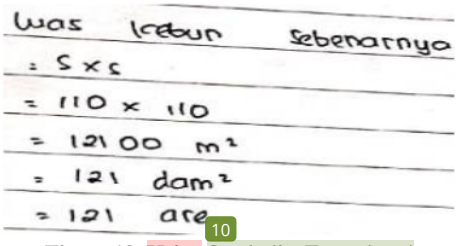

Figure 10. Using Symbolic, Formal and Technical Language and Operations Indicators

Based on Figure 10 showed that student could use the mathematic symbol. Student can write the correct formula of a square, and then the student can write the unit area correctly.

7. Using mathematical tools

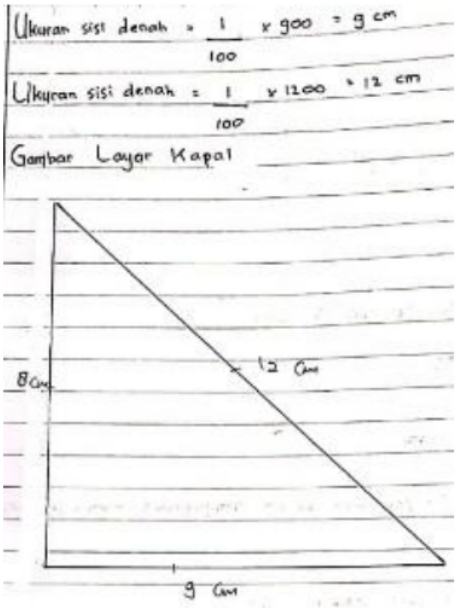

Figure 11. Using Mathematical Tools Indicators

Based on Figure 11 showed that student could use the good mathematic helping tool, the student can draw with the correct size based on the result get.

The analysis of the test results of the average difference in the mathematical literacy ability of the two learning classes obtained the value of $t_{value} = 2.03$ and $t_{table} = 1.677$. Since $t_{value} > t_{table}$ so that H_0 is accepted, it can be concluded that the mathematical literacy ability of students in the cooperative model CIRC type assisted by Schoology is higher than the ability of mathematical literacy of students in the expository learning model.

The analysis of the results of different proportional tests was used to compare the proportion of students 'mathematical literacy ability in the cooperative model CIRC type assisted by Schoology with the proportion of students' mathematical literacy ability in the expository learning model class. The number of students who achieve individual completeness in the class of cooperative learning model type CIRC assisted by Schoology was 29 students, whereas, the number of students who achieve

individual completeness in the expository learning model class was 22 students. The calculating results obtained Z_{value}= 1.986 and Z_{table}= 1,678. Since $Z_{value} > Z_{table}$ so that H_0 is accepted, it can be concluded that the proportion of student's completeness of mathematical literacy ability in the cooperative model CIRC type assisted by Schoology is more than the proportion of student's completeness in the expository learning model.

The average of total teaching skills of teachers and student activities using a cooperative learning model of CIRC type assisted by Schoology was in a very good criteria. The results of the average acquisition of teacher's teaching skills scores and student activities in four meetings are presented in the following Figure 12.

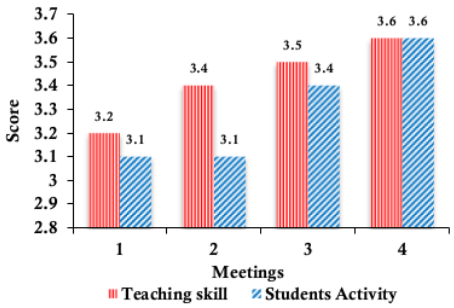

Figure 12. The Average Score of Teaching Skill and Students Activity

Based on Figure 12, it can be seen that teacher teaching skills and student activities during the research process have increased until the fourth meeting. The process of the implementation of the cooperative learning model of CIRC type assisted by Schoology showed that students were active in understanding the problem and discussing the problem-solving process. Additional supplements, such as media Schoology, are very helpful to create the active learning process. This happens since the teacher has implemented well and coherently following the cooperative process syntax of the CIRC type model.

Based on the results of the data analysis above, it can be concluded that the cooperative model CIRC type assisted by Schoology is effective on the mathematical literacy ability. Learning using a cooperative learning model type CIRC model assisted by Schoology allows students to understand the problem by discussing the problem arise in the questions. This learning model directs students to participate in solving mathematical literacy problems actively. This is the same way with the results of research conducted by Fitriana, Suharto, and Trapsilasiwi (2012) stating that the application of the CIRC type cooperative learning model on the subject of social arithmetic can increase the activities of teachers and students both individually and in groups, and the application of the model can also improve the results of Classical learning at 81.58% with 7 students who did not complete and 31 students who completed the learning. According to the research of Wulandari (2014) students' creative thinking skills in cube and block of grade VIII material with the CIRC learning model with an open-ended approach can achieve success indicator, the CIRC learning model with an open-ended approach is better compared to the direct instruction learning model of the creative thinking abilities of grade VIII students on the cube and block material.

The results of another study by Sulistyaningsih, Waluya, and Kartono (2012); Sulistyaningsih (2014) suggest that the use of cooperative learning type CIRC can effectively improve students' mathematical connection skills. Based on the results of the research in this presentation, it can be concluded that the CIRC type of cooperative learning model has a good influence on improving the mathematics literacy ability in the classroom.

The implementation of CIRC-type cooperative learning models assisted by Schoology in the experimental class showed that students had been actively involved in developing information during the learning through group discussions and presentations with daily life problems.

Factors that influence differences in mathematical literacy ability according to Nolaputra, Wardono, and Supriyono (2018) is that students can communicate and consult with a researcher about the material that has not been

understood through Schoology that can be done anytime and anywhere. This is not possible for controlling the class of students who do not use media Schoology; students can only communicate and consult in the classroom where the time is very limited. This is in line with the statement of Barana, and Marchisio (2016) by using e-learning, students can access learning resources and activities according to the wishes of students, and according to student needs. Therefore, media Schoology is a complimentary supplement in student learning activities.

CONCLUSION

Based on the results and discussion, it can be concluded that learning using the cooperative model CIRC type assisted by Schoology is effective on the mathematical literacy ability of student's junior high school. This is demonstrated through the average of mathematical literacy ability of grade VII in the cooperative model CIRC type assisted by Schoology have reached 75% classical completeness. The average mathematical literacy ability using the cooperative model CIRC type assisted by Schoology is better than the expository learning model. The proportion of mathematical literacy ability using the cooperative learning model CIRC type assisted by Schoology is better than the proportion of mathematical literacy ability using the expository learning model. The average of total teaching skills and activities of students in mathematics learning was in very good criteria.

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