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The influence of *Cooperative Integrated Reading And Composition* (CIRC) model on students' written mathematical communication skills in primary school

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Abstract. This research is motivated by the lack of mathematical communication skills of grade III learners, in explaining their ideas or ideas through writing in the form of language or mathematical symbols. The purpose in this study is to find out the influence of mathematical communication skills of grade III students who obtain learning using *cooperative integrated reading and composition* (CIRC) model. This study is a quasi-experiment with *pretest-posttest control group design,*using a sample of grade III elementary school students in Cikampek Kab. Karawang 2017/2018 samples taken using *Purposive Sampling technique.* The total number of samples was 40 with a composition of 20 learners in the experimental group and 20 learners in the control group, fractional material with research instruments in the form of tests and non-tests. The test instrument used is a description question to measure students' mathematical communication skills, while for student activities seen from the student's daily journal. The results showed that: 1) There is an influence of *cooperative integrated reading and composition* (CIRC) model on students' mathematical communication skills. 2) There are differences in students' mathematical communication skills between classes that study using *cooperative integrated reading and composition* (CIRC) models and conventional models. 3) Student activity increases after learning using *cooperative integrated reading and composition* (CIRC) model. This proves that the *Cooperative Integrated Reading and Composition* (CIRC) model affects students' mathematical communication skills.

Keywords. Cooperative Integrated Reading and Composition (CIRC), Mathematical Communication Skills, Mathematics Learning

A. Introduction

We are currently living in the era of globalization. The existence of globalization has an impact that requires everyone to improve their quality so that they can compete in the 21st century. The role of education is very important in preparing the next generation who have the skills to learn and innovate, the skills to use technology and information, and can work and survive with life skills. Education is essentially not just a learning system that only transforms science with technology. However, it is a process where there is the creation of ideas, concepts and values in accordance with certain educational goals that play a role in creating quality

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human resources. Education has a very important role in the process of improving the quality of human resources. Therefore, education deserves deep attention about the values and basics to improve the quality of human resources (Mukrimatin et al., 2018). In line with the above opinion regarding the importance of education, one of the lessons that is considered important at the elementary school level is mathematics. Learning mathematics in elementary school is a very important lesson. Because learning mathematics in elementary school will support mathematics learning at the next level. The higher the level of education taken, the higher the level of mathematical difficulty. At this time learning mathematics is not just solving a problem through arithmetic operations. Learning mathematics is expected to be able to develop mathematical abilities in students. In accordance with the content of the objectives regarding the importance of learning mathematics as stated in the 2006 curriculum, "Mathematics functions to develop the ability to calculate, measure, determine and use simple mathematical formulas needed in everyday life through the material of numbers, measurements and geometry. Mathematics also serves to develop the ability to communicate ideas with language through mathematical models which can be in the form of sentences and mathematical equations, diagrams, graphs or tables. According to Adjie & Maulana (2009), the objectives of learning mathematics are "1) To train thinking and reasoning in drawing conclusions, 2) to develop creative activities that involve imagination, intuition, and discovery by developing divergent, original thinking, curiosity, making predictions and conjectures as well as trial and error, 3) developing problem-solving skills, 4) developing the ability to convey information/communicate ideas, among others, through verbal conversations, notes, graphs, maps, diagrams, in explaining ideas. Based on the opinion above, it can be concluded that in learning mathematics, it is expected to be able to develop students' mathematical abilities. One of the abilities is communication skills. Everyone is expected to be able to use the language of mathematics to communicate the information and ideas they get. Because expressing ideas in mathematical form is easier. Many problems can be conveyed in mathematical language, for example by presenting problems or problems into a mathematical model, in the form of diagrams, mathematical equations, graphs and tables. This is in accordance with Sadiq (Ramellan, 2012 p.1) who revealed that "communicating ideas with mathematical language is actually more practical, systematic, and efficient".

Students' mathematical communication skills are important to improve. According to Greenes and Schulmanexpressed that the importance of communication because of several things, namely: "1) to express ideas through conversation, writing, demonstration, and visually depict in different types, 2) understand, interpret ideas presented in writing and in visual form, construct and produce and express arguments persuasively" (Armiati; Edwin Musdi; Purnama Ramellan, 2012).

But in reality the students' mathematical communication skills are still low. This is based on previous research conducted by (Deswita &Kusumah, 2018) revealed that students' mathematical communication skills are still low. Research (Tadris et al., 2017) revealed that students' mathematical communication skills in understanding the story are still weak. Research (Ariani, 2017) also revealed that students' mathematical communication skills are still low due to the tendency to memorize formulas and memorize the problem solving steps given by teachers. In line with the results of previous research,based on the findings of problems in one of the elementary schools in West Cikampek, there are still students who are considered less clear in answering questions that require further explanation. Based on the above problems, it can be concluded that mathematical communication skills are important for students to have. However, there are still many students who have difficulty in expressing an idea, idea / thought both verbally and in writing and in visual form. Therefore, learning innovations are needed that

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are designed to foster mathematical communication skills in students. One way that can be done is through cooperative *integrated reading and composition* (CIRC) learning model.

The problem that will be discussed in this study is *"Is there an influence of* Cooperative Integrated Reading and Composition *(CIRC)* learning model on the mathematical communication skills of the *researchers?"*

Theoretical Studies

1. CIRC Model

Cooperative Integrated Reading and Composition (CIRC) is one of the cooperative learning models that actively engages students in their learning activities and combines writing, reading, discussion and presentation activities.. The circ model stage according to Shoimin (2014, p. 53) is orientation, organization, concept recognition, publication, strengthening and reflection.

2. Mathematical Communication Skills

Mathematical communication skills are the ability of students in conveying something they know in the form of real objects, images, tables into mathematical form using their own language using mathematical symbols that occur in the classroom environment. (Syamsir &Noviarni, 2018) revealed that communication is not just a tool to express students' ideas in the form of writing, but to train students to interact with both teachers and friends in learning. Based on the opinion taken the conclusion that, mathematical communication skills are the ability to appreciate ideas / ideas in mathematics bothverbally / written. Verbally, this mathematical communication ability occurs in a classroom/group environment where it is characterized by the transfer of mathematical messages that are being studied between the teacher and his students. While in writing, this mathematical ability allows students to write down their ideas using mathematical ideassuchas symbols, diagrams, and others.

The indicators of mathematical communication skills that will be used in this study are indicators according to Sumarmo.. But in this study the indicators used only two indicators for written mathematical communication skills, including: Revealing real objects, situations, and everyday events into the form of mathematical models (drawings, tables, diagrams, graphs, expressions and algebra) and b) explaining ideas, mathematical models (images, tables, diagrams, graphs, expressions and algebra) into plain language .

Research Methods

Quasi-experimental research with *pretest-posttest control group design,*using a sample of grade III elementary school students in Cikampek Kab. Karawang 2017/2018 students were selected using *Purposive Sampling technique.* The total number of samples was 40 with a composition of 20 learners in the experimental group and 20 learners in the control group, fractional materials with instruments used in the form of tests and non-tests.

Discussion

class	N	Average	sd		
a	20	18,1	1,41	15	20
b	20	12,8	4,54	3	19

Technium Social Sciences Journal
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The results of the calculation of the average and standard deviation of the final test for complete communication capabilities are seen in Table 1 below:

information:
A=Experiment B=Control

The table above is a general overview of the *posttest* results of students' mathematical communication skills in experimental classes and control classes. The average *posttest* score in an experimental class of 20 students was 18.1 and the average score in a control class of 20 students was 12.8. The standard deviation or standard deviation in the table above is an overview of the deviation of the value of mathematical communication skills of students in the class. The smaller the standard deviation of a class, the more mathematical communication skills of students in a class are equal or evenly distributed, meaning that there is not one student who stands out in his ability compared to the other. Similarly, the greater the standard deviation of a class, the mathematical communication skills of students in different classes, meaning that there is one student who stands out more than others. The table shows that the experimental class has a standard deviation of 1.41 and a control class of 4.54. Of the two classes there are differences where the experimental class has a lower standard deviation than the control class which means that the experimental class has a deviation or spread of values that are more evenly distributed than the control class.

The maximum score indicates the maximum mathematical communication skills that can be achieved by the class or the highest score of the students of the class. The maximum score achieved by the experiment class is 20 out of a total score of 20. The maximum score achieved by the control class is 19 out of a total score of 20. A minimum score indicates the minimum mathematical communication skills that a class can achieve or the lowest score of a student from that class. The minimum score achieved by the experiment class is 15 out of a total score of 20. The minimum score achieved by the control class is 3 out of a total score of 20. Experiment classes have maximum and minimal *posttest* results higher than control classes.

The average difference between the two classes is 5.3. From the results of the postes data can be known that the mathematical communication skills of students in the experimental class are higher compared to the control class. However, the results have not been able to explain in detail whether students' mathematical communication skills in experimental classes and control classes are different after learning. To find out if the *posttest* results in the control class and experiment class are different or the same in detail, an inferential test will be conducted. The results can be seen after the normality test, homogeneity and t test. From the test results obtained the results of P-*Value* 0.00 < 0.05 or P-*Value* < α then rejected and accepted. This means that there are differences in the mathematical communication skills of students who get learning with the Cooperative Integrated Reading and *Composition* (CIRC) model compared to students who obtain learning with conventional models.

To determine the magnitude of the influence of the CIRC model on the mathematical communication skills of students conducted regression tests on *pretest* data and *posttest* experimental groups as for the prerequisites needed to conduct regression tests is data must be linear. As revealed by Sugiyono (2016, p. 265), if not linear then regression analysis cannot continue. After linearity test in the experimental class and control class showed P-*Value* of experimental class 0.224 > 0.05 and P-Value value in control class 0.607 > 0.05 or P-*Value* > α , then rejected and received. That is, *the experimental class's pretest* and *posttest* data have linear regression. Once the data is said to be linear, regression tests can also be conducted.

Technium Social Sciences Journal
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Based on the results of the significant value regression test (Sig.) is 0.273 or the value of P-Value > α accepted and rejected. That is, the Cooperative Integrated Reading and *Composition* (CIRC) model has no effect on students' mathematical communication**.** And judging by the value = 1,280 while the value 4.4. Value smaller than then in conclusion free variables and bound affect each other.

The absence of significant influence of the CIRC model on students' mathematical communication skills could be due to the presence of *outliers.* As Widhiarso (2001, p. 1) argues that outliers are names for unique subjects. These subjects can sometimes mess up so statistically they can be eliminated. To find out the strangeness of existing data, researchers re-examined *the pretest* and *posttest* scores used as linear regression test data. After looking at the data, the researchers conducted an extreme value test. This is in accordance with the opinion of Widhiarso (2001, p. 1) to see that the data can be tested by looking at extreme values. From the extreme test scores there are 5 students who are suspected to be *outliers.* The results of the regression test after the 3 outlier data are deleted showing a significant value (Sig.) of 0.47 or A value of P-Value < α rejected and accepted. This means that the Cooperative Integrated Reading and *Composition* (CIRC) model affects students' mathematical communication skills. However, the presence of students who *obtained outlier* data does not indicate a failure, as small score increases have still increased.

To see the magnitude of influence on the CIRC model on students' mathematical communication skills can be seen in the table R square, from the results obtained a value of R squre = 0.066, then a value of R square x 100 so that it can be said that the circ learning model affects the mathematical communication skills of students with a value of 6.6% while 93.4% of students' mathematical communication skills are influenced by things that are not studied by researchers, such as the implementation time of learning conducted during the day or the end of learning hours, the low ability of students in working in groups, school schedules that are too crowded for the exam schedule of grade VI so that the number of holidays, the division of classrooms are less clear so that the learning conditions in the classroom are often disrupted and the lack of time in research. This is in accordance with the shortcomings of the CIRC model according to Huda (2014, p. 221) "in CIRC learning each student is responsible for the task of his group. Each member of the group brings out ideas to understand a concept and complete the task, so that a long understanding and learning experience is formed"

The equation resulting from the regression test is Y= -4.879 + 0.734X. the conclusion is that if learning using cooperative *integrated reading and composition* (CIRC) (X) model increases by one unit, then the mathematical communication ability of the student (Y) will increase by 0.734 or 73.4%. This means that each *posttest* perdik value increased by 0.734 or 73.4%. Based on the results of the research and opinions can be concluded that to know the influence of circ model on the mathematical communication skills of grade III students on fractional material can not be done with only 4 meetings.

Conclusion

Based on the findings and discussions that have been described in general, it can be concluded that there is an influence of *cooperative integrated reading and composition* (CIRC) learning model on students' mathematical communication skills as well as an increase in the average *posttest* value after learning using *the Cooperative Integrated Reading and Composition* (CIRC) model.

Technium Social Sciences Journal
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