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The Ability to Calculate Mathematical Multiplication Using Cross Line Method

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Abstract
Elementary school students generally consider mathematics learning difficult, especially in the matter of multiplication, so a method is needed to develop and improve mathematical calculation skills. One method that can be used is the cross line method. This research aims to improve the ability to calculate multiplication using the cross line method. This type of research is Classroom Action Research (CAR) with the subject of research on third grade students of SD Negeri 9 Tanrutedong, South Sulawesi. Techniques of data collection were test and observation. The instruments used were test sheets and observation sheets. The collected data were analyzed using descriptive statistics. The results showed that the use of the cross line method could improve students' ability to calculate multiplication. This is indicated by the increase in: (1) The average score of the ability to count in the first cycle of 67.39 increased in the second cycle to 92.00, (2) The achievement of student learning completeness from the first cycle of 65.22% increased in the second cycle to 100%, and (3) the increase in the average percentage of student activity in the learning process by 77.78% in the first cycle to 94.68% in the second cycle.

Keywords: Ability, Calculating, Multiplication, Cross line, Elementary School Mathematical.

INTRODUCTION

Mathematics at the elementary school level has a very important role, because it is a very determining foundation in shaping the attitudes, intelligence and personality of students. Mathematics lessons that are given especially at the primary and secondary education levels are intended so that at the end of each stage of education, students have certain abilities for the next life. However, there are many complaints from students about mathematics which are considered difficult, uninteresting and boring to learn. This complaint will directly or indirectly affect mathematics learning outcomes at every level of education. Mathematics learning is generally considered difficult by students, especially on multiplication material, and so far, the method used to teach multiplication material is only memorization, so students get overwhelmed which results in the ability to calculate multiplication is still low. This is reinforced by the results of an interview with one of the mathematics teachers at SD Negeri 9 Tanrutedong, especially in grade III, with information obtained that there are still students who have difficulty understanding and working on multiplication material problems. In addition, information was also obtained that the average score of students' daily mathematics test results was still low, namely 60, while the Minimum Completion Criteria set at the school was 65.

Suwangsih (2010) argues that one of the characteristics of mathematics learning in elementary schools is gradual mathematics learning. It means that the concepts in mathematics learning are taught in stages from the concrete, the semi-concrete, then to the abstract. For this reason, in learning mathematics, concrete objects, pictures and symbols are used to make it easier for students to learn. Furthermore, to increase learning activity, it is required to use learning tools or media that can help the learning process and success. In addition, in learning mathematics, it is also required to apply an appropriate learning

model and method, so that in the end, mathematics learning can be well taken in by students. Mathematics learning must be well managed, Vacc and Bright (1999) state that it is very important to manage learning well and ensure that the material provided is according to students' abilities, and prevent negative attitudes or withdrawal behavior. Hiszu Ho et al (2000) and Fransworth (2009) support this statement, because negative attitudes or withdrawal behavior will interrupt the students' ability to think and repeat the knowledge they already have, and will cause problems in the ability to retain new information. Negative attitudes or withdrawal behavior can be in the form of disinterest in the subject matter delivered by the teacher, so that students tend to ignore the lesson and are unresponsive (Mustafa, 2015). The method used by the teacher during this time is repeated addition. Other than that, students often experience impatience and mistakes or are inaccurate in calculating. Another method that is also often used is by memorizing the multiplication. As a result, students become less interested and lazy to learn mathematics, especially in multiplication arithmetic operations.

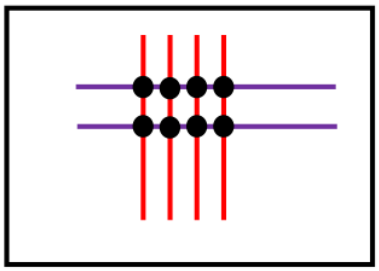
One of the ways taken to overcome the problems raised above is the creativity and innovation of teachers in teaching. In this case, it is necessary to use methods that can develop and improve students' mathematical calculation skills at the school. One method that can be used by teachers is the cross line method. By using the cross line method, students are expected to be more interested in learning and easier to accept the material being taught. According to Auliya (2012), the cross line method is a method of calculating the point of intersection on a line, such as drawing a horizontal line and a vertical line which is then crossed, after which a dot is given at the cross line, then count the number of points as a result of the multiplication. Multiplication using the cross line method is very effective in introducing multiplication operations to children, because there is an element of drawing lines and dots with colors that will make children interested to learn.

Research on the effect of using the cross line method on understanding mathematical concepts in multiplication material has also been conducted by Hidayah (2016). The results of his research revealed that there was an effect of using the cross line method on students' understanding of mathematical concepts on multiplication material. In addition, the similar research was also conducted by Arisandi (2014), who revealed that the cross line method can improve the multiplication operation ability in mathematics learning.

Based on the description above, the problem of this research is how to improve the ability of elementary school students in calculating multiplication using the cross line method. The purpose of this research was to determine and describe the improvement of students' ability in calculating multiplication using the cross line method.

Cross line method comes from English, namely from the words cross and line. Cross means a marking that consists of lines that cross each other and line means a length (straight in this case) without breadth or thickness; the trace of a moving point. So, the cross line method is a method that uses cross lines. According to Auliya (2012) the cross line method is a method by calculating the point of crossing on a line, such as drawing a horizontal line and a vertical line which is then crossed, after which a dot is given at the cross line, then count the number of points as a result of the multiplication.

a. **Multiply units by units, for example 2 x 4**
   Steps: draw 2 horizontal line which is crossed with 4 vertical line, then put a dot at the intersection of the two lines then count the number of points of the intersection as the result of the multiplication.



2 horinzontal line

4 vertical line

The intersection point is there 8

so 2 x 4 = 8

Figure 1. Cross Line Multiplication of ones by ones

b. Multiply the ones by tens, for example 3 x 24

Steps: draw 3 horizontal lines that are crossed with the first 2 vertical lines and the second 4 vertical lines, put a dot at the intersection of the line then calculate the intersection point between 3 horizontal lines and the first 2 vertical lines and the result is in the tens position. Then, calculate the intersection point between the 3 horizontal lines and the second 4 vertical lines and the result is in the ones position. If the result of the sum is two digits, the front digit is in the tens position while the back digit is in the ones position. The sum of the intersections of the first and second groups as a result of the multiplication. 3 horizontal line, 2 first vertical line, and 4 second vertical line. So 3 x 24 = 60 + 12 = 72

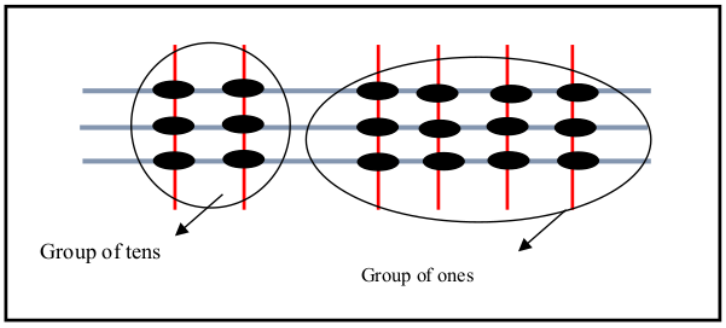


Figure 2. Cross Line Multiplication of ones by tens

c. Multiply tens by tens 21 x 30

Steps: draw the first 2 horizontal line and the second 1 horizontal line which is crossed with the first 3 vertical line and 1 dashed vertical line to represent the 0 number, count the points of intersection between the first 2 horizontal line and the first 3 vertical line and the result will be in the hundreds position. Then calculate the intersection points between the first 2 horizontal lines with 1 dashed vertical line and also count the intersection of the second 1 horizontal line with the first 3 vertical line, add up the results of the two and the result is in the tens position. Next, calculate the point of intersection between the second 1 horizontal line and 1 dashed vertical line and the result is in the ones position. Add up all the results according to their numeric positions. The number 0 is represented by a dashed line. The intercept with the dashed line is 0.

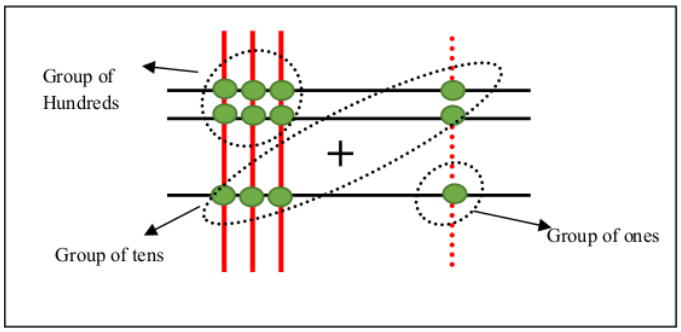


Figure 3. Cross Line Multiplication of Tens by Tens

The point of intersection of the hundreds is 6, the value is 600. The point of intersection of the tens 0 + 3 = 3 the value 30. The point of intersection of the ones is 0, the value is 0. So the result of: 21 x 30 = 600 + 30 +0 = 630.

RESEARCH METHODS

This research is a Classroom Action Research (CAR) with implementation stages which include: planning, action, observing and reflection, carried out in 2 (two) cycles. The research subjects were students of grade III SD Negeri 9 Tanrutedong, South Sulawesi, Indonesia. A total of 23 students, consisting of 13 male students and 10 female students. The research instrument used was the test sheet and the observation sheet (observation). Data were collected using test techniques and observation techniques, and analyzed using descriptive statistics.

RESULTS AND DISCUSSION

This section presents the results of the analysis based on what has been done. There are four kinds of analysis results presented, namely the analysis of instrument content validation, data analysis of the ability to calculate, analysis of student activities and analysis of the ability of teachers to manage learning.

The content validation sheet of this research instrument was validated by two (2) validators. After being validated, it is then analyzed in order to find out whether the instrument used is valid or not. The content validity of an instrument occurs when the content validation coefficient is greater than 75%. The validation of the contents of the instrument in this study showed that the results of the content validation for the student activity observation sheet were 82%, the observation sheet for the teacher's ability to manage learning was 83% and for the student calculating ability test sheet was 83%.

Observation Analysis of Student Activity

There are 3 (three) types of student activity that are observed, namely Activity 1 (AC 1), Students draw horizontal and vertical lines and then cross them as a first step in working on multiplication problems using the cross line method. Activity 2 (AC 2), students give a dot at the intersection of horizontal lines and vertical lines to find out the result of the multiplication. Activity 3 (AC 3), students count the number of points at the intersection of horizontal lines and vertical lines as a result of multiplication using the cross line method. In the first cycle the average percentage of student activity was 77.79% in the good category, after the prevention in the second cycle the student activity increased by 94.68% in the very good category.

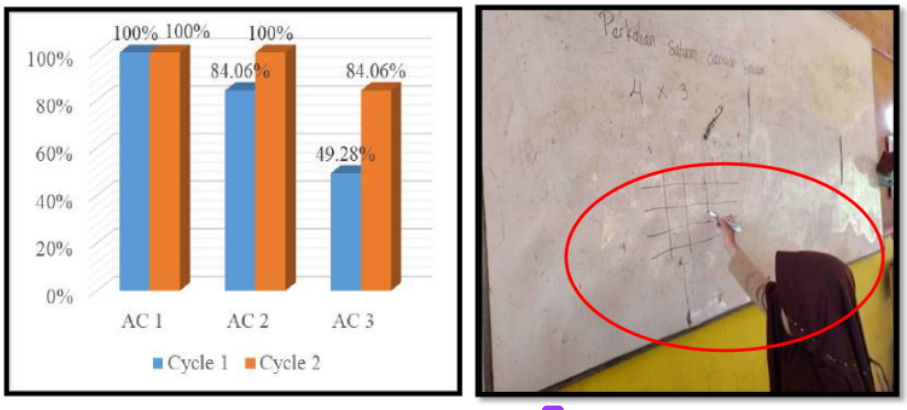


Figure 5. Comparison of Activities in Cycle I and Cycle II

Figure 5 shows the percentage of students' ability to calculate multiplication. The percentage gain in each activity in cycle I has increased in cycle II. Students can understand how to use the cross line method, making it easier for them to determine the multiplication result of a given math problem. Furthermore, the average percentage of improvement in student activity can be seen in the following figure.

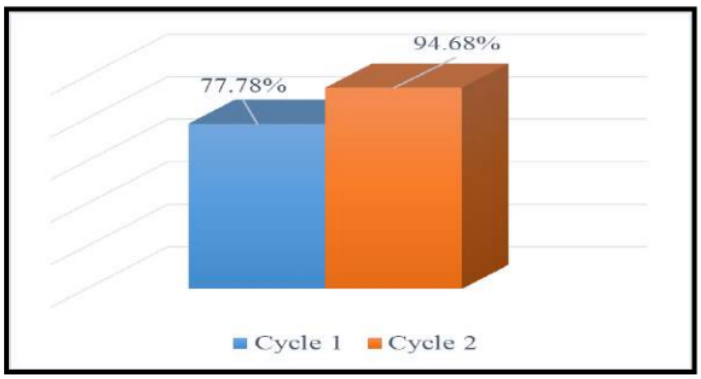


Figure 6. Percentage of Learning Activity Improvement

Based on the picture above, it can be seen that the average percentage of student activity has increased, namely 77, 78% in cycle I with a good category to 94,68 % in cycle II with a very good category with an improvement in difference is 16,9 %.

Analysis of Calculating Ability Test

To strengthen the observation data on the students' ability to calculate using the cross line method, a test sheet containing multiplication math problems was given.

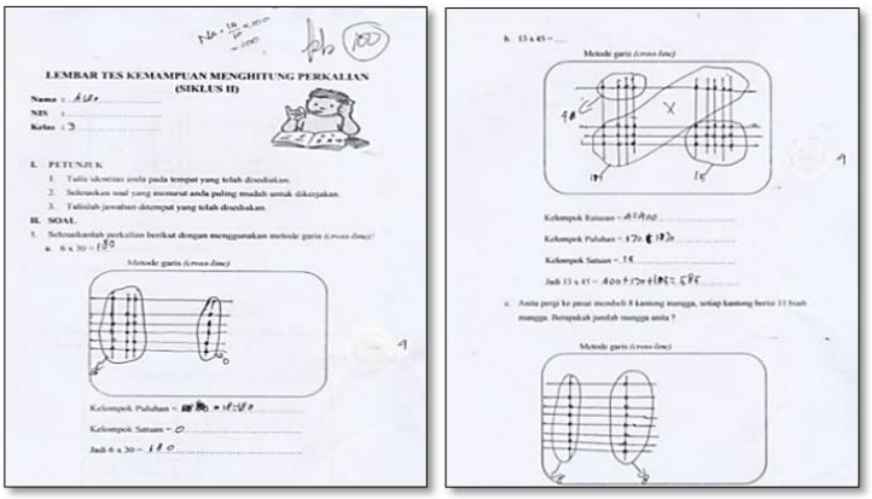


Figure 7. The Results of Students' Work

The results of the student multiplication test results in cycle II are presented in Table 1.

Table 1 Data on the results of the ability to calculate multiplication test

Statistics	Statistical Value
Subject	23
Ideal Score	100
Highest Score	100
Lowest Score	67
Score Range	33
Average	92.00
Standard Deviation	10.80
Median	100

The data in Table 1 shows that after using the cross line method, the average of ability to calculate the multiplication test was obtained 92.00 which indicates that the ability to calculate multiplication is in a very high category. Furthermore, if the results of the student multiplication calculation ability test are grouped into 5 (five) categories, then the distribution and percentage will be obtained as in Table 2.

Table 2. The Frequency Distribution and The Percentage of Ability to calculate multiplication

Score Interval	Category	Frequency	Percentage (%)
85 - 100	Very high	15	65.22
65 - 84	High	8	34.78
55 - 64	Enough	0	0
35 - 54	Low	0	0
0 - 34	Very low	0	0
total		23	100

The data in Table 2 shows the frequency and percentage of the students ability to calculate the multiplication using the cross line method. It was found that there were 15 (fifteen) students or 65.22%, and 8 (eight) students or 34.78% in cycle II,. Based on the results of the test analysis of the ability to calculate multiplication, the description of the completeness of the ability to calculate can be seen in Table 3.

Table 3. The Frequency distribution of the completeness of the ability to calculate multiplication

Score Interval	Study Completion Category	Frequency	Percentage (%)
0 - 69	Not complete	0	0
70 - 100	Completed	23	100
total		23	100

The data in Table 3 shows that 23 (twenty three) students or 100% of students are in the complete category. The overall data shows that the classical completeness achievement exceeds the indicator achievement, it is 85%. From the result of research that student learning completeness has increased from cycle I, namely 65.22% to 100% in cycle II with the difference of increasis 34.78%. The average percentage of the teacher's ability to manage learning has increased, from 3.6 in the first cycle with the "good" category to 4.0 in the second cycle with the "good category". This achievement indicates that it is very important to manage mathematics learning at the elementary level. Heruman (2007) states that in elementary school mathematics learning, reinvention is expected. Rediscovery is to find a way of solving informally of learning in classroom. Mathematics learning must have a link between students' previous learning experiences and the concepts to be taught.

Based on the results of the research above, it can be seen that there has been an improvement in learning outcomes from cycle I to cycle II and it has reached and even exceeded the success criteria. The average score in the second cycle test was 92.00 and the learning completeness reached 100%. With the achievement of these results, it can be concluded that the actions taken by researchers have been able to increase the ability to calculate student multiplication, so the researcher does not need to continue to the next cycle. The cross line method used is effective in improving students' ability to calculate multiplication. This was confirmed by Hidayah (2016) who suggests that learning the concept of multiplication using the cross line method is an effective way of calculating multiplication.

The achievement of the completeness of the student's ability to calculate the multiplication obtained from the first cycle showed that there were 15 students or 65.22% complete and 8 students or 34.78% incomplete, after the second cycle the students' ability to calculate showed 23 students or 100% complete. The completeness achievement of the calculating ability obtained in cycle II has increased from cycle I, where the total number of research subjects has reached the completeness criteria according to the indicators of success in this study. It can be concluded that the student's ability to calculate multiplication has increased using the cross line method.

The cross line method used in mathematics learning in elementary schools is effective in improving students' ability to calculate multiplication. According to Heruman (2007), multiplication in principle is similar to repeated addition. So that, the prerequisite ability that students must have is mastery of addition. Based on the results of research and discussion, it can be concluded that the ability to calculate the multiplication of grade III students of SDN 9 Tanrutedong, Sidenreng Rappang, South Sulawesi Indonesia Regency has increased using the cross line method. This achievement also provides an overview of students' mathematical thinking abilities. To understand students 'mathematical thinking skills, one effort that can be made is to apply a learning model that accommodates students' ability to solve mathematical problems using teaching aids (Mustafa, 2019)

CONCLUSSION AND ACKNOWLEDGEMENT

The cross line method used in mathematics learning in elementary schools is effective in improving students' ability to calculate multiplication. So that, the prerequisite ability that students must have is mastery of addition. Based on the results of research and discussion, it can be concluded that the ability to calculate the multiplication of grade III students of SDN 9 Tanrutedong, Sidenreng Rappang Regency has increased using the cross line method.

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