TUNAS
JURNAL PENDIDIKAN GURU SEKOLAH DASAR
http://journal.umpr.ac.id/index.php/tunas
Vol. 10, No. 1, December 2024, PP. 51-59
ISSN: 2477-6076 (print); 2685-8169 (online), DOI: 10.33084/tunas.v10i1.8540

The Effect of Jarimatics-Based Drill Method on Multiplication Operation Skills of Third Grade Elementary School Students

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Article Information
Received:
October 2024
Accepted:
November 2024
Published:
December 2024

ABSTRACT
Background: This research is motivated by the learning of mathematics in class III elementary school still using the lecture method and the lack of use of media and methods in learning. The jarimatika-based drill method is expected to be a solution to the problems found. *Aim:* The objectives of this study are: 1) To determine the multiplication operation ability of class III students of elementary school before using the jarimatika-based drill method, 2) To determine the multiplication operation ability of class III students of elementary school after using the jarimatika-based drill method, 3) To determine the effect of the jarimatika-based drill method on the multiplication operation ability of class III students of elementary school. *Method:* This type of research is an experiment with a Pre-Experimental One Group Pretest-Posttest design. The sample of this study was 11 class III students. The study was conducted in 8 meetings. Data collection techniques are tests, observations and documentation. Data analysis techniques in this study are validity tests, reliability tests, descriptive statistics, normality tests, homogeneity tests, hypothesis tests and N-gain tests. *Result and Discussions:* The results of the study showed that: 1) The average pretest score was 56.45, 2) The average posttest score was 76.64, 3) The results of the Paired Sample T-test in this study have an influence of the jarimatika-based drill method on students' multiplication operation abilities. It can be seen from the analysis results that there is a significant difference between the pretest and posttest scores, namely ($t(10) = -7.971$, $p < 0.000$, with a significance value of $0.000 < 0.05$.

Keywords: Multiplication operations, Whole numbers, Drill method, Arithmetic method

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Citation Information: Sangeran, N., Djafar, S. ., & Syarif , I. (2024). The Effect of Jarimatics-Based Drill Method on Multiplication Operation Skills of Third Grade Elementary School Students. *Tunas: Jurnal Pendidikan Guru Sekolah Dasar*, *10*(1), 51–59. https://doi.org/10.33084/tunas.v10i1.8540

INTRODUCTION

According Olivia (2024) Mathematics is one of the subjects that has an important role in everyday life. From the very beginning, students must master basic numeracy skills, especially multiplication operations. "Mastery of multiplication concepts early on will help students understand more complex mathematical concepts at the next level of education," said Dewi (2023) One of the basic arithmetic operations that form the basis of more complex math learning is multiplication. Therefore, mastery of multiplication concepts and skills is very important for elementary school students.

However, many students still have difficulty learning multiplication operations. According to Wakit, (2023) " Difficulty in learning the multiplication operation is one of the factors causing the low mathematics learning achievement of elementary school students." Various factors can cause difficulties in learning multiplication operations. These include not understanding the basic concepts of multiplication, using ineffective learning methods, or no student drive or interest in learning math. Students can experience low math learning achievement due to these difficulties and lose confidence in the subject. (Ananda & Wandini, 2022)

One of the efforts that can be made to overcome these problems is to apply the drill method based on jarimatika. The drill method is one of the learning approaches that has been proven effective in improving students' mathematical skills. (Mariska 2022). The drill method can assist students in building skill automation through repeated and systematic practice. This method is suitable to be applied in learning multiplication operations that require speed and accuracy. (Halamury, 2022) Jarimatika, on the other hand, is a finger counting technique that has gained popularity in recent years. This technique offers a fun and memorable way for students to perform basic math operations. Research conducted by Sari dan Nugroho (2022) showed that the use of jarimatika can increase students' interest and ability in counting, especially in multiplication operations.

Combining the drill method with the jarimatika technique has the potential to create an effective and interesting learning approach for grade III students. The jarimatika-based drill method allows students to practice multiplication operations intensively while using their fingers as visualization and calculation aids. This is in line with the opinion of (Fauziyah 2024) which states that mathematics learning that involves physical activity can improve students' understanding and retention of mathematical concepts.

The application of drill method based on jarimatika in grade III elementary school is expected to provide a solution to the problem of students' multiplication operation skills. Through systematic practice and the use of jarimatika, students are expected to improve their speed and accuracy in performing multiplication operations. Furthermore, this approach also has the potential to increase students' motivation and confidence in learning math.

The importance of choosing the right method in learning mathematics cannot be ignored. According to research conducted by Bete, (2021), the use of the jarimatika method has a significant effect on student learning outcomes. This shows that innovative and fun methods can increase students' motivation to learn, which in turn will have a positive impact on their ability to perform multiplication operations. (Wirahmad, 2024).

One of the advantages of the jarimatika-based drill method is its ability to make students more active in the learning process. Dimyati dan Mudjiono, (2017), emphasizing that student activeness in learning is very important to achieve optimal results. By using the jarimatika method, students not only learn passively, but are also actively involved in the learning process, thus improving their understanding of the material.

In addition, research by Gani (2017), showed that the application of appropriate methods can significantly improve student learning outcomes. In this case, the jarimatika-based drill method is expected to have a significant positive impact on the multiplication operation skills of grade III students in primary schools. Thus, this study aims to further explore the effect of this method on students' learning outcomes.

The application of the jarimatika-based drill method is also in line with the concept of active learning. Students are directly involved in the learning process, so they are not only recipients of information, but also active participants in learning. According to the theory (Kasi, 2023), students who are actively involved in the learning process tend to have a better understanding of the material being taught.

This study also aims to provide recommendations for teachers and educators in choosing appropriate methods to improve students' numeracy skills. By understanding the effect of the jarimatika-based drill method, it is expected that teachers can design more effective and enjoyable learning for students, so that they can achieve better results in multiplication operations.

Based on this background, this study aims to examine the effect of drill method based on jarimatika on the multiplication operation skills of third grade elementary school students. The results of this study are expected to provide new insights in the development of effective math learning strategies at the elementary school level, especially in improving students' multiplication operation skills.

METHOD

This research is a quantitative type. Sugiyono (2022) states that quantitative research emphasizes the use of systematic and controlled research procedures to obtain data that can be measured objectively. This research method is pre-experimental research. According to Sugiyono (2022: 17) states that the experimental research method is a research method used to seek the effect of certain treatments on others on controlled conditions. The design used in this research is one-group pretest-posttest, namely data collected from the same group of subjects before and after treatment. . The place of research was held in elementary school. The subjects in this study were 11 third grade elementary school students. The sampling technique is purposive sampling, which is a sampling technique with certain considerations. (Lenaini, 2021). . So the sample of this study was determined based on certain considerations The considerations for selecting the sample of this study are:

In grade III, the focus of the curriculum begins to move from understanding basic arithmetic towards multiplication operations. This is an important moment to use methods such as jarimatika to help students master this skill before moving on to more complex concepts. According to Daulay (2019) the right level of understanding of multiplication: Grades I and II are still in the stage of introducing basic arithmetic such as addition and subtraction, so they are not ready to be introduced to the more complex concept of multiplication. Whereas students in grades IV, V, and VI are already expected to master multiplication operations and focus on higher math operations such as division, fractions, or equations (Achmad 2017). Compatibility with Multiplication Material: In grade III, multiplication is only formally introduced, so the jarimatika method is very relevant to help students understand and practice this operation. This is different from grade IV and above, which require more advanced methods as they have already gone through the basic stages of multiplication.

The data collection methods and instruments used were tests, documentation, and observation. The tests carried out were in the form of a pretest test of 20 questions with 15 multiple choice numbers and 5 essay questions then a posttest test of 20 questions with 15 multiple choice numbers and 5 essay questions. Documentation used in the form of photos of activities during learning takes place.

The data collection instrument used was a pretest-posttest test. (Makbul, 2021) states that validity testing is the process of evaluating the ability of a tool to accurately measure what should be measured. The validity of expert judgment refers to the use by experts who have knowledge in the relevant field.

The reliability test evaluates the trustworthiness of a tool that can be trusted, respondents will not choose certain answers, so the data can be trusted. (Anufia & Alhamid, 2019).

Data analysis techniques in this study are data description analysis and inferential statistics:

Data description analysis

Mean= $\sum fx$ N
Description:
Me = Average
$\sum fx$ = Number of data
N = Number of students
Inferential statistics
Normality test
In this study using the Shapiro-Wilk test because the sample used was small or amounted to <50 (Syahriza, 2023).
The basis for taking the normality test is:
If the significance value (sig.) < 0.05 then the research data is not normally distributed.
If the significance value (sig.) > 0.05 then the research data is normally distributed.
Homogeneous test
The prerequisite homogeneity test in independent sample analysis in the Levene Test.
The basis for decision making in the homogeneity test is:
If the significance value <0,05, then Ho is rejected so that it can be stated that it is in a population with inhomogeneous variants.
If the If the significance value > 0.05, then Ho is accepted so that it can be stated that the population variation is homogeneous (Duli).
Hypothesis testing
Paired Sample t-Test is used to determine changes before and after treatment. Formulating the paired sample t-Test is:

$$t=\frac{\bar{X}-\mu^{\circ}}{\frac{s}{\sqrt{n}}}$$

information :
t= calculated t value
$\bar{X}$= Average value
μ°= hypothesized value
S= sample standard deviation of the sample
n= number of sample members

The guidelines for hypothesis testing are as follows:

If Sig. > (0.05) then Ho is accepted and Hi is rejected.

If Sig. < (0.05) then Ho is rejected and Hi is accepted.

N-Gain score test

The formula for the N-Gain Test is as follows (Anufia & Alhamid, 2019):

$$\text{Gain (G)} = \frac{skor\ posttest - skor\ pretest}{skor\ ideal - pretest}$$

Table 1. Classification of N-Gain score values

Mark	Classification
g > 0.7	Tall
0.3 ≤ g ≤ 0.7	Currently
g<0.3	Low

Table 2. N-Gain Score criteria

N-Gain Percentage Value	Classification
81% - 100%	Tall
61% - 80%	Currently
41% - 60%	Enough
21% - 40%	Very Low
10% - 20%	No Improvement

RESULTS AND DISCUSSION

Results

Pretest and posttest test instrument trial

Table 3. Validity Test of Multiple Choice and Essay Pretest Question Instruments

No Question	"r" Count	"r" Table	Information "R" Count	Interval Correlation Coefficient
1	-0.261	0.602	Invalid	Very Low
2	0.595	0.602	Invalid	Enough
3	0.354	0.602	Invalid	Low
4	0.866	0.602	Valid	Low
5	0.430	0.602	Invalid	Enough
6	0.312	0.602	Invalid	Low
7	-0.363	0.602	Invalid	Low
8	0.216	0.602	Invalid	Low
9	-0.354	0.602	Invalid	Very Low
10	0.667	0.602	Valid	Tall
11	0.267	0.602	Invalid	Low
12	0.354	0.602	Invalid	Low

13	0.785	0.602	Valid	Tall
14	0.447	0.602	Invalid	Enough
15	0.430	0.602	Invalid	Enough
16	0.694	0.602	Valid	Tall
17	0.500	0.602	Invalid	Enough
18	0.626	0.602	Valid	Tall
19	0.215	0.602	Invalid	Low
20	0.352	0.602	Invalid	Low

(Primary data source: Processed 2024)

The validity test provisions with a sample of 11 people, namely r table = 0.602
H0 is accepted if r count > r table, (the measuring instrument used is valid)
H0 is rejected if r statistic ≤ r table. (the measuring instrument used is invalid)

Based on table 3, it shows that 5 pretest instrument questions are declared valid because r count is greater than r table and 15 questions are declared invalid because r count is less than r table. The provisions on the correlation coefficient interval on questions with minimum criteria are sufficient that we can use in research. Based on table 3, the questions that we can use in research are 9 with 5 questions of sufficient criteria and 4 questions of high criteria. Therefore, the pretest question instrument that will be used in this study is 9 questions. According to Sugiyono (2022), a valid instrument means that the measuring instrument used to obtain data (measure) is valid.

Table 4. Validity Test of Multiple Choice and Essay Posttest Instruments

No Question	"r" Count	"r" Table	Information "R" Count	Interval Correlation Coefficient
1	0.452	0.602	Invalid	Enough
2	0.763	0.602	Valid	Tall
3	-0.011	0.602	Invalid	Very Low
4	-0.011	0.602	Invalid	Very Low
5	0.468	0.602	Invalid	Enough
6	0.348	0.602	Invalid	Low
7	-0.130	0.602	Invalid	Very Low
8	0.078	0.602	Invalid	Very Low
9	-0.250	0.602	Invalid	Very Low
10	0.587	0.602	Invalid	Enough
11	0.345	0.602	Invalid	Low
12	0.587	0.602	Invalid	Enough
13	0.750	0.602	Valid	Tall
14	0.394	0.602	Invalid	Low
15	0.348	0.602	Invalid	Low
16	0.673	0.602	Valid	Tall
17	0.501	0.602	Invalid	Enough
18	0.533	0.602	Invalid	Enough
19	0.463	0.602	Invalid	Enough
20	0.547	0.602	Invalid	Enough

(Primary data source: Processed 2024)

The reliability test requirements with a sample of 11 people are r table = 0.602
H0 is accepted if r count > r table, (the measuring instrument used is valid)
H0 is rejected if r statistic ≤ r table. (the measuring instrument used is invalid)

Based on table 4, it shows that 3 questions of the postest instrument are declared valid because r count is greater than r table and 17 questions are declared invalid because r count is less than r table. The provisions on the correlation coefficient interval on questions with minimum criteria are sufficient that we can use in research. Based on table 4, the questions that we can use in research are 11 with 8 questions of sufficient criteria and 3 questions of high criteria. Therefore, the posttest question instruments that will be used in this study are 11 questions.

Table 5. Multiple Choice and Essay Pretest Reliability

The "r" value of Cronbach's Alpha calculation		Table "r" value	Information
Multiple choice	Essay		
0.609	0.626	0.602	Enough

(Primary data source: Processed 2024)

In multiple-choice questions, r count is greater than r table, which is 0.609 > 0.602, and in essay questions, r count is greater than 0.626. Therefore, it can be concluded that the pretest question tool is reliable and is included in the category that is quite reliable as a data collection tool in this study.

Table 6. Multiple Choice and Essay Posttest Reliability

The "r" value of Cronbach's Alpha calculation		Table "r" value	Information
Multiple choice	Essay		
0.626	0.692	0.602	Enough

(Primary data source: Processed 2024)

From the calculation results using SPSS for Windows 27, it was obtained that r count > r table on multiple-choice questions, namely 0.626 > 0.602 and essay questions 0.692 > 0.602. So it can be concluded that the posttest question instrument is reliable and is included in the category of sufficient instrument reliability or can be trusted as a data collection tool in this study.

Table 7. Pretest and posttest scores

No.	Name	pretest	posttest
1.	Dln	60	80
2.	Pka	55	68
3.	Iu	60	90
4.	Ijl	60	78
5.	Ram	60	98
6.	Fik	55	75
7.	Adl	60	73
8.	Nal	58	65
9.	Jh	60	78
10.	Rad	58	78
11.	Raf	35	60

(Primary data source, 2024)

The table above shows the results of the pretest and posttest of variables X and Y before and after treatment. The pretest was conducted to determine the state of students' multiplication operation abilities before treatment, and the posttest was conducted to determine whether students' multiplication abilities had developed or improved since treatment. To calculate the pretest and posttest values, descriptive statistical analysis was used with the help of the SPSS 27 program. The results are as follows:

The descriptive statistics table for the pretest and posttest of the experimental class can be described in the diagram below:

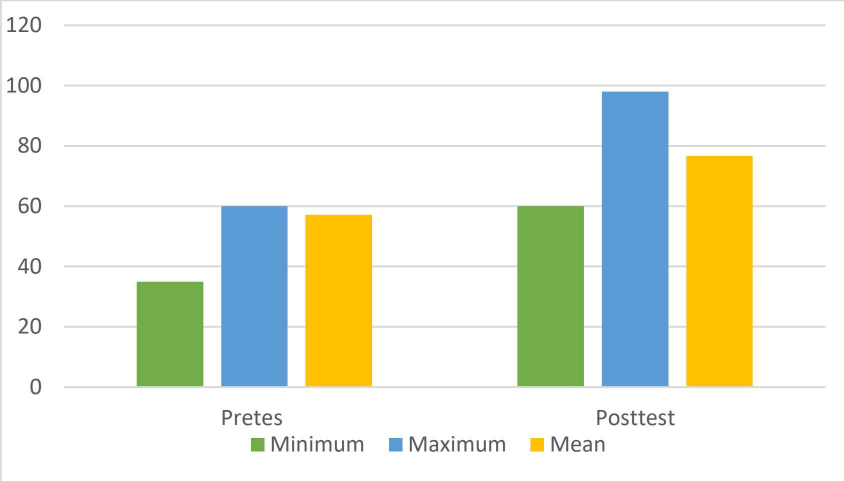

Figure . Descriptive Statistics of pretest and posttest

The descriptive statistics image above shows that the pretest is the data collected before the treatment is carried out. Data from 11 sample students were used in this test, both before and after the examination. In the previous test, the minimum score was 35, the maximum score was 60, and the average score (mean) was 56.45. In the next test, the minimum score was 60, the maximum score was 98, and the average score (mean) was 76.64.

Table 8. Shapiro Wilk Normality Test

Tests of Normality						
	Kolmogorov-Smirnova			Shapiro Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Pretest	.240	11	.077	.927	11	.386
Posttest	.195	11	.200*	.955	11	.709

(Primary data source: Processed 2024)

From table 8 both pretest and posttest have normal distribution, according to the Shapiro-Wilk test calculation table. The sig. pretest value of 0.386 is greater than 0.05, indicating a normal distribution. The sig. posttest value of 0.709 is also greater than 0.05, indicating a normal distribution.

Table 9. Homogeneity Test

Tests of Homogeneity of Variances					
		Levene Statistics	df1	df2	Sig.
Multiplication Operation Ability Results	Based on Mean	3,091	1	20	.094
	Based on Median	2,783	1	20	.111
	Based on Median and with adjusted df	2,783	1	14,867	.116
	Based on trimmed mean	3.130	1	20	.092

(Primary data source: Processed 2024)

In the homogeneous test calculation table, the Sig. value in the average point base column is 0.094. This value shows that 0.094 is greater than 0.05 in the homogeneous test decision-making criteria, indicating that the data is homogeneous or comes from samples with the same variation. Because the data is homogeneous and normally distributed, the hypothesis test can be used.

Table 10. Paired Samples t-Test

Paired Samples Test			
	Paired Differences	t	df	Sig. (2-tailed)

		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest - Posttest	-17.63636	7.33857	2.21266	-22.56648	-12.70625	-7,971	10	.000

(Primary data source: Processed 2024)

Based on the table above, the Sig. (2-tailed) value of 0.000 < 0.05 indicates that Ho is accepted and Hi is rejected. So, the jarimatika-based drill method has an impact on the multiplication operation ability of grade III elementary school students .

Table 11. N-Gain Test

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Gain_Score	11	.29	.91	.5902	.21351
Gain_Percent	11	28.89	90.91	59.0229	21.35135
Valid N (listwise)	11				

(Primary data source: Processed 2024)

The results of the N-gain test above show that the N-gain score has an average value, or mean, of 0.5902. If this value is compared with the classification of the N-gain score, the result is that 0.5902 is less than 0.7. So, the category is moderate, which means that the effectiveness is moderate. Furthermore, the classification of the increase in students' multiplication operation abilities before and after the treatment is 59.0229%, or can be rounded to 59%. The increase in students' multiplication operation abilities after the treatment of the application of the jarimatika-based drill method is included in the criteria of 41% to 60%, which is a sufficient classification.

Discussion

The multiplication operation ability of elementary school students before using the jarimatika-based drill method. The pretest score of grade III elementary school students reached an average score of 56.45, with a maximum score of 60 and a minimum score of 35. In addition, it was found that one student (9%) had a very low multiplication ability, namely 20-35, and ten students (91%) had a moderate multiplication ability, namely 53-68. There were no students who had very high or very high multiplication abilities. Furthermore, the average score of 56.45 was rounded up to 56, which showed that the average score of 56 was included in the moderate category, which was between 53 and 68. Because the Mathematics KKm of grade III elementary school students was still below the KKM standard, namely 75, their multiplication operation ability before the treatment was in the moderate category.

The multiplication operation ability of grade III elementary school students after using the jarimatika-based drill method. Data on the posttest scores were analyzed using the SPSS 27 program. The results showed an average score of 76.64 and a minimum score of 60 and a maximum of 98. As many as two students (18%) had very high multiplication abilities, with scores of 85-100; six students (54%) had moderate abilities, with scores of 69-84; and three students (28%) had moderate abilities, with scores of 53-68. No students had very low or low multiplication abilities. Furthermore, the average score after the test was obtained at 76.64 and rounded up to 77, with a score of 77 in the categorization table indicating an increase in students' multiplication abilities by 83%. Grade III elementary school students , after receiving treatment, had very good multiplication operation abilities. In addition, it is known that almost all students received scores above the KKM; Seven students received scores above the KKM, and four other students still had scores below the KKM.

After seeing the results of the students' pretest and posttest, it can be said that the jarimatika-based drill method improves the ability of multiplication operations. The effect of the jarimatika-based drill method on the multiplication operation abilities of grade III elementary school students. Pretest and posttest data were calculated using the jarimatika-based drill method with SPSS 27. The calculation was carried out using homogeneity and normality tests. Before the hypothesis test was carried out, both tests were used according to the requirements. If both tests meet the requirements, the hypothesis test can be started. However, in cases where this classical assumption test does not meet the requirements, it is possible that the classical assumption will be met through the use of nonparametric statistics, sample additions, or transformations on variables.

The students' Shapiro-Wilk multiplication operation ability shows normally distributed data, with a pretest value of Sig. 0.386 and a posttest value of Sig. 0.709, each more than 0.05. So, this normality test has met the classical assumptions.

The final homogeneity test shows a Sig. value of 0.094 (a significance value of more than 0.05), indicating that the samples have comparable variances. All tests have been completed and determined to be complete, so the hypothesis test can be continued.

The results of the hypothesis test using the Paired Sample Test formula show that the jarimatika-based drill method has an impact on the multiplication operation ability of grade III elementary school students. Hypothesis testing can be used to prove this. A significant value of 0.000 or less than 0.05 indicates that variable X has a positive significant effect on variable Y. There is evidence that the jarimatika-based drill method affects the multiplication operation ability of grade III elementary school students . This shows that using the right learning method has a significant impact on students' multiplication ability.

The results show that the N-gain score is classified in the moderate category, with a mean or average value of 0.5902, based on the N-gain test results from the pretest-posttest data calculated using SPSS 27. To classify the increase in multiplication operation ability before and after treatment, it was found that the increase in multiplication operation ability after treatment with the use of the jarimatika-based drill method was included in the sufficient category, with a result of 59.0229%, or rounded to 59%. Thus, the increase in multiplication operation ability after treatment with the use of the jarimatika-based drill method.

CONCLUSION

From the results of the discussion that has been explained above regarding the jarimatika-based drill method on the multiplication operation ability of grade III elementary school students, it can be concluded. The multiplication operation ability of grade III elementary school students before receiving treatment has an average value of 56.45. The multiplication operation ability of grade III elementary school students after receiving treatment has an average value of 76.64. Then, the results of the Paired Sample T-test in this study have an influence on students' multiplication operation ability. It can be seen from the significance value of 0.000 <0.05 which shows that the jarimatika-based drill method has an influence on students' multiplication operation ability. This can provide new facts that the application of a learning model using the jarimatika-based drill method on multiplication operation material can improve multiplication results in mathematics learning for grade III elementary school students.

ACKNOWLEDGMENTS

Thanks are conveyed to Muhammadiyah University of Enrekang, and more specifically the Elementary School Teacher Education Study Program for supporting the completion of this research.

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