

The effect of funnel counting learning media on mathematical logic intelligence second grade elementary school students

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Abstract

This research is based on the low ability of students Overcome difficulties and find optimal answers. multiplication material, which is caused by the lack of use of learning media in schools. This study aims to determine the effect of using funnel counting learning media on the mathematical logic intelligence of grade II elementary school students. Therefore, the study was carried out using quantitative techniques. using quasi experimental research type and posttest only control design. This research was conducted at SDN Rempoa 01 in the school year 2023/2024 even semester. The study population consisted of class II students totaling 116 people. The research sample consisted of 30 students as the control class and 31 students as the experimental class, which were selected using purposive sampling technique. The instruments used in this study include test and non-test instruments. The test instrument is a post-test with 13 description questions to measure mathematical logic intelligence, while the non-test instrument is in the form of student documentation. The data analysis of this study was assisted by the SPSS V.26 application. The results of the Independent Sample T-test test showed a significance value of $0.0001 < 0.05$ and a tcount value of $18.459 < \text{table of } 2.001$, so H_0 was rejected and H_a was accepted. This shows that there is an effect of learning media funnel counting on the mathematical logic intelligence of grade II students of SDN Rempoa 01 South Tangerang.

Keywords: Funnel Counting; Math Logic Intelligence; Elementary School.

INTRODUCTION

The teacher's strategy in improving students' understanding of the subject uses a learning environment that is appropriate to the content being taught. Conceptually, the word "media" refers to everything that acts as an intermediary or introducer, as explained (Aghni, 2018) that media can be people, materials or conditions that help create a conducive environment that facilitates learners in developing their insights, skills and behaviors. facilitates learners in developing their insights, skills and behaviors.

Learning is a process carried out to provide education in order to achieve optimal learning outcomes (Sutriyani, 2020). To achieve this goal, educators need to understand the needs of students so that learning activities can be tailored to their preferences, as expressed by (Arfani 2018). Therefore, a structured learning strategy is needed, as explained by (Mustaqim 2016), which states that learning is

a planned activity by educators by involving various resources to develop potential, knowledge, skills, and positive values in students.

It is expected that the utilization of learning media can help achieve learning objectives, as stated by (Nurrita 2018), that educational media plays a role as a means to improve learning, explain information that can be absorbed optimally, enabling the achievement of educational goals in an appropriate and effective manner.

Learning media can play a role in developing counting skills, one of which is the counting funnel media. According to (Jayanti 2020), counting funnels are simple media that are very effective for math learning methods, especially at the elementary school level. The selection of counting funnels in this study is based on the view (Karuniawati and Mukhoiyaroh 2019) that counting funnels are concrete media that can

be held directly by students, aiming to facilitate understanding of counting concepts. The most prominent intelligence in learning mathematics is mathematical logic intelligence, as it can be influential in every mathematical topic. Numerical-logical reasoning capacity refers to a person's proficiency in processing numerical data and reasoning, which includes proficiency in processing verbal as well as quantitative information, using logical thinking and analysis, finding appropriate formulas, and conducting scientific exploration (Azinar, J. A., & Munzir, S. 2014).

Mathematical logic intelligence is an important aspect to improve as it can influence other types of intelligence. This intelligence is often associated with brain function as it relates to the use of numbers, abstract patterns, and logical reasoning. The indicators of mathematical logic intelligence proposed by (Asmal, M. 2020) can be found in the following table 1.

Table 1
Indicators of Mathematical Logic Intelligence

Variables	Indicator	Sub Indicator
Mathematical Logic Intelligence	Numeracy skills	a. Determine the result of math arithmetic operations.
		a. Making conjectures. b. Math manipulation. c. Present conclusions, evidence & reasoning.
	Reasoning ability	d. Validity of arguments. e. Identify patterns from mathematical phenomena to make generalizations.
		a. Remember b. Comparing. c. Analyzing. d. Summarize.
	Problem Solving	a. Understand the problem. b. Make a solution plan. c. Implementing the completion plan. d. Rechecking.

According to (Syahputri, N. 2018), Teaching arithmetic at the basic education level has always been an interesting subject to study. Their mental development process

moves from the pre-operational stage to concrete operations, and slowly begins to touch the abstract realm. In line with this progress, mathematics teaching methods need to be adjusted to accommodate changes in the thinking capacity of primary school-age children, (Dahlia, Pranata, & Suryana 2020) stated that teaching arithmetic has a crucial role in shaping students' reasoning capabilities.

Through learning mathematics, It is expected that students are able to develop skills to think rationally, analytically, structurally, evaluatively and innovatively. In addition, this subject also plays a role in improving cooperation skills between individuals. In line with this perspective, similar opinions are also expressed by other experts who emphasize the importance of mathematics in students' cognitive development. (Anggraini, Y. 2021) Teaching arithmetic at the basic education level is an area that has significant potential for exploration and development further.

RESEARCH METHODS

This study applied a quantitative approach in the study. This method utilizes numerical data as the main means of examining and understanding the phenomenon under study. In the quantitative research process, researchers seek to gain new insights and knowledge by collecting and analyzing data that can be measured mathematically (Djollong, A. F. 2014).

According to (Sugiyono 2017), research uses a series of processes or phases to obtain research results, which help direct and focus research. This study procedure can be found in the following Figure 1.

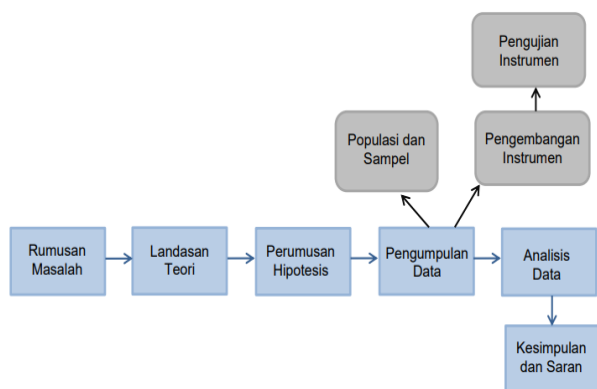


Figure 1
Research Chart Procedure

This study applied a Quasi Experimental Design to assess the treatment effects on learning outcomes in two groups of students. The experimental group utilized the counting funnel of learning media, meanwhile control group used traditional learning methods. The Non-equivalent Control Group Design method applied in the research proposed by (Kusuma & Hamidah, 2020) can be found in the following table 2.

Table 2
Non-equivalent Control Group Research Design

Group	Treatment	Post-test
Experiment	X	O ₂
Control		O ₄

Description:

- X : Use of the Counting Funnel Learning Media.
 O₁ : Pre-test is student learning achievement before through the utilization of Learning Media Funnel Counting.
 O₂ : Post-test is student learning achievement before through the utilization of Learning Media Funnel Counting.
 O₃ : Pre-test is student learning achievement before through the utilization of Learning Media Funnel Counting.
 O₄ : Post-test is student learning achievement before through the utilization of Learning Media Funnel Counting.

The population in research refers to an overall group that includes all individuals or elements that meet certain criteria relevant to the research objectives. Researchers set specific limits and characteristics to determine who or what is included in the population

under study (Sugiyono, 2017). The sample in this research consisted of grade II students of SDN Rempoa 01 in the even semester of the 2023/2024 school year, which was divided into four classes: II A, II B, II C, and II D. Can be found in the following table 3.

Table 3

Research Population					
Class	II-A	II-B	II-C	II-D	Total
Total	22	33	30	31	116

In the sample selection process, researchers applied the Purposive Sampling method. This method is a way of sampling based on specific predetermined criteria. The application of this technique is carried out by considering certain characteristics or attributes of the population that have been previously identified in accordance with the opinion (Malik and Chusni 2018).

The selection of the Test Group and the Comparison Group was based on the similarity of the characteristics of the final evaluation scores of the first semester, not through random selection. The mean score in the Control class was slightly superior to the Experiment class. Consequently, the test group applying the counting funnel learning media consisted of 31 learners from the Experimental class, while the comparison group using the traditional teaching method consisted of 30 learners from the Control class.

This study used an essay-shaped test given to Control class and Experiment class students. This test, according to (Mukhid 2021), is a tool used to measure the ability or achievement of research subjects. In this study, the tests given to the experimental and control groups after the learning process were used to evaluate the effect of the funnel counting learning media on mathematical logic skills. Before testing is carried out, the instrument is tested first.

RESULTS AND DISCUSSION

Results

Once the data had been gathered, the researcher systematically reorganized it and, under certain conditions, compiled tables with multiple data variables. Further explanation is as follows :

a. Test Normality

The normality test is carried out to determine whether the sample used in the study has a normal distribution or not. A data distribution is considered to meet the assumption of normality if its statistical significance value exceeds the threshold of 0.05. The pilot test in this study was conducted by students in the evaluation of mathematical logic capabilities.

The evaluation instrument consisted of 13 question items asked to the experimental group and the comparison group. The procedure applied to test normality is the Kolmogorov-Smirnov method, with the help of SPSS statistical software version 26. The outcomes of the normality The analysis results can be found in table 4.

Table 4
Output of Normality Test of
Mathematical Logic Intelligence Test
for Experimental and Control Classes

Tests of Normality							
Class	Kolmogorov-Smirnov			Shapiro-Wilk			
	Statistic			Statistic			
	df	Sig.	df	Sig.	df	Sig.	
Class 2c	.151	30	.078	.900	30	.008	
Class 2d	.173	31	.019	.905	31	.010	
a. Lilliefors Significance Correction							

According to table 4, the significance value obtained for the experimental class is 0.019 and for the control class is 0.078. Therefore, the significance value of the experimental class ($0.019 > 0.05$) and the significance value of the control class (0.078) is also > 0.05 . The normality test results show that H_0 is accepted and H_a is rejected, which indicates that the data or samples are normally distributed.

b. Homogeneity Test

After testing the normality of posttest data from the experimental and control groups, the next step is to test the uniformity of variance This homogeneity

analysis is intended to check whether there are similarities or differences in variation between the treated group and the comparison group.

(Usmandi 2020) suggests that homogeneity testing is one method to check whether there are similarities or differences in variants in different populations between treated groups and comparison groups.

To assess homogeneity in the measurement of logical-mathematical skills, the researcher applied the Levene method with the assistance of SPSS software version 26. The findings of this variance equality check can be observed which can be found in the following table 5.

Table 5
Homogeneity Test Output of
Mathematical Logic Intelligence Test
for Experimental and Control Classes

Test of Homogeneity of Variance					
	Levene Statistic	df1	df2	Sig.	
Based on Mean	6.935	1	59	.011	
Based on Median	6.531	1	59	.013	
Based on Median and with adjusted df	6.531	1	44.320	.014	Nilai
Based on trimmed mean	7.095	1	59	.010	

The findings of the homogeneity analysis listed in Table 5 indicate that the significance level (based on the mean value) reached 0.011. Referring to the variance uniformity test interpretation guidelines, the 0.011 exceeds the 0.05 threshold. This finding implies that the data sets under study have similar variations or are homogeneous. Based on the rules of inference, the initial assumption (H_0) is acceptable, while the counter-hypothesis (H_a) does not receive support from the available statistical evidence.

c. Independent Sample T-Test

According to (Nuryadi, Astuti, Utami, and Budiantara 2017), the purpose of this test is to compare the average of two independent populations or data groups. The findings of the Independent T test can be found in the following table 6.

Table 6
Independent Sample T-Test Output

Independent Samples Test									
Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower Upper
N i	Equal variances assumed	6.935	.011	-18.459	59	.000	-26.013	1.409	-28.833 -23.193
	Equal variances not assumed			-18.289	43.957	.000	-26.013	1.422	-28.880 -23.146

The statistical test results show a t-count value of 18.459 with a significance of 0.000. Based on the formula $(\alpha/2)$; $(df) = (0.05/2)$; (59) or 0.025; 59, a t-table of 2.001 is obtained. Comparing these two values, it can be found that the t-count (18.459) is higher than the t-table (2.001), indicating an important effect of the counting funnel teaching tool on the logical-mathematical ability of grade II elementary school students. As a result, the null hypothesis is disproven and the alternative hypothesis is supported. The significance value of 0.00 which is less than 0.05 signifies a notable difference between the average posttest scores of the experimental and control groups. This the conclusion that the use of counting funnel media has a positive impact on improving the mathematical logic of grade II students at SDN Rempoa 01.

Discussion

1. Numeracy Skills

In the first indicator realized in the first and second meetings, learners are asked to determine mathematical calculation operations involving multiplication in calculating the arrangement of numbers or numbers. For

example, learners determine the result of the number in the picture in which there is an arrangement of numbers that can become a whole number. During the learning process, students form discussion groups with as many as eight students in each group.

After the teacher gives and explains examples of problems related to counting skills, students are introduced by showing the counting funnel learning media. Then, it is explained how to use the counting funnel learning media. Some students are invited to come forward to be able to see clearly how to use the counting funnel learning media starting from the first stage to the completion stage carefully and can be found in the following Figure 2.



Figure 2 explaining how to use the Counting Funnel learning media

Learners are given time to explore the props that will be used in the lesson. After the activity, they return to the study room to complete the worksheet collaboratively. In the initial session, a large number of learners had difficulty in applying the newly introduced calculation aids. However, by the next meeting, the students started to show a better understanding in using the learning media.

2. Reasoning Ability

The second aspect of logical-mathematical ability became the focus of the next two learning sessions. At this stage, the learners have demonstrated a comprehensive understanding of the

operation of the arithmetic tools introduced. They are faced with the challenge of optimizing their personal reasoning capacity in dealing with the various problems presented. This process encourages learners to explore solutions through mental visualization and concrete representations, allowing them to transform abstract concepts into tangible.



Figure 3
One of the Learners Using the
Counting Funnel Learning Media

In Figure 3, it can be found that one of the students is experimenting with finding the results of counting operations by demonstrating how to use the counting funnel learning media that has been explained. In its use, students are required to focus the calculation on the congklak seeds which will later be put into the funnel to avoid errors in the calculation.

3. Logical Thinking

The third indicator was realized in the fifth and sixth meetings. In the fifth meeting, learners are asked to be able to remember, compare, analyze and conclude. For example, learners are given a problem about a scale with a weight that is of course each between the right and left sides is different by first summing the problem on the multiplication on the right and left sides of the scale what is the result of both. If the results have been found then from there it can be concluded how many results from the right and left sides which part can emphasize on 1 side.

In the initial question, some students

still had difficulty grasping the meaning of the question. However, after additional explanation, they began to understand the subject matter. Following the pattern of the previous meeting, the students were engaged in learning using the counting funnel tool. Which students use the learning media of the counting funnel and can be found in the following Figure 4.



Figure 4
Students Using the Counting Funnel
Learning Media

4. Problem Solving

The fourth aspect of mathematical reasoning skills is implemented in the seventh and eighth sessions. Students were encouraged to independently find clues, both physically and mentally, in applying this concept to everyday situations. For example, they were asked to operate the counting funnel props without assistance.

The learning process lasted for 8 meetings, the group receiving the experimental treatment using the counting funnel props and the control group applying the conventional method. Post-learning, a final evaluation was conducted to measure the logical-mathematical capacity in both groups. The results indicated that the average post-test scores for spatial thinking of the experimental group reached 46.91, while that of the control group was 28, indicating superior performance in the experimental group.

Statistical analysis revealed significant differences in mathematical reasoning skills between students who used the counting funnel teaching aid and those

who followed traditional learning. The Independent Samples T-test resulted in a t-count of 3.462, a t-table of 1.999, and a significance of $0.001 < 0.05$, indicating a positive impact of the teaching aid on improving the logical-mathematical skills of grade II students of SDN Rempoa 01 South Tangerang.

The study recorded a mean score of 82 for the group using teaching aids, compared to 65.50 for the group without teaching aids. Hypothesis testing produced a t-count of 59.77 with a t-table of 33.73 ($df = 30$), confirming the significant effect of teaching aids on students' mathematical reasoning ability.

According to the research outcomes and statistical analysis, reveals a notable difference in mathematical logic intelligence between experimental class students and control class students. Analysis with the Independent Sample T Test shows the tcount value of 3.462, ttable of 1.999, and a significance value of $0.001 < 0.05$. Therefore, it can be concluded that the learning media of the counting funnel has a positive effect on increasing the mathematical logic intelligence of grade II students of SDN Rempoa 01 South Tangerang.

As in the research (Faizah, A. N., Manasikana, C. A., & Sutriyani, W. 2022), the use of learning media for counting funnels in math lessons on multiplication material has average results showing that students who use learning media for counting funnels reach a value of 82, while those who do not use reach 65.50. Hypothesis testing carried out using the t-test resulted in a t-count of 59.77 with a t-table of 33.73 and $df = 30$. These results indicate that the use of the learning media of the counting funnel has a significant effect on the mathematical logic intelligence of grade II students of SDN Rempoa 01 South Tangerang.

CONCLUSIONS

The research conducted at SDN Rempoa 01 examined the effectiveness of the counting funnel props in improving mathematical reasoning skills of grade II students on the

topic of multiplication. Statistical evaluation using SPSS version 26 resulted in the following conclusions :

1. The interpretation of these outcomes indicates a substantial effect of using the counting funnel props on improving the logical-mathematical capacity of Grade II learners at the educational institution. The independent sample t-test results showed a significance value (2-way) of 0.000, which is below the α threshold (0.05). According to the decision-making criteria, this finding supports the rejection of H_0 and acceptance of H_a .
2. This finding implies that students who utilized the counting funnel teaching aid demonstrated higher proficiency in mathematical reasoning than their counterparts who followed the conventional learning method. Further analysis revealed a t-count value of 18.459, exceeding the t-table of 2.001 based on the t-value distribution. This comparison confirmed the significant difference between the means of the experimental and control groups in terms of the impact of the teaching aid on mathematical reasoning skills. The experimental group recorded a mean of 46.91, far surpassing the control group which only reached 28.

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