Effectiveness of Using *Koin Muatan* Teaching Aids to Improve Numeracy Skills

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ARTICLE INFO	ABSTRACT
	The problem that is always faced by students today is the lack of understanding of the basic concepts of mathematics, one of which is integer arithmetic operations, so it won't be easy to understand more abstract mathematical concepts. The low numeracy literacy ability is due to the learning process not applying the suitable model or media. Therefore, it is necessary to have appropriate learning media so that students understand concepts well and can improve Numerical Literacy skills. One of the proper media or teaching aids for learning integer arithmetic operations is *Koin Muatan*, made with paper as a base material that symbolizes positive and negative charges. The type of research used was experimental research, a one-group pretest-posttest design pre-experimental design on 21 SD GMIT 4 Kefamenanu students. Data collection techniques were observation, tests and documentation. At the same time, the data analysis technique used is descriptive statistical analysis, inferential analysis and N-Gain analysis. The t-test results are used to test the average value before and after being given treatment and whether there is a significant effect. Based on the results of the tests performed, the average pretest and posttest values were 43.51 and 70.79. An N-Gain test was carried out to determine the large increase in numeracy literacy skills so that an N-Gain value of 0.45 was included in the moderate category. This result proves an increase in numeracy literacy skills after students are given the learning treatment using the *Koin Muatan* teaching aids at SD GMIT 4 Kefamenanu.

Introduction

Literacy numeracy is currently one of the topics in learning mathematics. A person is said to have Numerical Literacy Ability to count, distinguish and process various data symbols and perform basic mathematical operations to fix the problem (Jain & Rogers, 2019). The low numeracy literacy ability is due to the learning process not applying the suitable model or media. Therefore, it is necessary to have appropriate learning media so that students understand concepts well and can improve Numerical Literacy skills. One of the proper media or teaching aids for learning integer arithmetic operations is *Koin Muatan*, made with

paper as a base material that symbolizes positive and negative integers belonging to mathematical concepts. Mathematical ideas can be learned better with the help of materials made just for that purpose. With visual aids, students can see, utilize, and think directly about the studied object, making it easier to grasp the abstract concepts provided. Supplemental materials can also improve classroom instruction. (Kurniati & Trapsilasiwi, 2017) States that using visual aids and other media in learning mathematics will be better and faster than teaching without media. Through media, students learn concrete things. To understand abstract mathematical concepts, students need concrete tools such as media to help clarify the material presented so that students can quickly understand and understand it. Students' activeness must also be involved in the learning process using visual aids. Therefore, trying to make props seem fun and not boring is necessary.

Visual aids in learning mathematics can foster students' numeracy literacy skills. (Pangesti, 2018) states that learning mathematics is closely related to numeracy literacy. Numerical literacy uses number concepts and arithmetic operations skills in everyday life. A person is said to have numeracy literacy skills if he fulfils three aspects: arithmetic, numeracy relations, and arithmetic operations (Mahmud & Pratiwi, 2019). These three aspects have different meanings. Counting is the ability to count an object and identify the number of objects. Numerical relations are the ability to distinguish the quantity of an object, such as more, less, less than, more than, and so on.

Meanwhile, arithmetic operations refer to the performance of elementary arithmetic procedures. However, the existing method of education does not use the most effective model or media, which contributes to the widespread lack of numeracy among the population. According to (Azhari & Devi, 2023), students aren't provided enough time to develop their numeracy skills through reading exercises because they are only given 15 minutes before the learning process begins and then learning with lectures. This result demonstrates that primary school kids have inadequate numeracy literacy skills. Therefore, students should practice asking questions that conform to numeracy literacy indicators and use suitable learning resources for the best results in attaining learning objectives. Numerical ability is essential in making decisions (Theses, 2014). Therefore, research is necessary because it trains numeracy skills from elementary school. Learning mathematics using payload coin props allows elementary school students to improve their numeracy skills.

Research Methods

The research employed a quantitative methodology. This research falls under the category of experimental study and follows a pre-experimental design known as one group pretest-posttest (Anggriyani et al., 2021; Deda & Disnawati, 2022). Researchers used this design to compare changes in pretest results with posttest results due to treatment before and after using a charge coin counter.

The study encompassed the entire population of fifth-grade pupils at SD GMIT 4 Kefamenanu. At the same time, the sample in this study was class VC SD GMIT 4 Kefamenanu, with a total of 21 students. This research is located in the sub-district of Kota Kefamenanu,

North Central Timor Regency. The research instruments are Pretest and Posttest, which aim to measure students' achievement levels before and after studying the material with the help of visual aids. Information was gathered in March 2023 using a combination of observation, documentation, and pilot tests. The next stage is data analysis techniques.

The first data analysis technique uses descriptive data analysis by comparing student test results before and after treatment. Furthermore, the t-test for t-test results is used to test the average value before and after being given treatment whether there is a significant effect or not. Then, decide based on the significance value (Sig.) if the value of Sig. (2-tailed) is less than Alpha, then $H0$ is rejected, and $H1$ is accepted and vice versa if the Sig. (2-tailed) larger than Alpha, then $H0$ is accepted and $H1$ is rejected.

The next step is to figure out how well using *Koin Muatan* teaching tools to improve numeracy literacy skills is helping students learn math with the N-Gain formula. The N-gain test was used to determine how much math literacy skills improved. The results were then analyzed using the N-gain index.

$$N-Gain = \frac{Post\ Test\ Score - Pre\ Test\ Score}{Ideal\ Score - Pre\ Test\ Score}$$

(1)

The Gain value obtained interpreted according to the N-gain index classification (Deda & Disnawati, 2022; Nuswowati & Taufiq, 2015) can be seen in Table 1:

Table 1 Interpretation of the N-Gain Index

N-gain Index (g)	Interpretation
$g \geq 0,7$	High
$0,3 \leq\ <g<0,7$	Moderate
$g < 0,3$	Low

Findings

The study's findings showed a positive impact after providing treatment for elementary school students using Charge Coins in mathematics learning. We can see the positive effects of pre-test and post-test results. Table 2 below shows the pretest and posttest results on learning basic integer operations using visual aids.

Table 2 Average Pretest Posttest Score

Name	Pretest	Posttest 1	Posttest 2
S1	17,241	72,413	86,206
S2	41,379	96,551	93,103
S3	68,965	75,862	86,206
S4	48,275	69,931	59,931
S5	62,068	65,517	72,413
S6	31,034	72,413	68,965
S7	37,931	72,413	75,862
S8	48,275	68,965	68,965
S9	62,068	65,517	75,862
S10	24,137	59,931	65,517
S11	37,931	49,827	51,724
S12	48,275	68,965	72,413
S13	27,586	75,862	86,206
S14	55,172	79,31	82,758
S15	37,931	68,965	79,31

Name	Pretest	Posttest 1	Posttest 2
S16	20,689	75,862	72,413
S17	37,931	65,517	69,931
S18	31,034	72,413	75,862
S19	55,172	51,724	59,931
S20	72,413	89,655	75,862
S21	48,275	68,965	72,413
43,51	**70,79**	**73,89**	

From the data in Table 2, it is clear that the students of SD GMIT 4 Kefamenanu have very poor numeracy literacy. This evidence is the typical outcome of the March 2023 pretest administered before introducing the *Koin Muatan* support instrument. Students were given pretest questions before receiving instructional materials to gauge their prior knowledge and numeracy literacy concerning integer arithmetic. After administering a pretest, the researcher administered treatment as a posttest, using weighted coins props to clarify concepts related to integer arithmetic. Students were given posttest questions to answer after being exposed to the pedagogical aids to gauge the extent to which they had internalized the information and developed their numeracy literacy. The average posttest scores are higher than the pretest scores, as seen in the table above. After two months, the students were given the same questions they had discussed in class. The results suggest that students' numeracy literacy has improved since the students' first posttest mistakes were corrected on the second posttest. Table 3 shows a comparison of students' pre- and post-test scores.

The results of the tests showed that the average pre- and posttest scores were 43.51 and 70.79, respectively. Therefore, it is safe to say that fifth-graders at SD GMIT 4 Kefamenanu have inferior numeracy literacy skills. A mean pretest score of 43.51 indicates no treatment with *Koin Muatan* tools. After administering a pretest, the researcher implemented a therapy based on *Koin Muatan* teaching aids for integer arithmetic operations to enhance students' numeracy literacy and facilitate their content comprehension. Numerous calculations were performed after the posttest to measure the impact of *Koin Muatan* teaching tools on students' numeracy literacy, including a T-test and an N-Gain. The results of the t-test are used to test the average value before and after being given treatment whether there is a significant effect or not. Based on the SPSS value of -7.034 or 7.034 and 2.359 so that the value is > (7.034 > 2.359), it is rejected and accepted, and the results are significant; namely, the significance value is less than 0.05, Sig. (0.00) < (0.05), so it is rejected, which means there is an effect before and after being given treatment.

This study aims to enhance mathematical reasoning skills. The N-gain test was carried out to obtain the N-Gain value, namely 0.45, where the value was at $0.3 \leq Gain \leq 0.7$, which is the medium category, and the N-Gain percentage is 44.95%. The portion is less than 76%, which means that the category of interpretation of the effectiveness of the Gain is included in the quite effective category.

Table 4 Paired Samples Test

		Paired Differences	T	Df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	
	Shiva Numerical Literacy Posttest	70,79	21	Lower	Upper

The results of the t-test are used to test the average value before and after being given treatment whether there is a significant effect or not. Based on the SPSS value of -7.034 or 7.034 and 2.359 so that the value is > (7.034 > 2.359), it is rejected and accepted, and the results are significant; namely, the significance value is less than 0.05, Sig. (0.00) < (0.05), so it is rejected, which means there is an effect before and after being given treatment.

The N-gain test was carried out to obtain the N-Gain value, namely 0.45, where the value was at $0.3 \leq Gain \leq 0.7$, which is the medium category, and the N-Gain per cent is 44.95%. The percentage is less than 76%, which means that the category of interpretation of the effectiveness of the Gain is included in the quite effective category.

Catching in with instructors to make sure their teaching strategies are working. Scoring is carried out according to the steps of the scientific approach. Based on the teacher's activity observation sheet results, the average implementation of learning mathematics during four meetings with integer arithmetic operations using teaching aids and a scientific approach is 3.22. The result shows that integer arithmetic operations learning is well implemented because it fulfils the scoring category. The material given on the first day is addition and subtraction of integers with an average of 3.0; the material for the second day is multiplication and integer operations with an average of 3.0. The result shows that the average teacher activity in the first and second meetings remains the same, so there is an effort from researchers to increase teacher activity in learning. At the third meeting, the material for integer multiplication operations began to grow, namely 3.4, and the average teacher activity at the fourth meeting increased, namely 3.5.

Table 5 Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
NGain_Skor	21	-,08	,94	,4497	,24038
NGain_Persen	21	-7,69	94,12	44,9661	24,03822
Valid N (listwise)	21				

Based on the results of the tests performed, the average pretest and posttest values were 43.51 and 70.79. Several computations were performed after obtaining the pre- and post-test results: the prerequisite test, T-test, and N-Gain, to determine the effect of using *Koin Muatan* teaching aids to improve numeracy literacy skills.

The results of the prerequisite test in the form of a normality test based on calculations using SPSS 22.0 obtained the pretest and posttest significance values with Sig. (0.200 and 0.108) > (0.05), then the data obtained as pretest and posttest values are normally distributed. From the results of the normality test carried out using the Kologorov-Smirnov

test, it can be concluded that the pretest and posttest values have a normal data distribution. Based on the results of the prerequisite test, it can be done with the T-test because the data is normally distributed. According to (Laerd Statistics, 2013; Shamaan et al., 2015)the basis of the t-test and F-test assumes the residual values are normally distributed.

The results of the t-test are used to test the average value before and after being given treatment whether there is a significant effect or not. Based on the SPSS value of -7.034 or 7.034 and 2.093 so that the value is > (7.034 > 2.359), it is rejected and accepted, and the results are significant; namely, the significance value is less than 0.05, Sig. (0.00) < (0.05), so it is rejected, which means there is an effect before and after being given treatment.

To determine the extent to which students' mathematical thinking skills have improved. The N-gain test was carried out to obtain the N-Gain value, namely 0.45, where the value was at $0.3 \leq Gain \leq 0.7$, which is the medium category, and the N-Gain percentage is 44.95%. The percentage is <76%, which means that the category of interpretation of the effectiveness of the N-Gain is included in the quite effective category.

Discussion

Based on the statistical test results, applying the payload coin teaching aids is quite effective in increasing numeracy skills. This result aligns with teaching aids in learning mathematics on effective fraction material (Telaumbanua, 2020). In addition, the effectiveness of using Geoboard Teaching Aids in Improving Mathematics Learning Outcomes for Elementary School Students strengthens the results of this study (Anwar & Nurmina, 2019). Apart from learning mathematics, the use of visual aids is also effective in learning biology subjects (Hamansah & Danial, 2017).

The use of visual aids is suitable for areas that have low competitiveness. For example, TTU Regency has UN scores below the Provincial and National averages (Puspendik, 2019). In addition, in countries such as Ethiopia, the use of visual aids is seen as an innovative act in teaching and research (Geletu & Adige, 2023). *Koin Muatan* math teaching aids are realistic media that teach elementary school students abstract concepts and increase their knowledge of mathematics (Dewi & Agustika, 2020). This study's results indicate that after the learning treatment using the Loaded Coin math teaching aids, the numeracy ability has increased quite a bit. We can see from the pretest results that 43.51 rose to 70.79 at the posttest. Plus, the hypothesis test results show an effect of action after learning to use payload *Koin Muatan*.

Furthermore, the results of N-Gain stated that learning by using payload coin teaching aids was 44.95% effective in improving numeracy skills. However, after two months, the researchers conducted a posttest again using the posttest questions after the treatment, obtaining an average result of 73.89. The results of the second posttest improvement after the first posttest confirmed that learning using payload coin teaching aids was 44.95% effective in improving numeracy skills. However, learning using loaded coin props has a durability of 2 months and is able to improve numeracy skills. The second post test questions are exactly the same as the first post test questions.

Conclusion

Based on the statistical test results obtained, i.e. 7.034 > 2.093 in the two-sample t-test, it can be concluded that applying *Koin Muatan* media effectively increases numeracy literacy skills. The magnitude of the increase based on the N-Gain calculation obtained is 0.45, which is the medium category. Also, the percentage of N-Gain was 44.97%, meaning applying *Koin Muatan* media is quite effective in increasing numeracy skills. However, after two months, the researchers conducted a posttest again using the posttest questions after the treatment obtained an average result of 73.89. The results of the second posttest improvement after the first posttest confirmed that learning using *Koin Muatan* teaching aids was 44.95% effective in improving numeracy skills. However, learning using *Koin Muatan* props has a durability of 2 months and can improve numeracy skills.

Acknowledgment

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