



## The Use of Jarimatika and Abacus Learning Media on Students' Counting Skills

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History Article

Received: October, 2022

Accepted: November, 2022

Published: December, 2022

### Abstract

This research is a quantitative study with a student population of SDN 02 Alastuwo, and the research sample is class IIA and IIB. Researchers use test questions and documentation as research techniques. The data analysis technique used is the t-test, which previously carried out prerequisite tests: the balance test, normality test, and homogeneity test. This study aims to compare the use of Jarimatika media with the abacus media on the numeracy skills of second-grade students of SDN 02 Alastuwo. The results of the analysis showed that there was no difference between the use of Jarimatika media and abacus media on students' numeracy skills. The results of the t-test obtained  $t_{count} < t_{table}$ , namely  $0.943 < 1.669$ . The average score of students increased after the application of both media. The average value of students using the media of Jarimatika is 83.57 and the average value for using the abacus is 79.70. This shows that both media are equally effective in improving students' numeracy skills. This research can be used as a reference that the media of Jarimatika and the abacus are effective in increasing the ability to count.

### Abstrak

Penelitian ini merupakan penelitian kuantitatif dengan populasi siswa SDN 02 Alastuwo dan sampel penelitian yaitu kelas IIA dan IIB. Peneliti menggunakan soal tes dan dokumentasi sebagai teknik penelitian. Teknik analisis data yang digunakan yaitu uji t, yang sebelumnya dilakukan uji prasyarat yaitu uji keseimbangan, uji normalitas serta uji homogenitas. Tujuan penelitian ini adalah komparasi penggunaan media jarimatika dengan media sempoa terhadap kemampuan berhitung siswa kelas II SDN 02 Alastuwo. Hasil analisis diperoleh bahwa tidak terdapat perbedaan antara penggunaan media jarimatika dan media sempoa terhadap kemampuan berhitung siswa. Hasil uji t diperoleh  $t_{hitung} < t_{tabel}$  yaitu  $0,943 < 1,669$ . Rata-rata nilai siswa meningkat setelah penerapan kedua media. Rata-rata nilai siswa menggunakan media jarimatika adalah 83,57 dan rata-rata dengan media sempoa adalah 79,70. Hal ini menunjukkan bahwa kedua media sama-sama efektif dalam meningkatkan kemampuan berhitung siswa. Penelitian ini dapat digunakan sebagai referensi bahwa media jarimatika dan sempoa efektif dalam meningkatkan kemampuan berhitung.

**Keywords:** Jarimatika; Mathematics; Media; Sempoa.

## INTRODUCTION

Education is a human effort towards a better life (Suparwati, 2021). Educational objectives can be achieved if teachers as educators always develop learning processes that adapt to current conditions (Elwijaya et al., 2021). According to Permendiknas Number 32 of 2013 about National Education Standards, students can play an active role in developing creativity, self-reliance, interests and talents, and physical and mental conditions if the learning process can be carried out interactively and in a fun way. Educational success can be seen from educational objectives. If the educational objectives are achieved, then the implementation of education is said to be successful and vice versa (Febriyanti, 2021). According to Nuria Febriyana et al (2022) education needs attention from the government, society, and especially education managers.

One way to improve the quality of education is to improve the quality of learning at the elementary school level (Julia et al., 2022). Students will be taught basic skills, namely reading, writing and counting at the elementary school level (Lestari, 2020). Students will have difficulty pursuing education after elementary school if students are not able to master reading, writing and counting abilities (Huljannah, 2021). Students can achieve maximum learning objectives if the internal and external factors of students are well facilitated (Kustandi et al., 2021). The main learning objective is that students can master the materials by the objectives that have been set, one of which is mastering mathematics (Tayibu & Faizah, 2021).

One of the subjects that play an important role in education is mathematics (Mirza et al., 2022). Mathematics will be studied at every level of education, from elementary school to higher education

(Silviani et al., 2021). Mathematics is needed for counting and thinking processes in solving various problems (Janah et al., 2019). Mathematics improves thinking and reasoning skills and helps to solve everyday problems (Agustina et al., 2022).

Mathematics learning at the elementary school level emphasizes understanding the basic concepts of mathematics and showing symbols (Bulkani et al., 2022). Arithmetic and mathematical operations are the mathematic's basic skills taught in elementary school. One of the basic skills that every student must master is counting (Wafiqoh et al., 2022).

The results of observations at SDN 02 Alastuwo showed that students' counting skills were still low, namely skills in adding and subtracting numbers using the column method. The mistakes that are often made by students in using the column addition and column subtraction methods are not being careful in placing the ones and tens, students also do not understand the concept of regrouping and exchanging. This is in line with the research of Afifah et al (2022) which stated that in the addition and subtraction process, students had difficulty understanding the concepts of addition and subtraction, difficulty recognizing place values in column addition and column subtraction, and lacked accuracy.

Based on observations, it also showed that the use of learning media by teachers at SD Negeri 02 Alastuwo was still low, teachers tend to only explain the materials contained in the textbook, followed by working on some questions, while students only listened to explanations from the teacher. This results in students' understanding of the addition and subtraction material that has not been maximized. Students who only listen to the teacher's explanation and continue to work on the questions will result in lack of

student understanding of the material being taught (Pratama, 2019).

The application of learning media is more effective in improving students' understanding of the addition and subtraction material when compared to the lecture method (Adira Valentina, 2022). It was strengthened by research conducted by Wulandari & Kiswoyo (2019) that students were less focused and bored with mathematics lessons which resulted in low student learning outcomes on additional material, students felt bored because teachers used conventional learning models and did not use learning media.

In learning mathematics on the addition and subtraction material, if the teacher uses a conventional model, students will only listen without being able to practice. This is in line with research by Ulfah (2019) which stated that in carrying out learning, most teachers still used a monotonous method without varying strategies or media. Teacher innovation in mathematics learning is very much needed (Abidin et al., 2020). Determining learning media that are varied and by the material and characteristics of students is one of the media innovations that can be done by teachers (Trope et al., 2021).

Learning methods and media are important elements in the learning process, and both are closely related, the selection of learning methods can affect the type of learning (Esti Nur Qorimah, 2021). Teachers can use media as a facility to deliver learning to expedite, clarify, and increase the effectiveness and efficiency of the learning process (Widodo & Wahyudin, 2018). According to Permatasari & Prihatnani (2021), learning media is helpful in delivering materials in the learning process effectively and efficiently. Learning media needs to be used to overcome the limitations of the learning process (Batubara et al., 2021). The

use of learning media is a tool in the learning process to support the application of learning methods to improve learning outcomes (Ambiyar et al., 2021). A learning process must make students the centre of activity (Mesquita-Romero et al., 2022). Student involvement in learning activities determines learning success (Moradi & Noor, 2022).

Based on the problems presented above, it is necessary to use learning media to help improve the counting skills of 2<sup>nd</sup>-grade students of SDN 02 Alastuwo. One of the counting media that can be used is Jarimatika and abacus. Jarimatika is a simple way to count with the help of fingers (Himmah et al., 2021). In line with the opinion of Irmayanti et al (2022) who defined Jarimatika as a kind of counting process that uses the finger as a tool to assist calculations. While an abacus is an ancient counting tool consisting of a wooden frame with a series of shafts containing easily movable beads (Azimah, 2021). According to Doberneck & Dann (2019), the abacus is a mathematics teaching medium that can be used to explain the concept of numbers and also can be used in addition and subtraction operations.

In the use of learning media, of course, there are advantages and disadvantages of the media (Pakpahan, 2022). It is also found in Jarimatika and the abacus. The advantages of Jarimatika are that it is media that provide visualization of the counting process, it is fun for students because it is not difficult to learn, and the tools used are very simple, namely the students' fingers (Danuri & Nugroho, 2020). However, according to Nirmalasari et al (2021) Jarimatika has a disadvantage, namely that the mathematical operations that can be completed are limited due to the limited number of human fingers.

While the advantage of the abacus, according to Anam et al. (2020), is that the abacus is an interesting medium and can

develop arithmetic skills in students. Unfortunately, abacus media takes longer because students must be taught about the parts of the abacus and how to use formulas for problem-solving (Rusyani et al., 2021).

Based on the previous research conducted by Yusup (2018) there was an increase in students' counting skills in adding and subtracting numbers by applying Jarimatika. This is in line with research conducted by Hamidah et al. (2022), which showed that by using Jarimatika, students could more easily do addition, subtraction, multiplication, and division.

In addition to research on Jarimatika, there is also research on abacus media by Pradana & Ummah (2020), which concludes that students' counting skills have increased significantly with the use of the abacus. It is strengthened by the results of research conducted by Anugrahana (2020) that using an abacus can improve students' counting skills, make learning mathematics more fun, and increase students' creativity.

Based on the results of the research above, there has been no research on the comparison of the effectiveness between Jarimatika and abacus on the addition and subtraction counting skills, especially for elementary school students. Therefore, the purpose of this study is a comparison the use of Jarimatika and the abacus on students' counting skills.

## METHOD

This research used quantitative research with an experimental method and quasi-experimental research design, which aimed to compare the use of Jarimatika and abacus on students' counting skills. Quantitative research is a type of research to study certain populations or samples using data collection instruments, and quantitative data analysis aims to test

predetermined hypotheses (Sugiyono, 2018). An experimental research method is a research that is used to find the effect of one thing that is given treatment while the quasi-experimental research design is research that cannot control all variables as a whole (Sutama, 2019). Researchers chose a quasi-experimental research design because researchers would compare the effect of using an abacus and Jarimatika on students' counting skills, but researchers could not fully control all the variables.

This research was conducted on August 29<sup>th</sup>, 2022, at SDN 02 Alastuwo. The population is the entire research subject (Arikunto, 2018), which were students of SDN 02 Alastuwo in the 2022/2023 academic year. While the sample is part of the overall object being studied and is considered to represent the entire population. Researchers used 31 2<sup>nd</sup>-grade students consisting of class IIA (14 students) and class IIB (17 students) as a sample. The composition of the research sample is presented in Table 1.

Table 1. Research sample

Learning Media	Class	Total Students
Jarimatika	A	14
Abacus	B	17
Total Sample		31

There are two independent variables and one dependent variable. The independent variables in this study were the Jarimatika learning media and abacus learning media, while the dependent variable was the students' counting skills.

Data collection techniques used were testing and documentation. The type of test used in this study was multiple choice questions with 25 questions. The documentation used is a list of student names and student scores as well as photos during the research. A multiple choice test is a test in which there are several incomplete answers and to complete it,

choose one answer that is considered correct (Arikunto, 2018).

Validity and reliability tests were carried out before the study to obtain a valid and reliable test instrument. After the questions are valid and reliable, then the data analysis technique was carried out. Questions try-out aimed to find whether items in the research instrument could be used or not. The instrument being tested was in the form of math test questions for adding and subtracting integers consisting of 25 multiple-choice items. The try-out session was attended by 28 2<sup>nd</sup>-grade students at SDN Badran Surakarta.

The normality test and homogeneity test are prerequisite tests before data analysis. The normality test aimed to see whether the sample from the study used was normally distributed or not using the *Kolmogorov-Smirnov* method. While the homogeneity test was used to see whether the two research groups had the same variance or not.

Researchers used the t-test as an analysis technique to determine the differences in students' counting skills using Jarimatika and an abacus.

Data analysis is carried out after data from all respondents or other sources have been collected. The data collected is used to test the hypothesis so that a conclusion will be obtained. The hypotheses of this study were  $H_0$  = There is no difference between the use of abacus learning media and Jarimatika learning media on students' mathematics learning outcomes and  $H_1$  = There is a difference between the use of abacus learning media and Jarimatika learning media on students' mathematics learning outcomes. The test criteria: reject  $H_0$  (accept  $H_1$ ) if  $t_{count} > t_{table}$ , with a significance level of 5%.

## RESULTS AND DISCUSSION

### Results

Researchers tested the validity and reliability of the questions to be used in the research. The question was given to 28 2<sup>nd</sup>-grade students at SDN Badran Surakarta. The results of the validity of the questions can be seen in table 2.

Table 2. Validity Test Results

No.	$r_{count}$	$r_{table}$	Description
1	0.286	0.388	Invalid
2	0.177	0.388	Invalid
3	0.270	0.388	Invalid
4	0.730	0.388	Valid
5	0.429	0.388	Valid
6	0.599	0.388	Valid
7	0.546	0.388	Valid
8	0.437	0.388	Valid
9	0.541	0.388	Valid
10	0.618	0.388	Valid
11	0.694	0.388	Valid
12	0.451	0.388	Valid
13	0.251	0.388	Invalid
14	0.089	0.388	Invalid
15	0.282	0.388	Invalid
16	0.336	0.388	Invalid
17	0.836	0.388	Valid
18	0.766	0.388	Valid
19	0.571	0.388	Valid
20	0.571	0.388	Valid
21	0.550	0.388	Valid
22	0.815	0.388	Valid
23	0.489	0.388	Valid
24	0.738	0.388	Valid
25	0.345	0.388	Invalid

Based on table 2 above, the results of the validity of the test questions were known to be 17 valid questions that were worthy of research. Meanwhile, invalid questions were not used. The calculation results obtained that the instrument reliability index was 0.845, it was obtained that the instrument used was reliable.

Furthermore, the research was carried out at SDN 02 Alastuwo in two classes, namely class IIA and class IIB. Jarimatika learning media was applied to class A, while abacus learning media was

applied to class B. The balance test was carried out to measure the initial abilities of the two classes before the research. The results of the students' balance test were seen from the math test scores. The results of the balance test calculations are presented in Table 3.

Table 3. Balance test results

Class	Mean	$f_{count}$	$f_{table}$
A	81.78	3.253	3.340
B	78.70		

Based on Table 3, the results of the balance test using the  $f$  test obtained were  $f_{count} = 3.253$  and  $f_{table} = 3.340$ . Because  $f_{count} < f_{table}$ , it is concluded that the two classes were balanced. Because the two classes used in the experiment were balanced, it can be continued for research.

Next is the normality test using the *Kolmogorov-Smirnov* formula, the result of the normality test got that the significance value for both classes was 0.20 or the result was greater than 0.05. So that it can be concluded that the counting skills of class A and class B students were normally distributed.

After the normality test, researchers then conducted a homogeneity test. It was found that the significance value for both classes was 0.097 and the significance value for both classes was  $> 0.05$  so it was concluded that the data in this research were homogeneous.

The results of the comparison study using Jarimatika and an abacus on the counting skills of 2<sup>nd</sup>-grade students of SDN 02 Alastuwo could be seen from the results of hypothesis testing using the  $t$ -test. The results of hypothesis testing are presented in table 4.

Table 4. T-test results

A	$t_{count}$	$t_{table}$
0.05	0.943	1.699

Based on Table 4, it was obtained that  $t_{count}$  is 0.943 while  $t_{table}$  is 1.669, it could be seen that  $t_{count} < t_{table}$  then  $H_0$  was rejected, and it was concluded that there was no difference between the use of Jarimatika and abacus media on the counting skills.

However, based on the mean value of students' counting skills on addition and subtraction material, students' counting skills increased after the use of Jarimatika and abacus media. The comparison of students' mean scores is presented in table 5.

Table 5. Comparison of students' mean score

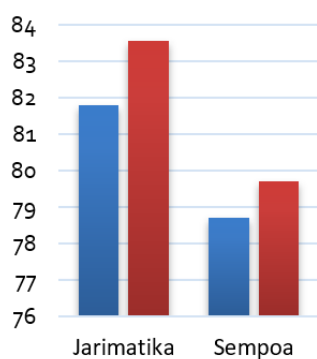
Learning Media	Mean
Jarimatika	83.57
Abacus	79.70

Based on Table 5, it was known that the mean value using Jarimatika media was higher than the mean value using abacus media, which was  $83.57 > 79.70$ . Value  $T_t$  can be seen from the mean value of students before and after the application of Jarimatika and the abacus that the application of both media, students' counting skills increased as seen from the mean scores presented in Table 6 and Graph 1.

Table 6. Students' counting skills

Learning Media	Pretest	Posttest
Jarimatika	81.78	83.57
Abacus	78.70	79.70

Based on table 6 and graph 1 above, showed that the mean value of students had increased after using Jarimatika media and abacus media. The pretest value was seen from the results of the addition and subtraction math test, while the post-test value was seen from the results of students who worked on the test questions given by researchers after applying both learning media.



Graph 1. Students' counting skills

## Discussion

In this study, it was also found that there was an increase in counting skills of class IIA students before using the Jarimatika and after using Jarimatika, this can be seen from the mean score of the students before and after the use of the Jarimatika media. The mean score before using Jarimatika was 81.78 while after the application of the media, the mean score of the students increased to 83.57. This showed that the use of Jarimatika affected increasing students' counting skills. This is in line with research by Al Musthafa & Mandailina (2018) which stated that the use of the Jarimatika method is useful and helps in improving students' counting skills and students are more enthusiastic in learning activities. The increase in counting skills was strengthened in the research conducted by Afriani et al (2019) which obtained the results that the Jarimatika method could improve students' counting skills. Strengthened by research conducted by Himmah et al (2021), it was found that students' counting skills increased by applying Jarimatika, students were also actively involved and happy in demonstrating the Jarimatika method when counting.

Jarimatika makes it easier for students to learn to count using the help of their fingers to make learning fun because students are directly involved in learning.

Jarimatika also trains students' concentration and also develops their right and left brain performance (Lestari, 2020). Jarimatika increases students' activeness and motivation to learn (Kamara, 2021).

The abacus media also had an effect on improving students' counting skills, in this study, the scores of class IIB students before the application of the abacus media were 78.70 and increased to 79.70. Even though the mean increase was smaller than the Jarimatika media, it can be said that using the abacus can improve students' counting skills. This is in line with the research conducted by Azimah (2021) which stated that learning by using an abacus could improve students' counting skills, as evidenced by the results of the students' mean score before the treatment, which was 50.98 and then increased to 70.66. It is the same with the research conducted by Pradana & Ummah (2020) which stated that there was an effect of using the abacus media on students' counting skills, namely students experienced an increase in counting skills and affected students' learning outcomes.

The result of this study is that there was no difference between the use of Jarimatika media and abacus media on students' counting skills, indicating that both media, namely Jarimatika and abacus, were equally effective in improving students' counting skills. This can be seen from the students' counting skills which increased after the application of both media.

Both media also affected students' activeness and increased students' motivation in the learning process. In line with research conducted by Kristiawati (2021), students' ability to solve counting problems, and also students' activeness and activity in the learning process increased. Students tend to be enthusiastic about following the counting process using the

abacus media (Anjasrina et al., 2020). In a research conducted by Indiasuti (2021), it is stated that Jarimatika increased students' enthusiasm for learning mathematics. Students were more motivated to learn with Jarimatika, this can be seen from the students who were more active in asking and answering when learning to use Jarimatika (Widi et al., 2021).

The use of learning media is an important factor in improving students' learning outcomes and motivating students to learn because learning media can support the development of student's knowledge, especially for students who are in the learning process (Audie, 2019). Learning media can generate enthusiasm for students to learn new things. Interesting learning media will stimulate students in the learning process (Nurfadhillah et al., 2021). If learning media is used properly, it can be a more effective and efficient tool to achieve learning objectives. Learning media also motivates students to learn (Puspitarini et al., 2019).

However, this research was limited to the use of Jarimatika and abacus which were used to teach addition and subtraction material. The numbers taught in this study were limited to natural numbers less than one hundred, this was adapted to the method of Jarimatika which can only be used for additions and subtractions of natural numbers less than one hundred.

## CONCLUSION

Based on the results of data analysis, it was concluded that there was no difference in the application of Jarimatika media and abacus media on the counting skills of the 2<sup>nd</sup>-grade students of SDN 02 Alastuwo. It could be seen from the results of the t-test that  $t_{\text{count}} < t_{\text{table}}$ , that is  $0.943 < 1.669$ . However, if it was seen from the results of the mean scores of the test, the

use of Jarimatika media was higher than the use of abacus media, namely  $83.57 > 79.70$ . Both media affected increasing students' counting skills and activeness in the learning process, so this research proved that both Jarimatika and the abacus were effective in improving students' counting skills on the addition and subtraction material. The recommendation from the results of this research is that further researchers can add broader material that are not limited to addition and subtraction and can develop technology-based learning media.

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